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*Edited by Delfín Ortega-Sánchez
and Carlos Pérez-González*



Education Annual Volume 2025 - Education for Global Transformation

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Aims and Scope of the Series

Education and Human Development is an interdisciplinary research area that aims to shed light on topics related to both learning and development. This Series is intended for researchers, practitioners, and students who are interested in understanding more about these fields and their applications.

Meet the Series Editor



Katherine Meltzoff received her BA in Psychology from Trinity College, in Connecticut, USA and her Ph.D. in Experimental Psychology from the University of California, San Diego. She completed her postdoctoral work at the Yale Child Study Center with Dr. James McPartland. Dr. Meltzoff's doctoral dissertation explored neural correlates of reward anticipation to social versus nonsocial stimuli in children with and without autism spectrum disorders (ASD). She has been a faculty member at the University of California, Riverside in the School of Education since 2016. Her research focuses on translational studies to explore the reward system in ASD, as well as how anxiety contributes to social challenges in ASD. She also investigates how behavioral interventions affect neural activity, behavior, and school performance in children with ASD. She is also involved in the diagnosis of children with ASD and is a licensed clinical psychologist in California. She is the Assistant Director of the SEARCH Center at UCR and is a faculty member in the Graduate Program in Neuroscience.

Meet the Topic Editors



Professor Delfín Ortega-Sánchez holds a Ph.D. in the Didactics of History and Social Sciences (Autonomous University of Barcelona), Education (University of Burgos), and History (University of Extremadura). His scholarly work centres on democratic, inclusive, and socially engaged citizenship education, with a particular emphasis on the teaching and learning of controversial issues. His research trajectory has earned international recognition, including his selection as one of the world's Top 10 Social Science Researchers in the seventh edition of the USERN Prize (2022). He was also awarded the First Prize in Transformative Education Research (2025) by the Global Citizenship Foundation, in partnership with UNESCO MGIEP, in recognition of his research trajectory in the field of education for democratic citizenship.



Professor Carlos Pérez-González is a scholar of educational research and innovation, with a particular focus on historical and literary education. He has extensive teaching and research experience at the Metropolitan University of Educational Sciences and the Catholic University of Valparaíso in Chile, as well as at universities in Constance, Zurich, Munich, Siena, and Florence. His career reflects a strong commitment to international collaboration and to advancing university teaching. He has actively contributed to major academic conferences and inter-university research networks. He has also led or played a central role in more than ten national and European research projects, demonstrating sustained leadership in the development of educational methodologies and interdisciplinary approaches.

Contents

Preface	XIII
Section 1	
Inclusive Citizenship, Equity, and Educational Communities	1
Chapter 1	3
Perspective Chapter: Promoting Democratic and Inclusive Citizenship Education – Pathways to Engaged and Equitable Societies <i>by Sam Ramaila</i>	
Chapter 2	29
Perspective Chapter: Primary Education in Western China after COVID-19 – Challenges and Strategies for Home-School-Community Synergy <i>by Yuan Huang and Ou Huang</i>	
Chapter 3	47
Perspective Chapter: Advancing Grade 12 Mathematics Education in South African Community Learning Centres – A Framework for Equity and Innovation <i>by Carlit Casey Tibane and Olivia Neo Mafa-Theledi</i>	
Section 2	
Digital Education, Information Literacy, AI, and Media Culture	59
Chapter 4	61
Perspective Chapter: Empowering Digital Education through Information Literacy <i>by Md Rosli Ismail, Thirumeni T. Subramaniam and Shahril Effendi Ibrahim</i>	
Chapter 5	77
Ten Years of Video-Based Mathematics Learning: Insights and Future AI Integration <i>by Sidonie Costa</i>	

Chapter 6	93
Gender Stereotypes in Media History: What Gender Identity Is Reproduced in Historical Video Games? A New Analysis of <i>Assassin's Creed</i> from the Perspective of Historical Education	
<i>by César Barba-Alonso and Delfín Ortega-Sánchez</i>	
Section 3	109
Educational Agents, Futures Design, and Educational Well-Being	
Chapter 7	111
Teaching with What you Are: The Importance of Teachers' Positive Resources and of the Neuropsychopedagogical Training Envisioning the Future on Adolescents' Well-Being – A Correlational and Analysis of Variance Study	
<i>by Giulia Perasso, Grazia Serantoni, Carmela Lillo, Alessandro Maculan, Francesca Vianello and Tania Di Giuseppe</i>	
Chapter 8	127
Design Futures: Cultivating Strategic Foresight Competencies in Design Education	
<i>by Noha Essam Khamis</i>	
Section 4	141
Higher and Professional Education: Policies, Internationalization, and Futures of Work	
Chapter 9	143
Magicalizing Numbers through the Strategic Use of Econometrics, Liberal-Metrics, and Politico-Metrics in Higher Education in Nigeria: A Paradigmatic Approach	
<i>by Ikyer Godwin Aondofa</i>	
Chapter 10	165
Perspective Chapter: Future Trends of the Internationalization of Higher Education – The Case of China and Spain	
<i>by Yinglong Qiu, Adela García-Aracil and Rosa Isusi-Fagoaga</i>	
Chapter 11	179
Perspective Chapter: A First Look at How Professionals are Trained and Developed to Meet Industrial Needs – An Indian Perspective	
<i>by Velmanirajan Kathambaran, Surya Meena Velmanirajan, Anuradha Kanagaraj and Sooraj Prabu Velmanirajan</i>	

Preface

This volume brings together a carefully curated selection of international studies that address, from complementary perspectives, some of the major educational challenges of our time: the construction of democratic and inclusive citizenships, digitalization and media culture, the design of fairer educational futures, and the role of higher and professional education in the reconfiguration of work and human development.

In Section 1, *Inclusive Citizenship, Equity, and Educational Communities*, the volume opens with the study *Perspective Chapter: Promoting Democratic and Inclusive Citizenship Education – Pathways to Engaged and Equitable Societies*, which places education for democratic and inclusive citizenship at the heart of building more participatory, just, and egalitarian societies. Grounded in consolidated theoretical frameworks and comparative analyses, the chapter examines curricular models and practices that combine active methodologies, a community-based approach, and teacher education oriented towards civic engagement. It is followed by *Perspective Chapter: Primary Education in Western China after COVID-19 – Challenges and Strategies for Home-School-Community Synergy*, which turns attention to primary education in western China after the pandemic to analyse the challenges and strategies for strengthening home-school-community synergy in contexts marked by profound territorial and social complexity. The section closes with *Perspective Chapter: Advancing Grade 12 Mathematics Education in South African Community Learning Centres – A Framework for Equity and Innovation*, which explores the potential of Community Learning Centres as equity-oriented devices for upper secondary mathematics education in South Africa, proposing a framework for systemic improvement that combines Deliverology and Implementation Science to ensure sustainable, scalable, and inclusive processes.

Section 2, *Digital Education, Information Literacy, AI, and Media Culture*, focuses on the transformations brought about by digitalization and artificial intelligence. *Perspective Chapter: Empowering Digital Education through Information Literacy* examines the decisive role of information literacy in open, distance, and digital education settings, showing how these competences underpin autonomous learning, critical thinking, and the ethical use of information in an ecosystem shaped by the expansion of AI, MOOCs, gamification, and online collaboration. Subsequently, *Ten Years of Video-Based Mathematics Learning: Insights and Future AI Integration* presents a decade of experience in university mathematics teaching supported by video-based resources, and discusses the possibilities of AI, from the personalization of learning pathways to specialized chatbots, as an ally to extend, without replacing it, the pedagogical work of lecturers. In turn, *Gender Stereotypes in Media History: What Gender Identity Is Reproduced in Historical Video Games? A New Analysis of Assassin's Creed from the Perspective of Historical Education* offers a thorough and rigorous critical analysis of gender stereotypes and of the Eurocentric, patriarchal, and class-based representations present in the Assassin's Creed saga, underlining their relevance for history education and for a critical reading of media culture products.

In Section 3, *Educational Agents, Futures Design, and Educational Well-Being*, chapter *Teaching with What You Are: The Importance of Teachers' Positive Resources and of the Neuropsychopedagogical Training Envisioning the Future on Adolescents' Well-Being – A Correlational and Analysis of Variance Study* highlights the profound interdependence between teachers' psychological resources, classroom dynamics, and adolescent well-being, with the aim of showing the effects of the neuropsychopedagogical training *Envisioning the Future* on students' emotional regulation, perceptions of bullying, and self-determination. The chapter *Design Futures: Cultivating Strategic Foresight Competencies in Design Education*, for its part, incorporates futures practices and Strategic Foresight into design education, proposing a framework and a participatory workshop experience that guide decision-making and innovation in contexts of high uncertainty.

Finally, Section 4, *Higher and Professional Education: Policies, Internationalization, and Futures of Work*, is devoted to higher and professional education in a global scenario marked by crises, inequalities, and shifting configurations of work. *Magicalizing Numbers through the Strategic Use of Econometrics, Liberal-Metrics, and Politico-Metrics in Higher Education in Nigeria: A Paradigmatic Approach* offers a critical reflection on the strategic uses of quantification in the governance of Nigerian higher education and its paradigmatic implications for equity and accountability, while *Perspective Chapter: Future Trends of the Internationalization of Higher Education – The Case of China and Spain* analyses the possibilities and tensions of cooperation between China and Spain in the post-COVID-19 era, highlighting the role of internationalization as a lever for competitiveness, sustainable local development, and talent attraction in a changing geopolitical context. The volume closes with *Perspective Chapter: A First Look at How Professionals are Trained and Developed to Meet Industrial Needs – An Indian Perspective*, which examines, from the specific context of Tamil Nadu, employers' expectations, the limitations of professional personality development programmes, and the need to integrate emerging technologies, such as AI, machine learning, IoT, and robotics, into education and training for work.

This book is addressed to education researchers, policy-makers, leadership teams, teacher educators, and education professionals interested in understanding and transforming, from situated and comparative perspectives, the relationships between citizenship, digitalization, futures design, and higher and professional education. We express our profound gratitude to the authors for the quality and generosity of their contributions, to the reviewers for their demanding and constructive comments, and to the IntechOpen team for their editorial support throughout the entire process.

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Section 1

Inclusive Citizenship, Equity, and Educational Communities

Perspective Chapter: Promoting Democratic and Inclusive Citizenship Education – Pathways to Engaged and Equitable Societies

Sam Ramaila

Abstract

This chapter examines the pivotal role of democratic and inclusive citizenship education in creating engaged, responsible, and equitable societies. It outlines the theoretical foundations of democratic and inclusive education, emphasizing values such as participation, justice, and equality. A comparative analysis of global approaches to citizenship education identifies best practices through case studies from various countries. The chapter highlights practical strategies for integrating democratic principles into curricula, using student-centered and inquiry-based pedagogies, and emphasizing teacher training and community involvement. It also addresses challenges such as structural inequalities, cultural resistance, and policy limitations, offering recommendations to overcome these barriers. Through successful models, the chapter demonstrates how democratic citizenship education fosters active and responsible citizens. It also explores the future of citizenship education, focusing on the need to adapt to emerging trends and technologies. The chapter concludes by calling for a sustained commitment from educators, policy-makers, and society to prioritize democratic and inclusive education in pursuit of a more just world.

Keywords: democratic citizenship education, inclusive education, civic engagement, global citizenship, educational equity

1. Introduction

In an era of rapid globalization, technological advancement, and sociopolitical change, the role of education in shaping engaged, responsible, and equitable citizens has never been more crucial. Citizenship education, at its essence, is about more than just teaching the mechanics of government or the rights and responsibilities of individuals; it is about nurturing a commitment to the common good and fostering the ability to participate meaningfully in the civic life of one's

community, nation, and the world. However, for citizenship education to be truly transformative, it must be grounded in the principles of democracy and inclusivity. Democratic citizenship education emphasizes the development of critical thinking, active participation, and a commitment to social justice, enabling individuals to engage thoughtfully and constructively in societal issues [1]. Inclusivity, on the other hand, ensures that this education is accessible to all, regardless of race, gender, socioeconomic status, or other aspects of identity, and that it reflects the diverse experiences and perspectives that characterize contemporary societies [2]. As the world grapples with challenges such as political polarization, social inequality, and the marginalization of vulnerable groups, the need for a citizenship education that is both democratic and inclusive becomes increasingly urgent. Such an education is not only about imparting knowledge but also about cultivating the values, skills, and attitudes necessary for individuals to contribute to the creation of more just and equitable societies.

This chapter explores the critical importance of promoting democratic and inclusive citizenship education as a pathway to achieving engaged and equitable societies. It delves into the theoretical underpinnings of these concepts, examining how they can be effectively integrated into educational curricula and practices. Additionally, it addresses the challenges and barriers to implementing such education and offers practical strategies for educators and policymakers. Ultimately, this chapter argues that, by prioritizing democratic and inclusive principles in citizenship education, we can empower learners to become active, informed, and compassionate citizens who are equipped to navigate and shape the complex world they inhabit. The promotion of democratic and inclusive citizenship education is not just an educational imperative; it is a societal one, vital for the sustenance of democracy and the realization of a more inclusive and equitable future for all.

2. Contextualizing citizenship education

Citizenship education is a cornerstone of modern education systems, tasked with the vital role of preparing individuals to participate actively and responsibly in civic life. At its core, citizenship education encompasses the knowledge, skills, and values necessary for individuals to contribute meaningfully to society [3]. It is not merely about understanding the legal and political frameworks of a nation but also about fostering a sense of belonging and commitment to the community, both locally and globally. The scope of citizenship education extends beyond the traditional classroom, permeating various aspects of societal life. It includes the promotion of critical thinking, ethical reasoning, and the ability to engage in constructive dialog. Citizenship education is designed to cultivate informed, active citizens who can critically assess societal issues, make reasoned decisions, and work collaboratively to solve problems [4].

In today's increasingly diverse and interconnected world, the principles of democracy and inclusivity have become more critical than ever in the context of citizenship education. Democratic principles ensure that individuals are equipped with the tools to participate in the decision-making processes that shape their lives, promoting equality, justice, and the protection of individual rights [5]. Inclusivity, on the other hand, ensures that all voices are heard, and that education is accessible to everyone, regardless of their background, identity, or socioeconomic status [6]. By embedding

democratic and inclusive values into citizenship education, educators can help to create a society where all individuals feel valued and empowered to contribute. This approach not only promotes social cohesion but also strengthens the foundation of democracy itself by ensuring that all citizens are prepared to engage in civic life in meaningful ways.

3. Purpose and objectives of the chapter

The purpose of this chapter is to explore the essential role that democratic and inclusive citizenship education plays in shaping engaged and equitable societies. It seeks to provide a comprehensive understanding of how these educational practices can be integrated into existing curricula to promote active citizenship and social justice.

The chapter aims to achieve several key objectives. First, it will provide a theoretical overview of the concepts of democratic and inclusive citizenship education, examining their historical development and current relevance. Next, it will present practical strategies for educators and policymakers to effectively implement these principles in educational settings. Additionally, the chapter will identify and discuss the challenges and barriers to promoting democratic and inclusive citizenship education, offering potential solutions and recommendations for overcoming these obstacles.

Finally, the chapter will consider the broader implications of these educational practices for addressing both global and local challenges. In an era marked by political polarization, social inequality, and cultural diversity, the promotion of democratic and inclusive citizenship education is more important than ever. By equipping learners with the knowledge, skills, and values needed to navigate these complex issues, education can play a transformative role in building more engaged, equitable, and resilient societies.

This chapter, therefore, serves as a call to action for educators, policymakers, and stakeholders to prioritize democratic and inclusive citizenship education in their efforts to create a better future for all.

4. Theoretical foundations of democratic and inclusive citizenship education

4.1 Democratic citizenship education

At the heart of democratic citizenship education lies a commitment to key principles and values such as participation, justice, and equality. These principles are essential in nurturing individuals who are not only aware of their rights and responsibilities but are also motivated to actively engage in the civic life of their communities. Participation is a cornerstone of democracy, emphasizing the importance of individuals' involvement in decision-making processes that affect their lives [5]. Justice, another critical value, ensures that the rights of all individuals are respected and that inequalities are addressed [7]. Equality underpins both participation and justice, ensuring that all individuals can engage in society on an equal footing, regardless of their background or circumstances [8].

The concept of democratic citizenship education has deep historical roots and philosophical underpinnings. Its evolution can be traced back to the ancient Greek philosophers, who emphasized the role of education in shaping virtuous citizens capable of contributing to the polis, or city-state. In more modern times, thinkers like John Dewey have argued for an education system that goes beyond the mere transmission of knowledge, advocating instead for an approach that fosters critical thinking, problem-solving, and active participation in democratic life. Dewey's vision of education as a means of preparing individuals for participatory democracy has profoundly influenced contemporary educational practices, emphasizing the development of civic competencies and the promotion of social responsibility. Democratic citizenship education is not static; it has evolved in response to the changing needs and challenges of societies. In today's globalized world, where democratic values are increasingly under threat, the need to reinforce these principles through education is more pressing than ever. By equipping learners with the tools to critically analyze societal issues, make informed decisions, and advocate for justice and equality, democratic citizenship education plays a crucial role in sustaining and strengthening democratic societies.

4.2 Inclusive citizenship education

Inclusive citizenship education focuses on ensuring that all individuals, regardless of their identity or circumstances, can participate fully in civic life [9]. In diverse societies, where individuals come from various cultural, ethnic, socioeconomic, and gender backgrounds, inclusivity is essential for creating a sense of belonging and ensuring that no one is marginalized or excluded. Inclusivity in citizenship education goes beyond merely acknowledging diversity; it involves actively addressing the structural inequalities and biases that can prevent certain groups from fully participating in society. This approach requires educators to adopt an intersectional perspective, recognizing that individuals' identities are shaped by multiple factors, such as race, gender, class, and ability, which intersect and influence their experiences of inclusion or exclusion. The significance of inclusive citizenship education is particularly pronounced in societies that are characterized by deep-seated inequalities and historical injustices [10]. In such contexts, education can serve as a powerful tool for social transformation, helping to break down barriers to participation and promoting a more equitable distribution of power and resources. By fostering an inclusive approach to citizenship education, educators can help to create a society where all voices are heard, and where everyone can contribute to the common good.

4.3 Integrating democracy and inclusivity

The integration of democratic and inclusive principles in citizenship education is not only possible but also necessary for fostering active and responsible citizens. These two concepts are inherently synergistic: democracy cannot truly flourish without inclusivity, and inclusivity is hollow without the democratic values of participation, justice, and equality. Education plays a pivotal role in integrating these principles by creating learning environments that model the democratic and inclusive societies we aspire to build [6]. This involves adopting teaching practices that encourage critical thinking, open dialog, and collaboration, while also ensuring that all students, regardless of their backgrounds, feel valued and supported. In such environments, students learn not only about their rights and responsibilities but also about the

importance of respecting and valuing the rights of others, thereby preparing them to be active participants in a diverse and democratic society. Moreover, integrating democracy and inclusivity in citizenship education helps to cultivate a sense of agency among learners, empowering them to become change-makers in their communities [6]. By learning to navigate and address complex societal issues through a democratic and inclusive lens, students develop the skills and dispositions necessary to contribute to the creation of more just and equitable societies.

In summary, the theoretical foundations of democratic and inclusive citizenship education provide a robust framework for understanding the critical role that education plays in shaping the citizens of tomorrow. By embracing the principles of participation, justice, equality, and inclusivity, educators can help to build societies that are not only democratic but also genuinely inclusive, where all individuals can thrive and contribute to the common good.

5. Global perspectives on democratic and inclusive citizenship education

In today's rapidly evolving global landscape, the pursuit of democratic and inclusive citizenship education has emerged as a critical cornerstone for fostering equitable and just societies. Across different continents, nations are grappling with how best to equip their citizens—especially the younger generations—with the knowledge, skills, and values necessary to participate fully and effectively in democratic life. This narrative explores the diverse approaches and perspectives on democratic and inclusive citizenship education from various parts of the world, highlighting the unique challenges, opportunities, and innovations that shape this vital field.

In North America, democratic citizenship education has long been rooted in the principles of individual rights, freedom, and civic responsibility. Schools in the United States and Canada often emphasize the importance of understanding the Constitution, civic duties, and the functioning of government institutions [11]. However, recent years have seen a growing recognition of the need to incorporate a more inclusive approach that acknowledges and addresses historical injustices, such as racial inequality and indigenous rights. This shift has led to the development of curricula that not only teach democratic principles but also foster critical thinking about social justice and equity.

In Europe, the concept of democratic citizenship is deeply intertwined with the continent's history of conflict, reconciliation, and the ongoing project of European integration. Many European countries have implemented citizenship education programs that aim to promote social cohesion, respect for diversity, and an understanding of shared values such as human rights and the rule of law [12]. The European Union (EU) has played a significant role in encouraging member states to adopt inclusive approaches to citizenship education that reflect the region's multicultural reality. However, the rise of populism and nationalism in some parts of Europe has posed challenges to these efforts, prompting debates about the balance between national identity and European solidarity.

In Africa, the legacy of colonialism and the struggle for independence have significantly influenced approaches to citizenship education. Many African nations have sought to use education as a tool for nation-building, promoting a sense of unity and collective identity in the wake of diverse ethnic, linguistic, and cultural backgrounds [13]. Democratic citizenship education in Africa often emphasizes the importance of community, social responsibility, and active participation in public life.

However, challenges such as political instability, poverty, and limited resources have sometimes hindered the effective implementation of these programs. Nonetheless, there are inspiring examples of grassroots initiatives and educational reforms that aim to empower citizens and promote democratic values across the continent.

Asia presents a diverse tapestry of perspectives on democratic and inclusive citizenship education, reflecting the region's rich cultural heritage and varied political systems. In countries like Japan and South Korea, citizenship education is often closely linked to moral education, with a focus on instilling values, such as respect for others, social harmony, and collective well-being [14]. In contrast, India, the world's largest democracy, has a long tradition of democratic education that emphasizes the importance of pluralism, secularism, and the protection of minority rights [15]. However, the region also faces significant challenges, including the need to address issues of inequality, caste discrimination, and authoritarian tendencies in some areas.

In Latin America, the struggle for democracy and social justice has profoundly shaped citizenship education. Many countries in the region have experienced periods of dictatorship and repression, leading to a strong emphasis on human rights education as a means of preventing the recurrence of such abuses [16]. Democratic citizenship education in Latin America often focuses on empowering marginalized communities, promoting social inclusion, and fostering a culture of participation and accountability. However, economic inequality, corruption, and political polarization continue to pose obstacles to the realization of these goals.

As we examine these global perspectives, it becomes clear that while the contexts and challenges may differ, the overarching goal of democratic and inclusive citizenship education remains the same: to prepare individuals to be informed, engaged, and responsible members of their societies. Whether through formal education systems, community initiatives, or policy reforms, the pursuit of this goal is crucial for building more just, equitable, and resilient democracies worldwide. In an increasingly interconnected world, the exchange of ideas and best practices across borders can play a vital role in advancing democratic and inclusive citizenship education for all.

6. Comparative analysis of global approaches

Citizenship education varies significantly across different countries, shaped by unique cultural, political, and historical contexts. Examining these diverse approaches provides valuable insights into how democratic and inclusive principles are integrated into education systems worldwide, and what lessons can be drawn for broader application.

In Finland, citizenship education is deeply embedded in the national curriculum, which emphasizes the development of critical thinking, ethical reasoning, and active participation [1]. Finnish education policies prioritize equity and inclusion, ensuring that all students, regardless of their background, have equal opportunities to engage in civic life. The curriculum integrates democratic values throughout various subjects, promoting a holistic approach to citizenship education that fosters a strong sense of social responsibility among students. Finland's success in cultivating an engaged and informed citizenry highlights the importance of a well-rounded, inclusive educational framework that balances academic learning with civic education.

South Africa presents a contrasting yet equally instructive case. Emerging from a history of apartheid, South Africa has made significant strides in promoting democratic citizenship education as part of its efforts to build a more inclusive society [17].

The national curriculum includes Life Orientation, a subject designed to equip students with the knowledge and skills necessary for active citizenship in a diverse democracy [18]. This subject covers a wide range of topics, including human rights, social justice, and community engagement, reflecting the country's commitment to reconciliation and social cohesion. However, challenges remain, particularly in addressing the deep-seated inequalities that persist in the education system. The South African experience underscores the importance of aligning citizenship education with broader social and economic reforms to ensure that all citizens can participate fully in the democratic process.

In the United States, citizenship education has traditionally been rooted in the teaching of civics and government, with a strong focus on the principles of democracy and the functioning of political institutions [19]. However, the approach to citizenship education varies widely across states and school districts, leading to significant disparities in the quality and content of instruction. In recent years, there has been a growing recognition of the need to incorporate more inclusive and culturally responsive teaching practices that reflect the diverse experiences of students. Initiatives such as project-based learning (PBL) and community service programs have been introduced to provide students with practical experiences that connect classroom learning to real-world civic engagement. The U.S. experience highlights the challenges of implementing a standardized approach to citizenship education in a diverse and decentralized education system, as well as the importance of adapting educational practices to meet the needs of all students.

Across these varied contexts, several key lessons emerge. First, successful citizenship education requires a curriculum that integrates democratic and inclusive principles across all subjects, rather than confining these concepts to a single course. Second, the effectiveness of citizenship education is closely linked to the broader social and political context, emphasizing the need for alignment between educational goals and societal values. Finally, the importance of inclusivity cannot be overstated; ensuring that all students have access to quality citizenship education is essential for building a truly democratic and equitable society.

7. International policies and frameworks

Global frameworks and international policies play a crucial role in shaping national approaches to citizenship education. Organizations, such as UNESCO and the United Nations have been instrumental in promoting the values of democracy, human rights, and social inclusion through education, influencing the development of citizenship education curricula around the world. One of the most significant global frameworks in this regard is the United Nations' Sustainable Development Goals (SDGs), particularly Goal 4, which aims to ensure inclusive and equitable quality education for all. Target 4.7 of this goal specifically calls for the integration of education for sustainable development and global citizenship into national curricula. This target emphasizes the need to equip learners with the knowledge, skills, and values necessary to promote sustainable development, human rights, gender equality, and a culture of peace and non-violence. The SDGs have encouraged countries to reevaluate and revise their citizenship education programs, ensuring that they align with the broader objectives of global citizenship and sustainable development.

UNESCO's Global Citizenship Education (GCED) initiative is another key policy framework that has influenced national citizenship education strategies. GCED aims

to empower learners to assume active roles in addressing global challenges and to contribute to a more peaceful, tolerant, and inclusive world. The framework promotes a holistic approach to education, focusing on three core dimensions: cognitive (knowledge and understanding of global issues), socio-emotional (values and attitudes that support responsible global citizenship), and behavioral (actions and participation in community and global contexts). Countries that have adopted the GCED framework have seen a shift towards more interdisciplinary and participatory approaches to citizenship education, emphasizing the interconnectedness of local and global issues.

The impact of these international policies on national curricula can be seen in the way countries have incorporated global citizenship themes into their education systems. For instance, in many European countries, citizenship education now includes a focus on global issues, such as climate change, migration, and social justice, reflecting the influence of the SDGs and GCED. Similarly, in Asia and Latin America, there has been a growing emphasis on education that fosters a sense of global responsibility and intercultural understanding [20]. However, the implementation of these international frameworks is not without challenges. In some countries, there may be resistance to adopting global citizenship education due to political, cultural, or ideological differences. Additionally, the integration of these frameworks into national curricula requires significant investment in teacher training, curriculum development, and educational resources, which can be a barrier for resource-constrained countries [21].

In summary, international policies and frameworks have played a pivotal role in promoting democratic and inclusive citizenship education on a global scale. By encouraging countries to adopt a more holistic and integrated approach to citizenship education, these frameworks have helped to align national curricula with the broader goals of global citizenship and sustainable development. The ongoing challenge lies in ensuring that these global principles are effectively translated into national educational practices, adapted to local contexts, and accessible to all learners.

8. Strategies for promoting democratic and inclusive citizenship education

In an increasingly diverse and interconnected world, promoting democratic and inclusive citizenship education has become paramount. This approach not only fosters an understanding of democratic principles but also ensures that all students, regardless of their background, feel valued and empowered within the educational environment. Here are some effective strategies for advancing democratic and inclusive citizenship education:

8.1 Integrate civic education across the curriculum

Democratic citizenship education should not be confined to social studies or civics classes alone. Instead, it should be integrated across various subjects to highlight its relevance in different contexts. For example, literature classes can explore themes of justice and equity, while science classes can discuss the role of informed citizenship in environmental issues. This cross-curricular approach helps students see the practical applications of democratic principles in everyday life.

8.2 Foster critical thinking and discussion

Encouraging students to think critically about societal issues and engage in open discussions is crucial for developing informed citizens. Classrooms should create a

safe space where students can debate different viewpoints, analyze current events, and discuss the impact of various policies and practices on different communities. This fosters not only critical thinking but also empathy and understanding.

8.3 Promote student voice and agency

Empowering students to have a say in their education and the functioning of their school can enhance their sense of ownership and responsibility. Schools can implement student councils, forums, and feedback mechanisms that allow students to express their opinions and participate in decision-making processes. This involvement helps students understand democratic processes and the importance of active participation.

8.4 Ensure inclusive curriculum and resources

An inclusive curriculum acknowledges and reflects the diverse backgrounds and experiences of all students. Educators should use materials and resources that represent various cultures, histories, and perspectives. This includes selecting texts and case studies that cover a range of voices and experiences, ensuring that all students see themselves reflected in the content.

8.5 Provide professional development for educators

Teachers play a pivotal role in delivering democratic and inclusive citizenship education. Therefore, ongoing professional development is essential to equip educators with the skills and knowledge needed to handle diverse classrooms effectively. Training should cover strategies for inclusive teaching, managing classroom diversity, and fostering a supportive learning environment.

8.6 Encourage community and parental involvement

Building strong partnerships with the community and involving parents in the educational process can enrich citizenship education. Schools can organize community projects, invite guest speakers from diverse backgrounds, and create opportunities for parents to engage in school activities. This involvement helps bridge the gap between school and community, reinforcing the principles of democratic engagement.

8.7 Promote global awareness and responsibility

Citizenship education should extend beyond national borders to include global issues. Students should be encouraged to explore global challenges, such as climate change, human rights, and social justice. By understanding their role in a global context, students can develop a sense of responsibility and a commitment to contributing positively to the world.

8.8 Support social and emotional learning

Social and emotional learning (SEL) is integral to citizenship education as it helps students develop empathy, self-awareness, and interpersonal skills. Incorporating SEL

into the curriculum can support students in understanding and respecting diverse perspectives and working collaboratively towards common goals.

8.9 Utilize technology for engagement

Technology can be a powerful tool for enhancing democratic and inclusive citizenship education. Digital platforms and tools can facilitate collaborative projects, virtual exchanges with students from different regions, and access to a wide range of perspectives and resources. Technology can also support differentiated instruction to meet the diverse needs of students.

8.10 Evaluate and reflect on practices

Regular evaluation and reflection on teaching practices and educational outcomes are essential for continuous improvement. Schools should gather feedback from students, parents, and the community to assess the effectiveness of citizenship education initiatives and make necessary adjustments. Reflective practices ensure that the education provided remains relevant and responsive to the needs of all students.

Promoting democratic and inclusive citizenship education involves a multifaceted approach that integrates civic principles into all aspects of schooling. By fostering critical thinking, ensuring inclusivity, empowering student voice, and involving the community, educators can help prepare students to be engaged, informed, and empathetic citizens. As society continues to evolve, these strategies will play a crucial role in nurturing a generation of individuals who are not only aware of their rights and responsibilities but also committed to making a positive impact in their communities and beyond.

9. Curriculum design and development

Incorporating democratic values and inclusivity into the curriculum is essential for fostering engaged and equitable societies. A curriculum that embodies these principles goes beyond the mere transmission of knowledge; it actively encourages students to participate in democratic processes, think critically, and respect diverse perspectives. To achieve this, curriculum design must be intentional in integrating democratic values such as participation, justice, and equality, as well as inclusivity that ensures all students, regardless of their backgrounds, can access and benefit from educational opportunities. One approach to designing such a curriculum is the development of inclusive and participatory curriculum models [22]. These models prioritize student voice and agency, allowing learners to engage in decision-making processes about what and how they learn. For example, project-based learning (PBL) can be used to encourage students to work on real-world problems that require collaboration, critical thinking, and an understanding of diverse viewpoints. Another model is the “spiral curriculum,” which revisits core concepts at increasing levels of complexity, allowing for a deeper understanding and the integration of new perspectives over time [23]. This approach supports the continuous development of democratic and inclusive attitudes by embedding these principles throughout a student’s educational journey. Additionally, curriculum frameworks such as those in Finland emphasize equity by integrating democratic values across all subjects rather than isolating them in a single course on civics or social studies. This holistic approach ensures that students

encounter democratic principles in various contexts, reinforcing their importance and relevance to everyday life.

10. Pedagogical approaches

Effective pedagogy is crucial in bringing a democratic and inclusive curriculum to life. Student-centered and inquiry-based learning are two pedagogical approaches that align closely with the goals of democratic citizenship education. In student-centered learning, the focus shifts from teacher-led instruction to an environment where students take an active role in their learning [24]. This approach empowers students to pursue their interests, ask questions, and explore topics deeply, fostering critical thinking and a sense of ownership over their education. Inquiry-based learning, a form of student-centered pedagogy, encourages students to investigate complex issues, often related to social justice or community challenges, thereby developing their problem-solving skills and civic awareness [25]. Dialogic teaching, another powerful pedagogical approach, emphasizes the role of dialog in learning [26]. By engaging students in discussions where multiple perspectives are valued and debated, dialogic teaching fosters an inclusive classroom environment where every student's voice is heard. This method also supports the development of critical pedagogy, where students are encouraged to question and challenge existing power structures and social norms. Critical pedagogy, as advocated by educational theorists like Paulo Freire, is particularly effective in promoting democratic and inclusive values, as it empowers students to become active participants in shaping their society.

11. Teacher training and professional development

The success of democratic and inclusive citizenship education largely depends on the preparedness and ongoing development of educators. Teachers need to be equipped with both the knowledge and skills to effectively deliver a curriculum that promotes these values. This preparation begins with teacher education programs that emphasize democratic and inclusive principles. Such programs should provide future educators with a strong foundation in civic education, social justice, and cultural competence, ensuring they are well prepared to teach in diverse and dynamic classrooms. Best practices in teacher education include experiential learning opportunities, such as internships and community-based projects, where pre-service teachers can apply democratic and inclusive teaching methods in real-world settings [27]. Additionally, these programs should incorporate training in dialogic and inquiry-based pedagogies, as well as strategies for creating inclusive learning environments that accommodate the needs of all students, including those with disabilities or from marginalized communities. Ongoing professional development is equally important. Teachers must have access to continuous learning opportunities that allow them to stay current with educational research, policy changes, and new pedagogical strategies. Professional learning communities (PLCs) can be a valuable resource in this regard, providing educators with a supportive network where they can share experiences, challenges, and best practices related to democratic and inclusive education. Furthermore, workshops and seminars focused on specific aspects of citizenship education, such as teaching controversial issues or fostering student activism, can enhance teachers' ability to engage students in meaningful and transformative learning experiences [28].

12. Community and stakeholder engagement

Effective citizenship education extends beyond the classroom and requires active collaboration with parents, communities, and civil society. Engaging these stakeholders is essential for creating a supportive environment where democratic and inclusive values can flourish. Parents play a crucial role in reinforcing the lessons learned in school and fostering civic-minded attitudes at home. Schools can facilitate this by organizing workshops, seminars, and discussion forums where parents can learn about the principles of democratic citizenship education and how to support their children's learning. Encouraging parental involvement in school activities, such as governance committees or community service projects, also helps to strengthen the connection between home and school and promotes a shared commitment to civic education [29].

Community and civil society organizations are also vital partners in citizenship education. Collaborating with local organizations, such as nongovernmental organizations (NGOs), advocacy groups, and cultural institutions, can provide students with opportunities to engage in community-based projects, participate in public debates, and develop a deeper understanding of social issues [30]. These partnerships not only enrich the educational experience but also help to bridge the gap between theory and practice, demonstrating to students the real-world impact of democratic and inclusive values. Schools can also play a role in creating partnerships with local governments and businesses to support citizenship education initiatives. For instance, partnerships with local government bodies can facilitate student involvement in civic activities, such as volunteering, public consultations, and participatory budgeting processes [31]. Businesses, on the other hand, can offer internships or mentorship programs that emphasize social responsibility and ethical leadership.

In summary, the design and implementation of a democratic and inclusive citizenship education curriculum require a multifaceted approach that integrates curriculum design, pedagogical innovation, teacher training, and community engagement. By working collaboratively, educators, parents, and community stakeholders can create a rich learning environment that prepares students to become active, responsible, and engaged citizens in a diverse and democratic society.

13. Challenges and barriers to democratic and inclusive citizenship education

Implementing democratic and inclusive citizenship education faces numerous challenges and barriers that can impede its effectiveness. These obstacles range from structural and institutional issues within education systems to cultural and societal challenges that reflect broader societal norms and values. Understanding and addressing these barriers is crucial for the successful promotion of citizenship education that truly reflects democratic and inclusive principles.

13.1 Structural and institutional barriers

Structural and institutional barriers within education systems are significant obstacles to achieving democratic and inclusive citizenship education. Two of the most pervasive issues are inequality and limited access to quality education. In many regions, educational opportunities are unevenly distributed, with marginalized

communities often receiving inadequate resources and support [32]. This disparity undermines the principles of equality and justice that are central to democratic education, as students from disadvantaged backgrounds are less likely to participate fully in civic life or develop the skills needed to engage in democratic processes. Policy limitations also play a role in restricting the implementation of inclusive citizenship education [10]. In some cases, national education policies may not prioritize citizenship education or may do so in ways that fail to address the needs of all students. For instance, curricula may be overly standardized, leaving little room for the exploration of diverse perspectives or the inclusion of marginalized voices. Additionally, rigid assessment systems can discourage the use of innovative, student-centered pedagogies that are essential for fostering democratic engagement [33]. Resource constraints further exacerbate these challenges. Schools, particularly those in underfunded areas, often lack the materials, trained personnel, and infrastructure necessary to implement comprehensive citizenship education programs [34]. Without adequate resources, even the most well-designed curricula and pedagogical approaches can fall short of their goals, leaving students without the full benefits of democratic and inclusive education.

13.2 Cultural and societal challenges

Beyond structural barriers, cultural and societal challenges pose significant difficulties for the promotion of democratic and inclusive citizenship education. In diverse societies, navigating varying cultural norms and values can be complex. For example, in societies with deeply entrenched traditions or hierarchical social structures, the principles of equality and participation inherent in democratic education may conflict with existing cultural practices [35]. This can create resistance among both educators and communities, who may perceive these values as undermining or disrespecting their cultural heritage. Resistance to inclusive practices can also stem from societal attitudes towards marginalized groups, such as ethnic minorities, immigrants, or people with disabilities [36]. Prejudices and stereotypes can influence how students from these groups are perceived and treated within the education system, leading to exclusion or discrimination [37]. Educators themselves may hold unconscious biases, which can impact their ability to teach inclusively or to foster an environment where all students feel valued and respected. These cultural and societal challenges are further complicated by the global rise of populism and nationalism, which often emphasize exclusionary and divisive ideologies [38]. In such contexts, promoting a curriculum that advocates for inclusivity and diversity can be particularly challenging, as it may be seen as counter to prevailing political and social narratives.

13.3 Addressing challenges: policy recommendations

Overcoming the challenges to democratic and inclusive citizenship education requires targeted strategies and policy changes that address both structural and cultural barriers. One key strategy is to advocate for more equitable education policies that prioritize access to quality education for all students. This includes allocating resources to underfunded schools, ensuring that curricula are flexible and inclusive, and supporting the professional development of educators to equip them with the skills needed to teach diverse student populations effectively. To address policy limitations, there should be a concerted effort to integrate democratic and inclusive principles into national education frameworks. This

might involve revising curricula to include more diverse perspectives, promoting interdisciplinary approaches that link citizenship education with other subjects, and adopting assessment methods that value critical thinking, collaboration, and civic participation. Furthermore, policies should encourage the use of innovative pedagogies, such as project-based learning and dialogic teaching, which actively engage students in the democratic process.

Cultural and societal challenges require strategies that promote inclusivity and cultural sensitivity. This can be achieved by developing culturally responsive teaching practices that respect and integrate students' cultural backgrounds into the learning process. Educators should be trained to recognize and challenge their own biases, and schools should create inclusive environments that celebrate diversity and encourage dialog across cultural differences. Community engagement is also critical in this regard; involving parents and local leaders in the development and implementation of citizenship education can help to bridge cultural divides and foster greater acceptance of democratic values. At the policy level, governments and educational institutions should advocate for broader societal change that supports inclusive citizenship education. This might include public awareness campaigns that highlight the benefits of diversity and inclusion, as well as legal reforms that protect the rights of marginalized groups and promote equal access to educational opportunities. Additionally, international cooperation and the adoption of global frameworks, such as the Sustainable Development Goals (SDGs), can provide a foundation for national efforts to implement inclusive and democratic education. While the challenges to democratic and inclusive citizenship education are significant, they are not insurmountable. By addressing structural inequalities, overcoming cultural resistance, and advocating for supportive policies, educators and policymakers can create educational environments that empower all students to become active, responsible, and engaged citizens.

14. Case studies and best practices

Examining successful models of democratic and inclusive citizenship education provides valuable insights into how these principles can be effectively implemented in diverse educational contexts. By analyzing case studies of programs and initiatives that have achieved notable success, we can identify best practices and key success factors that can inform future efforts. Additionally, understanding the lessons learned from these case studies can offer guidance on how to adapt and implement similar strategies in different settings.

14.1 Successful models of democratic and inclusive citizenship education

Several programs around the world exemplify successful implementation of democratic and inclusive citizenship education, demonstrating innovative approaches that engage students and foster a deeper understanding of democratic principles.

14.1.1 The Finnish education system

Finland's education system is often cited as a model of inclusive and democratic education. Finnish schools emphasize student agency, collaboration, and the

integration of civic education across subjects [39]. The curriculum encourages critical thinking and active participation in democratic processes, with a focus on nurturing students' ability to engage thoughtfully with societal issues. One notable initiative is the "Phenomenon-Based Learning" (PhBL) approach, where students explore topics through interdisciplinary projects that promote inquiry, collaboration, and real-world problem-solving. This model has been successful in fostering democratic values by allowing students to take ownership of their learning and engage with diverse perspectives.

14.1.2 South Africa's citizenship education

In South Africa, various citizenship education programs aim to address the legacies of apartheid by promoting democratic values and inclusivity [40]. For instance, the "Civic Education Program" integrates democratic principles into the national curriculum, emphasizing human rights, social justice, and active citizenship. This program includes community-based projects and service learning, which help students apply their knowledge in real-world contexts. The success of these programs can be attributed to their focus on relevance and local engagement, ensuring that citizenship education resonates with students' experiences and challenges.

14.1.3 The United States' service-learning initiatives

In the United States, service-learning initiatives, such as those promoted by the "Corporation for National and Community Service," combine community service with academic learning [41]. These programs encourage students to participate in civic activities while reflecting on their experiences and their role in society. Service learning has been effective in promoting democratic engagement and social responsibility, as it connects classroom learning with real-world issues and fosters a sense of agency and community involvement among students.

14.1.4 Canada's "Global Citizenship Education"

Canada's "Global Citizenship Education" programs emphasize the development of global awareness and active participation in democratic processes [42]. Initiatives like the "Global Citizenship Program" in Ontario schools integrate global issues, such as human rights and environmental sustainability, into the curriculum. By encouraging students to engage with global challenges and diverse perspectives, these programs help cultivate a sense of global responsibility and prepare students to contribute to an interconnected world.

Impact assessment and key success factors:

The success of these models can be attributed to several key factors:

Student agency: Allowing students to take an active role in their learning and decision-making processes fosters a sense of ownership and engagement.

Integration across curriculum: Embedding democratic values and inclusivity across various subjects ensures that these principles are consistently reinforced.

Community involvement: Engaging with local communities and real-world issues helps students connect classroom learning with practical experiences.

Cultural relevance: Tailoring programs to address local contexts and cultural norms increases their effectiveness and resonance with students.

14.2 Lessons learned and transferability

Analyzing these successful models provides several important lessons for the adaptation and implementation of democratic and inclusive citizenship education in different contexts:

14.2.1 Adaptability to local contexts

While the core principles of democratic and inclusive education are universal, the implementation must be adapted to fit local contexts. This means considering cultural norms, societal challenges, and educational resources when designing and adapting programs. For example, the community-based approach used in South Africa may be particularly effective in regions where local engagement is crucial, while the interdisciplinary approach of Finland's PhBL might be adapted to fit different educational frameworks [43].

14.2.2 Importance of stakeholder engagement

Engaging various stakeholders, including educators, parents, community leaders, and policymakers, is essential for the successful implementation of citizenship education programs. Collaborative efforts ensure that programs are well supported and reflect the needs and values of the community [44]. This engagement also helps in building partnerships and securing resources necessary for program success.

14.2.3 Continuous evaluation and improvement

Regular assessment and feedback are crucial for the ongoing success of citizenship education programs [45]. By evaluating the impact of programs and gathering insights from participants, educators can identify strengths and areas for improvement. This iterative process helps refine programs and adapt them to changing contexts and emerging needs.

14.2.4 Scalability and replication

Successful programs often serve as models that can be scaled or replicated in other contexts [46]. However, it is important to carefully consider the unique characteristics of each new setting and adapt the program accordingly. Pilot projects and phased implementations can help test and refine adaptations before broader rollout.

14.2.5 Emphasis on professional development

Training and supporting educators are key to the effective implementation of citizenship education [45]. Professional development programs should focus on equipping teachers with the skills and knowledge needed to deliver democratic and inclusive curricula, as well as providing ongoing support and resources.

Overall, the analysis of successful models of democratic and inclusive citizenship education reveals valuable insights into effective practices and strategies. By learning from these case studies and understanding the factors that contribute to their success, educators and policymakers can develop and implement citizenship education programs that foster engaged, equitable, and democratic societies.

15. Future directions in democratic and inclusive citizenship education

As we look towards the future of citizenship education, emerging trends and technologies, alongside evolving societal dynamics, offer new opportunities and challenges. Embracing these developments is crucial for ensuring that citizenship education remains relevant and effective in fostering democratic and inclusive societies. This section explores the role of digital citizenship and technological innovations in education and considers how citizenship education can be reimagined to address the needs and opportunities of the twenty-first century.

15.1 Emerging trends and technologies

15.1.1 Role of digital citizenship and technology in education

Digital citizenship has become an integral component of contemporary citizenship education. With the proliferation of digital technologies, understanding how to navigate online spaces responsibly and ethically is essential for active participation in modern democracies. Digital citizenship encompasses a range of skills, including digital literacy, online safety, and the responsible use of technology. It prepares students to engage with digital platforms in ways that uphold democratic values, such as respect for others, critical thinking, and informed decision-making. Technology also plays a transformative role in education, offering innovative tools and methods that can enhance citizenship education. For instance, virtual and augmented reality (VR/AR) technologies create immersive learning experiences that allow students to explore historical events, simulate democratic processes, and engage with global issues in a more interactive and impactful way. These technologies can help students develop empathy and a deeper understanding of complex social and political issues. Innovations in teaching methods, such as flipped classrooms and blended learning, further support democratic and inclusive education. Flipped classrooms, where students engage with instructional content at home and participate in interactive activities in class, encourage active learning and collaborative problem-solving. Blended learning combines traditional classroom instruction with online resources, offering students flexibility and personalized learning opportunities. These methods can foster greater student engagement and participation, essential for cultivating democratic values.

15.1.2 Innovations in teaching methods and learning environments

The shift towards student-centered learning environments and the integration of technology has led to new pedagogical approaches that enhance democratic and inclusive citizenship education. Inquiry-based learning, project-based learning, and collaborative learning are examples of methods that encourage students to take an active role in their education. These approaches align with democratic principles by promoting critical thinking, dialog, and collaboration. Learning environments are also evolving to support these innovative approaches. Classrooms are increasingly designed to facilitate group work, discussions, and interactive activities. Digital platforms and tools enable real-time collaboration and communication, allowing students to work on projects with peers from diverse backgrounds and locations. These environments not only enhance learning but also model the collaborative and participatory aspects of democratic societies.

15.2 Rethinking citizenship education for the twenty-first century

15.2.1 Adapting to changing societal and global dynamics

As societal and global dynamics shift, citizenship education must adapt to address new challenges and opportunities. The rise of global interconnectedness, climate change, and social justice movements all demand that citizenship education prepare students to engage with complex, transnational issues. This requires a broadened perspective that goes beyond national boundaries and incorporates global citizenship education. Global citizenship education emphasizes the interconnectedness of people and issues across the world, encouraging students to think critically about their role in a global society. It involves understanding global challenges, such as inequality, migration, and environmental sustainability, and developing skills to contribute to solutions. By integrating global perspectives into citizenship education, students can become more informed and responsible global citizens.

15.2.2 Vision for the future of democratic and inclusive citizenship education

Looking ahead, the vision for democratic and inclusive citizenship education involves creating learning environments that are dynamic, responsive, and inclusive. Education systems must embrace diversity and foster critical thinking, empathy, and active participation. This includes not only adapting curricula and pedagogical approaches but also ensuring that educational policies and practices are equitable and inclusive.

A future-oriented citizenship education will likely incorporate the following elements:

Emphasis on digital literacy: As digital technologies continue to evolve, citizenship education must emphasize digital literacy and the ethical use of technology. This includes teaching students how to critically evaluate online information, engage in digital discourse, and understand the implications of their digital footprint.

Integration of global perspectives: Citizenship education should address global issues and promote an understanding of global interdependencies. This involves incorporating diverse cultural perspectives, global challenges, and international frameworks into the curriculum.

Focus on equity and inclusivity: Ensuring that all students have access to high-quality citizenship education is essential for fostering democratic and inclusive societies. This means addressing disparities in educational resources, providing support for marginalized groups, and promoting inclusive practices.

Fostering civic engagement: Citizenship education should encourage students to actively participate in their communities and societies. This includes opportunities for service learning, civic participation projects, and involvement in local and global initiatives.

Adaptation to technological advances: Education systems must be flexible and adaptable to technological changes. This involves integrating new technologies into the learning process, exploring their potential benefits and limitations, and preparing students for the future digital landscape.

In summary, the future of democratic and inclusive citizenship education lies in embracing emerging trends, leveraging technological innovations, and adapting to changing societal dynamics. By focusing on digital citizenship, global perspectives, and equitable practices, education systems can prepare students to engage thoughtfully and responsibly in an increasingly interconnected world.

16. Related terms and definitions

The following terms and definitions help establish a clear understanding of the key concepts and issues discussed in the chapter.

Democratic citizenship education: An educational approach that aims to equip students with the knowledge, skills, and values necessary to participate effectively in democratic processes, understand their rights and responsibilities as citizens, and contribute to the public good.

Inclusive education: An educational philosophy that ensures all students, regardless of their abilities, backgrounds, or socioeconomic status, have equal access to quality education and opportunities to participate fully in school life.

Civic engagement: Active participation in the public life of a community in an informed, committed, and constructive manner, with a focus on the common good.

Equity in education: The principle of fairness in education, ensuring that personal or social circumstances, such as gender, ethnicity, or economic status, are not obstacles to achieving educational potential.

Social justice education: An educational approach that focuses on the fair distribution of resources, opportunities, and privileges within a society, and empowers students to address and challenge inequalities.

Cultural competence: The ability to understand, communicate with, and effectively interact with people across cultures. It involves awareness of one's own cultural worldview, knowledge of different cultural practices and worldviews, and cross-cultural skills.

Global citizenship: The recognition of being part of an interconnected world, where individuals understand global issues, appreciate cultural diversity, and act responsibly towards social, economic, and environmental sustainability.

Critical pedagogy: A teaching approach that encourages students to question and challenge power structures and inequalities within society. It promotes critical thinking, reflection, and the empowerment of students to become active agents of change.

Human rights education: Education that promotes the understanding and practice of human rights, fostering respect for the rights of others, and encouraging actions that support and uphold human dignity.

Participatory learning: A learning approach that involves students actively in the learning process, encouraging them to contribute to discussions, decision-making, and problem-solving, thereby fostering a deeper understanding and engagement with the content.

Empowerment: The process of increasing the capacity of individuals or groups to make choices and transform those choices into desired actions and outcomes. In education, it refers to equipping students with the skills and confidence to take control of their learning and contribute to society.

Civic identity: An individual's sense of belonging to a community or society, which shapes their engagement in civic life, their responsibilities as citizens, and their participation in democratic processes.

Agency: The capacity of individuals to act independently and make their own free choices. In education, it refers to empowering students to take control of their learning and to be active participants in their education and society.

Pluralism: A condition or system in which multiple groups, beliefs, or values coexist within a society. In education, it involves teaching students to respect and value diversity and to understand and navigate a world with multiple perspectives.

Social cohesion: The bonds or “glue” that bring people together in a society, characterized by a sense of belonging, mutual respect, and shared values. Education plays a key role in fostering social cohesion by promoting inclusive practices and understanding.

These terms and definitions provide a foundation for understanding the concepts that underpin democratic and inclusive citizenship education and how they contribute to building engaged and equitable societies.

17. Conclusion

As I conclude this chapter on promoting democratic and inclusive citizenship education, it is essential to recapitulate the key themes and arguments that have been explored. The chapter has outlined the theoretical foundations of democratic and inclusive citizenship education, examined global approaches and policies, and discussed practical strategies for curriculum design, pedagogical methods, and community engagement. It has also addressed the challenges and barriers faced in implementing these principles and highlighted successful models and emerging trends that offer pathways for the future.

17.1 Summary of key points

This chapter has emphasized the critical importance of integrating democratic values and inclusivity into citizenship education. We began by defining citizenship education and its scope, stressing the significance of democratic principles, such as participation, justice, and equality. I explored the theoretical foundations of democratic and inclusive citizenship education, highlighting the need to address both democratic engagement and inclusivity to foster equitable societies. Through comparative analysis, I examined how different countries have approached citizenship education, learning from successful models and international frameworks. The chapter detailed various strategies for integrating democratic values into curriculum design, pedagogical approaches, and teacher training. It also addressed the role of community and stakeholder engagement in supporting citizenship education initiatives. Challenges and barriers were discussed, including structural, institutional, cultural, and societal obstacles. We proposed policy recommendations to overcome these challenges and enhance the implementation of democratic and inclusive citizenship education. Finally, the chapter explored emerging trends and technologies, such as digital citizenship and innovative teaching methods, and emphasized the need to adapt citizenship education to the evolving global landscape. The vision for the future of citizenship education includes a focus on global perspectives, equity, and civic engagement.

17.2 Implications for educators and policymakers

For educators and policymakers, the insights from this chapter provide practical guidance for implementing democratic and inclusive citizenship education in their systems. Educators are encouraged to:

Incorporate democratic values: Design curricula that integrate democratic principles and promote student participation, critical thinking, and civic responsibility.

Adopt inclusive practices: Ensure that educational content and teaching methods are inclusive of diverse perspectives and address the needs of all students.

Utilize technology effectively: Leverage digital tools and technologies to enhance engagement and provide students with the skills needed for responsible digital citizenship.

Engage with the community: Foster partnerships with parents, communities, and civil society to support and enrich citizenship education efforts.

Policymakers should focus on:

Creating supportive policies: Develop and implement policies that promote democratic and inclusive education, address structural barriers, and ensure equitable access to resources.

Supporting professional development: Invest in ongoing training and development for educators to equip them with the skills and knowledge needed to deliver effective citizenship education.

Encouraging innovation: Support innovative approaches and technologies that enhance citizenship education and adapt to changing societal needs.

17.3 Final thoughts

The ongoing commitment to democratic and inclusive education is crucial for building engaged and equitable societies. Education systems play a vital role in preparing students to become active, informed, and responsible citizens who can contribute positively to their communities and the world. As we move forward, it is imperative for educators, policymakers, and society at large to continue advocating for and implementing practices that uphold democratic values and inclusivity. The call to action is clear: we must work collectively to advance democratic and inclusive citizenship education, addressing challenges, embracing innovations, and striving for continuous improvement. By doing so, we can foster a generation of students who are not only knowledgeable and skilled but also committed to creating a more just and equitable world.

In conclusion, promoting democratic and inclusive citizenship education is not merely an educational goal but a societal imperative. The principles of democracy and inclusivity must be woven into the fabric of education to ensure that all students can participate fully in society and contribute to the collective good. The journey towards achieving these goals requires dedication, collaboration, and a steadfast commitment to the values that underpin democratic and inclusive societies.

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Conflict of interest

The author declares no conflict of interest.

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Perspective Chapter: Primary Education in Western China after COVID-19 – Challenges and Strategies for Home-School-Community Synergy

Yuan Huang and Ou Huang

Abstract

The COVID-19 pandemic has profoundly impacted global education, with the significant effects on primary education in western China. In the post-pandemic era, substantial changes have emerged in family education models, teacher work conditions, and school-community support. Drawing on 1534 parent and 128 teacher questionnaires, this study analyzes the key challenges. Results show that family educational expenditures have shifted, with rising economic pressure widening disparities in access to resources and heightening risks of inequality. Teachers face heavier workloads and increased stress from pedagogical transformation. While online teaching helped maintain continuity, it revealed limitations in fostering interaction and engagement. In this context, the importance of collaborative education among families, schools, and communities has grown. The study highlights the need for a stable collaboration mechanism and proposes strategies such as strengthening parental guidance, reducing teacher workload and administrative tasks, promoting school-community resource sharing, and integrating online with offline teaching. These measures can enhance the quality and equity of primary education and support holistic student development. The study concludes that building a close, coordinated, and efficient home-school-community partnership is essential for sustainable development of primary education in western China. Adopting a descriptive research approach, this study provides an initial overview rather than inferential statistical analysis.

Keywords: post-pandemic era, primary education, digital learning, educational equity, home-school-community collaboration

1. Introduction

Since the outbreak of the COVID-19 pandemic at the end of 2019, global education systems have faced unprecedented disruption. According to statistics released

by the United Nations Educational, Scientific and Cultural Organization (UNESCO), as of May 2020, approximately 1.56 billion students around the world were forced to suspend classes due to school closures, and around 63 million teachers had their teaching activities directly affected [1]. This large-scale educational interruption not only disrupted existing teaching orders but also significantly exacerbated educational inequality, especially for students from economically disadvantaged families [2]. Research by UNICEF further indicates that approximately 1.8 billion minors worldwide were restricted to varying degrees by pandemic control measures.

In China, more than 240 million students were forced to shift to online learning due to the pandemic. This sudden transformation revealed multiple weaknesses in the education system, including in digital infrastructure, resource allocation, and instructional organization. The “digital divide” between urban and rural areas and among different social strata widened further. Students’ access to educational opportunities and quality became increasingly stratified, depending on their family’s economic condition, learning environment, and access to technology. While the “suspension without stopping learning” policy ensured a certain degree of educational continuity, the effectiveness of such efforts was marked by a significant imbalance.

As we entered the post-pandemic era, the educational environment has undergone profound changes compared to the pre-pandemic period. With economic growth slowing down, both government and household spending on education came under pressure. Due to the prioritization of public health and economic recovery in fiscal allocations, education budgets were compressed [3]. Simultaneously, household education expenditure structures were adjusted, especially in non-compulsory education sectors. Employment instability and declining social mobility have increased psychological stress within families, and passive attitudes such as “lying flat” have, to some extent, affected parents’ educational expectations and investment behaviors.

These macro-level contextual changes urge a reassessment of the foundational education system, particularly the support and operational models of primary education. At this critical stage of student development, families, schools, and communities—recognized as the three major educational support pillars—are all confronting new challenges and opportunities for transformation. Constructing an open, integrated, and collaborative education support network has become a key issue in improving education quality and achieving educational equity. Prior research has shown that positive home-school cooperation can enhance students’ academic performance and behavioral regulation, while strong community participation can further amplify the overall effectiveness of collaborative education.

In light of this, this study focuses on the theme “An Analysis of the Current Situation of Primary Education in Western China and the Optimization of Home-School-Community Collaboration Mechanisms in the Post-Pandemic Era.” Based on survey data collected from parents and teachers, this study systematically analyzes the post-pandemic changes in family education structure, teacher professional status, and the school-community support system. It explores the current state and problems of the existing home-school-community collaboration mechanism and proposes targeted optimization strategies.

Specifically, the chapter unfolds its investigation in four aspects: first, it analyzes the post-pandemic changes in household educational investment, parental expectations, and child development support; second, it explores the sources of stress and occupational changes encountered by teachers during the pedagogical adaptation process; third, it evaluates the current interaction between schools and communities in supporting educational resources; and finally, it proposes forward-looking

optimization paths and policy recommendations for improving home-school-community collaboration, aimed at promoting a more balanced and high-quality development of primary education.

This research is grounded in 1534 parent questionnaires and 128 teacher questionnaires, with data primarily sourced from two representative medium-developed cities in western China—Chengdu and Chongqing. These two cities are typical in terms of economic development, educational resource allocation, urban-rural structure, and social governance models. They reflect both the diversity of educational environments across urban and rural areas and the common challenges faced by the western region in the post-pandemic context. Therefore, the survey data offer strong regional representation and practical reference value for analyzing the current situation and optimization paths of home-school-community collaboration mechanisms in primary education in western China. In our dataset, 62% of respondents are from urban primary schools, and 38% are from rural primary schools. These proportions closely reflect the actual urban-rural population ratios in the surveyed regions, suggesting that our sample distribution is broadly representative of the local demographic structure and educational environment.

2. Changes and challenges in family education in the post-pandemic era

Against the backdrop of the COVID-19 pandemic, China experienced an unprecedented economic slowdown, a trend that mirrored global economic challenges. According to a report published by the International Monetary Fund, China's GDP growth rate dropped to 2.3% in 2020, marking the lowest level in nearly three decades [4]. Since then, it has not returned to its pre-pandemic trajectory. This deceleration was primarily driven by a decline in export demand, weak domestic consumption, and a slowdown in fixed-asset investment [5].

At the same time, the uncertainty brought about by the pandemic and prolonged social isolation measures had a profound impact on the national psychological state. Multiple social surveys indicated that Chinese residents' sense of happiness and security was significantly affected, and mental health issues have increasingly become focal points in both public discourse and policy-making [6]. Particularly in the domains of family life and education, parents have faced rising economic anxiety, increased parenting stress, and emotional strain. These factors have not only compromised the quality of family education but have also indirectly affected students' emotional stability and academic performance.

2.1 Changes in family education expenditures and investment orientation

The economic impact of the pandemic was first reflected in the adjustment of household spending on education. Survey data show that 36.51% of families reduced their educational investment for their children after the pandemic, with only a small portion maintaining or increasing their expenditure. This reflects a trend in which families, faced with declining incomes, reduce educational expenses to cope with financial pressure. Such changes are particularly evident in the non-compulsory education sector. Extracurricular tutoring and interest classes have traditionally been major expenditure items at the primary school stage, with 43.35% and 40.16% of families, respectively enrolling their children in these programs. However, in times of financial strain, many parents prioritized cutting back on these “non-essential”

expenses. Survey results indicate that only 29.60% of parents still prioritized academic tutoring expenses for their children during financial difficulties, while only 20.53% continued to support interest class participation. As a result, some students lost opportunities for extracurricular enrichment, and this also impacted training institutions and the interest education industry, with a reduction in student enrollment and decreased revenue.

The reduction in household education expenditure further exacerbated educational inequality among families with different economic levels. Low-income families, due to limited financial resources, were forced to cut or even abandon parts of their children's educational arrangements. According to the survey, 29.66% of parents reported adjusting their children's learning environment due to economic stress, such as transferring schools or reducing extracurricular activities. In contrast, families with better economic conditions were able to maintain their original educational plans without significant compromise. This disparity places children from disadvantaged families at a disadvantage in terms of access to educational resources and learning conditions—especially in remote learning scenarios or accessing high-quality educational content—thereby potentially widening gaps in academic performance and overall development.

2.2 Impact of family values and social mindsets on education

The socio-economic changes in the post-pandemic era have not only affected material conditions but also profoundly influenced family educational beliefs and broader societal attitudes [6]. Slower economic growth and reduced employment opportunities have weakened families' confidence in education as a path to upward social mobility. The emergence of phenomena such as “involution” and “lying flat” (躺平) reflects a passive response by some families to intense competition and uncertainty about the future. Survey findings reveal that many parents have become more cautious in evaluating the return on educational investments after the pandemic, leaning toward more secure and cost-effective educational pathways. Some families have lowered their expectations for their children's academic achievement and advancement, instead placing more emphasis on practical skills or vocational education, thereby reducing their spending on after-school tutoring and competition training. Although this shift in perspective is an adaptive response to real-world conditions, it may negatively affect students' motivation at a broader level.

The spread of social sentiment also plays a role in this process. Through the mechanism of emotional contagion, individuals or groups can influence the attitudes and behaviors of others, thereby reinforcing a more hesitant or skeptical stance on educational investment among families [7]. At the same time, the financial pressure caused by the global economic slowdown has significantly increased, further weakening the capacity of ordinary families to invest in their children's education [8].

Meanwhile, differences in family economic conditions have shown increasingly evident effects on students' psychological well-being and behavioral patterns. The survey data show that 24.64% of primary school students have experienced feelings of comparison with peers due to their family's financial situation: among them, 23.34% of parents reported their children “occasionally” felt inferior or envious due to poorer economic conditions, and 1.30% reported this occurred “frequently.” In addition, 24.77% of students felt inferior or envious of others (with 23.47%

Item	Occasionally (%)	Frequently (%)
Emotional comparison with classmates due to economic reasons	23.34	1.30
Feeling inferior or envious of others due to economic conditions	23.47	1.30
Decrease in learning motivation due to financial situation	21.45	4.24
Missed learning opportunities due to economic constraints	32.27	4.89

Table 1.
Survey results on the impact of family economic factors on primary school students' psychology and learning.

occasionally and 1.30% frequently). These findings suggest that approximately one-quarter of students were psychologically affected by economic disparities in peer interactions (see **Table 1**).

The effects of economic disparity on students extend beyond emotional well-being to include motivation and access to educational opportunities. According to the survey, 25.68% of students had their learning enthusiasm affected to varying degrees by their family's financial situation—21.45% of parents considered the impact to be “slight,” while 4.24% rated it as “significant.” Moreover, 37.16% of students reportedly missed certain learning or extracurricular opportunities due to economic constraints, with 4.89% of parents indicating that the impact was substantial. These missed opportunities included participation in after-school tutoring, summer camps, and other enrichment activities.

Parents' subjective perceptions also align with these findings. A majority of parents acknowledged that economic stress might negatively affect their children's psychological state and academic performance. If left unaddressed, the psychological gap and opportunity disparity caused by financial inequality could lead to long-term consequences, such as diminished self-confidence and academic decline among affected students.

Additionally, disparities in the distribution of educational resources across schools further limit student development. Although most parents believed that their child's school offered relatively balanced resources, 6.39% reported noticeable inter-school disparities. Students in such environments are more likely to be at a disadvantage due to resource limitations compared to their peers in better-equipped schools.

2.3 Family coping strategies and educational support

In response to the post-pandemic economic and social environment, many families have adopted proactive coping strategies. First, cautious planning of educational expenditures has become a common consensus among families. Survey results show that 39.31% of households have not yet established a dedicated education budget. The lack of financial planning may lead to inefficient and blind investment in education. Given the current economic climate, families are advised to carefully evaluate their income and expenditure structure, prioritizing essential educational expenses [9]. By creating detailed financial plans that include tuition, books, and tutoring fees, families can alleviate financial stress while improving the efficiency of resource allocation. Furthermore, 43.55% of families reported having reduced extracurricular and training expenses over the past year to ease financial burdens. While this can help in the short term, in the long run, families must still weigh and plan how to support their children's holistic development under budget constraints.

Second, families are enhancing their educational role by optimizing resource utilization. Many parents have taken the initiative to create a conducive learning environment at home, such as establishing daily reading routines, setting up quiet study spaces, and using high-quality online learning resources. Approximately 16.69% of parents regularly use online platforms or community-based educational activities to supplement their children's learning. These approaches transcend the limitations of time and space, offering students accessible learning channels under financial constraints. Some parents also engage in do-it-yourself teaching aids or organize everyday science experiments, integrating life skills into education. These practices not only foster interest but also help fill the gap left by reduced external educational services.

At the same time, families have become more attentive to providing psychological support. Economic stress can trigger anxiety, frustration, and other emotional responses in children, making positive parental guidance critical. A total of 54.17% of parents indicated that they frequently discuss the family's financial situation with their children to help them understand current realities and the collective direction of effort. Such sincere communication enables children to view material limitations more rationally and alleviates inferiority caused by peer comparison. Emphasizing values such as "diligence can make up for material scarcity" helps students cultivate a positive mindset for overcoming challenges, while also enhancing parent-child relationships and family cohesion.

Lastly, an increasing number of families are attempting to leverage community educational resources to ease financial burdens. Although 43.22% of families have never engaged with such resources, 13.75% reported doing so "frequently," and 43.02% said they participated "occasionally," indicating that over half of surveyed families have sought to enhance learning opportunities through community services. These resources, such as free tutoring programs, libraries, and science center activities, provide practical support and valuable educational supplementation. Data show that 32.40% of families reported reduced financial stress as a result of using public educational resources. Despite varying levels of access influenced by resource availability and information channels, encouraging broader family participation and guiding communities to enhance educational service capacity remain key strategies for realizing collaborative education.

3. Teachers and schools: Instructional adaptation and support mechanisms

3.1 New developments in the teaching workforce in the post-pandemic era

The COVID-19 pandemic has led to structural changes in the primary school teaching workforce. On one hand, the number of young teachers entering frontline teaching positions has increased, injecting new vitality into the education system. On the other hand, these young educators now face a more complex professional environment with increasingly diverse sources of pressure. Survey results indicate that 5.43% of teachers have either left their positions or are considering leaving in order to prepare for civil service or public institution examinations. This reflects a decline in the attractiveness of the teaching profession and an increased risk of talent loss. The stability and social recognition associated with civil service positions appeal to many educators, while the limited availability and intense competition for teaching

posts under the civil service system leave many young teachers in an unstable “temporary + exam preparation” state. This not only consumes their energy but also reduces their dedication to teaching, increasing the likelihood of professional burnout.

Anxiety over employment status is just one facet of the broader pressure teachers face. The survey revealed that the main sources of stress for teachers include: workload (68.99%), income levels (56.59%), student academic performance (51.16%), and classroom management (27.91%). Excessive workload ranked as the top concern, as teachers must devote significant time to lesson planning, grading, tutoring, and administrative duties. Prolonged exposure to high-intensity work leads to physical and mental exhaustion. More than half of the teachers reported stress related to academic performance, as student achievement not only reflects teaching effectiveness but also directly impacts teacher evaluations. Poor student outcomes can easily lead to feelings of self-blame and anxiety among teachers. Furthermore, 56.59% of teachers cited low income as a source of stress, and 66.67% believed that their current salary does not match their workload. Compared with other professions requiring similar qualifications and effort, teacher salaries remain relatively low—particularly in areas with high living costs—leading to an imbalance between effort and reward that negatively impact job satisfaction and retention. Classroom management poses another challenge, with 27.91% of teachers reporting significant difficulties. As students’ personalities become more diverse, maintaining classroom order becomes increasingly difficult, affecting teaching effectiveness and adding to teacher stress.

The accelerated development of information technology in the post-pandemic era has also introduced new challenges. The widespread adoption of online teaching has propelled the digital transformation of education, requiring teachers to master new instructional tools and digital skills, including the operation of online platforms, creation of multimedia content, and data-driven teaching strategies. For teachers accustomed to traditional classroom methods, this shift presents a considerable challenge. Emerging technologies such as artificial intelligence are reshaping teaching paradigms, compelling educators to continuously upskill and enhance their digital literacy. However, this transformation process also places additional demands on teachers’ time and energy, creating a “dual pressure” scenario: coping with the burden of teaching while also facing the pressure to upgrade professional competencies. Effectively supporting teachers during this transitional period is an urgent issue that education administrators must address.

3.2 The impact of teacher stress on instructional stability and quality

The stress teachers endure and the professional choices they make directly affect both the quality and continuity of school instruction. On one hand, excessive stress may undermine teachers’ engagement in teaching; on the other hand, high teacher turnover disrupts instructional consistency. Survey results indicate that 25.58% of teachers believe that turnover has a significant impact on instructional stability, 36.43% consider the impact “moderate,” and 37.98% regard it as “minimal.” Thus, approximately 62% of teachers acknowledge that turnover may have some negative effects, though most consider the situation manageable. This suggests that moderate levels of turnover are present, but schools are generally able to mitigate the disruptions through internal coordination and management mechanisms. However, in schools with frequent teacher replacements, students must constantly adapt to different teaching styles and expectations, which may hinder instructional coherence and the accumulation of knowledge. The departure of experienced key teachers—if followed

by less experienced successors—can even lead to a temporary decline in teaching quality. To reduce unnecessary turnover, schools should improve the working environment and provide growth opportunities to enhance teachers' willingness to stay.

Regarding instructional quality, 31.01% of surveyed teachers believe that the quality of primary education has declined in recent years, while 68.99% believe it has remained stable or unchanged. This divergence may be linked to regional differences: in areas with teacher shortages or high stress levels, quality decline is more evident; whereas in other schools, efforts to strengthen research and professional development have helped maintain standards. Regardless of regional variation, preventing a decline in quality remains a critical task for education authorities.

Many teachers expressed skepticism about the effectiveness of current training programs in improving teaching quality. Only 30.23% of teachers considered existing training to be “effective,” 58.14% deemed it “partially effective,” and 11.63% found it “ineffective.” The majority of teachers reported that current training lacks specificity and fails to address real challenges in the classroom. This underscores the need to optimize the content and format of training programs, making them more practical and relevant—especially in areas such as instructional stress management, resource integration, classroom control, and blended teaching practices.

In summary, teachers in the post-pandemic era are facing complex and multifaceted pressures, which potentially affect instructional quality and stability. While some teachers may experience a loss of enthusiasm under pressure, many others remain committed and strive to deliver quality education. This resilience deserves recognition. To support and stabilize the teaching workforce, schools and education departments should take a multifaceted approach: improving salaries, reducing administrative burdens, offering psychological support, strengthening teaching research systems, and enhancing the relevance of training programs. Such systemic interventions are essential to ensuring the sustained and healthy development of primary education in the post-pandemic era.

3.3 The evolution and integration of teaching modes

The large-scale implementation of online teaching during the COVID-19 pandemic had a profound impact on the instructional models of primary education [10]. In the post-pandemic era, the normalization of online teaching and the integration of online and offline modes have become developmental trends. The pandemic prompted educators to reconsider the relationship between traditional classrooms and digital technologies, exploring effective pathways for their integration. At the 2022 UN Transforming Education Summit, digital education was advocated as a public good. Similarly, at China's 2020 National People's Congress, strengthening the infrastructure and normalization of online education was highlighted [10], offering policy support for the promotion of blended teaching in grassroots schools.

Survey data show that 63.57% of teachers advocate for “traditional classroom teaching as the main mode, with online learning as a supplement,” while 34.11% support the “organic integration of online and offline teaching.” Almost no teachers endorsed fully replacing in-person instruction with online education. This indicates that most teachers recognize the value of blended learning, viewing online teaching as an auxiliary tool, while emphasizing the irreplaceability of face-to-face interaction in primary education for emotional connection and real-time feedback. Additionally, 88.37% of teachers reported that online instruction significantly reduced student classroom engagement, especially among younger students with shorter attention

spans. Thus, improving interactivity in online instruction is essential for optimizing blended models. Experts recommend incorporating real-time Q&A, group collaboration, and gamified tasks to enhance student engagement, and many teachers in the survey expressed a desire for related professional development.

The effective advancement of blended teaching requires both institutional and technological support. According to the survey, 68.22% of schools have already provided technical support such as stable internet, online platforms, and learning devices. However, around 30% of schools still face shortcomings in infrastructure, which limits teachers' ability to utilize digital tools. It is therefore crucial to further promote the equitable distribution of educational technology, particularly ensuring equipment and technical staff are in place in both urban and rural schools to narrow the digital divide.

Moreover, enhancing teachers' digital literacy and instructional design capabilities is urgently needed. Online instruction is not only about tool usage but also entails a shift in pedagogical thinking. Educational experts advocate for the construction of a "dual-track integrated teaching" system [11], aiming to break down the isolation between online and offline instruction and achieve deep integration and mutual enhancement [12]. For example, basic content delivery can be conducted through online micro-lessons for pre-class self-learning, while classroom time is reserved for discussion and practical application. This approach aligns with the "flipped classroom" model and is particularly suitable for the learning characteristics of primary students.

In the survey, over 80% of teachers expressed a strong desire for training on online tools and blended teaching design. Such training should go beyond technical operations to focus on instructional strategies—such as designing integrated lessons, monitoring learning outcomes, and ensuring the smooth transition between online and offline content. Only when teachers acquire the necessary skills and methodologies can blended learning be fully implemented and effectively support instructional transformation.

In summary, the pandemic has driven primary education toward more flexible and diversified teaching models. Online teaching has shifted from an emergency measure to a routine supplemental approach. In the foreseeable future, the model of "classroom-based teaching supported by digital technology" will dominate primary education. Educators must continue exploring integration pathways and refining instructional design to achieve dual goals: enhancing teaching quality and expanding educational equity.

4. Constructing a new model of home-school-community collaboration

4.1 The necessity of home-school-community collaboration research

In light of the numerous challenges emerging from both families and schools, the importance of home-school-community collaboration has become increasingly prominent in the post-pandemic era [13]. Each party plays a distinct role in supporting students' development: the family provides essential living conditions and emotional support; the school is responsible for systematic knowledge transmission and character formation; and the community helps broaden students' horizons by offering diverse practical experiences and resources [14]. Only through the synergy of these three entities can a comprehensive educational support network be established to foster students' all-round development.

First, collaborative efforts help optimize the allocation of educational resources. Schools can leverage the personnel and facilities of community organizations to organize diverse extracurricular activities, while families can access educational guidance and information from both schools and the community. Community education should serve as a key supplement to school and family education—particularly for students from economically disadvantaged backgrounds or those with special needs. Community and non-profit organizations can provide free academic tutoring and psychological support, helping to compensate for structural gaps in educational resources and promote equity in education.

Second, the collaborative model enhances students' adaptability and holistic competencies [15]. Each stakeholder—family, school, and community—brings unique educational strengths. Their cooperation enables students to engage in social practices, volunteer services, and cultural experiences outside the classroom, thus strengthening their capacity to cope with societal changes. At the same time, collaboration fosters broader community engagement in education, creating a more supportive and positive learning environment. When community members actively participate in school affairs and care about the next generation's development, education becomes a shared responsibility rather than the school's burden alone. This inclusive environment not only supports student growth but also enhances social cohesion within the community.

In the long term, collaborative education also helps cultivate civic awareness and a sense of social responsibility in students [13, 14]. Involving multiple parties in the educational process enables students to learn respect for differences and develop communication and cooperation skills. Their participation in community affairs fosters a stronger sense of public responsibility and global awareness, gradually shaping them into socially responsible citizens. These educational goals are difficult to achieve through traditional school education alone.

Naturally, collaboration is not an instantaneous process. In practice, discrepancies in understanding and unclear role boundaries may arise among different stakeholders. Effective collaboration requires, first, consensus on the underlying philosophy, and second, policy support and institutional safeguards to ensure clarity of responsibilities and coordinated division of labor. A well-structured, stable, and clearly delineated collaborative mechanism is essential to ensure orderly operation. In conclusion, constructing a new home-school-community educational support system is not only a necessary response to the challenges of post-pandemic education, but also a strategic pathway toward achieving high-quality primary education.

4.2 Implementation strategies for home-school-community collaboration

To translate the concept of home-school-community collaboration into educational practice, systematic planning and sustained efforts are required. Based on questionnaire survey results and domestic practical experience, this study proposes the following strategies to serve as references for implementing collaborative education at the primary school level.

4.2.1 Establishing regular communication mechanisms

Frequent communication is the foundation of effective collaboration. Schools should set up a “home-school-community joint meeting” system. In addition to traditional parent-teacher conferences, 2–3 themed meetings can be held each semester,

inviting parent representatives, community educators, and teachers to jointly discuss students' developmental needs and available resources. For example, one primary school holds a monthly "Joint Education Roundtable" where teachers share students' performance at school, parents reflect on their children's situation at home, and community members introduce accessible learning resources. Through ongoing dialog, the three parties can better understand each other's needs, align strategies, strengthen mutual trust, and achieve coordinated educational actions.

4.2.2 Making full use of online platforms to promote information sharing

Digital technologies significantly enhance communication efficiency among schools, families, and communities. Schools can establish online platforms such as parent-teacher apps or WeChat mini programs to share homework assignments, performance feedback, and event notifications. Community institutions can also publish information on free courses or activities. Many schools have created parent WeChat groups that include homeroom and subject teachers, enabling real-time Q&A and experience sharing. These online channels proved invaluable during the pandemic and should continue to be optimized in the post-pandemic era. To ensure effective and respectful communication, schools should also develop basic rules, such as response time limits and communication etiquette.

4.2.3 Jointly developing on- and off-campus educational activities

Co-developing educational projects is a key component of home-school-community collaboration. Communities offer resources that schools often lack, such as museums, science centers, and skilled professionals. Schools can partner with community organizations to design extracurricular activities like "Little Scientists Exploration" or "Intangible Cultural Heritage Experiences." In one case studied in this research, a primary school collaborated with an environmental enterprise and community support to establish an "off-campus practice base" and organized "Little Environmental Guardians" volunteer events. This not only enhanced students' environmental awareness and sense of social responsibility but also strengthened parent-child interactions, achieving win-win outcomes. Community resources, when integrated with school activities, can become valuable extensions of the curriculum.

4.2.4 Encouraging community volunteer participation and resource sharing

Communities should be regarded as key partners in collaborative education. Retired teachers, college students, and professionals can be encouraged to volunteer in schools, offering extracurricular tutoring, interest-based instruction, or career mentoring. This supplements school resources and strengthens school-community ties. At the same time, public facilities such as libraries, sports centers, and laboratories should be made accessible for school use when possible. In return, schools can open their facilities—such as auditoriums for public lectures or playgrounds for community youth activities. This "two-way sharing" mechanism improves resource utilization efficiency and fosters community residents' sense of participation and belonging in education, thereby forming a vibrant and interactive educational community.

4.3 Implementation pathways for the home-school-community collaboration model

At the practical level, promoting home-school-community collaboration requires clear, actionable implementation pathways and operational guidelines. Based on survey data and exemplary practices, this study proposes the following four promotable pathways:

4.3.1 Clarify responsibilities and establish a collaborative working mechanism

Collaboration requires institutional support. Schools can establish a “Home-School-Community Collaboration Task Force” composed of school administrators, teachers, parent committee members, and community representatives. The task force should hold regular meetings to discuss collaboration plans and evaluate progress, thereby institutionalizing and normalizing collaborative work. The mechanism should clearly define each party’s responsibilities: schools are responsible for coordination and guidance, parents for feedback and cooperation, and communities for providing resources and support. Educational authorities can issue policy guidelines or incorporate collaboration outcomes into school evaluation systems to ensure effective implementation. This combination of top-down policy support and bottom-up practical exploration helps sustain collaborative efforts.

4.3.2 Enrich parental education and support activities

Parents are a key component of collaborative education. Schools can establish “Parent Schools” or organize lectures and training courses to share educational philosophies and practical parenting strategies, such as child psychology and parent-child communication. Surveys show that many parents are highly interested in such learning opportunities. Schools can also encourage parents to form mutual-aid groups or parenting salons to exchange experiences and build a supportive network. Research shows that improving parents’ educational literacy positively affects students’ learning attitudes and performance, and enhances their willingness and ability to engage in collaborative education.

4.3.3 Build a linked support system for students’ holistic development

The core of home-school-community collaboration lies in supporting students’ development. Schools can partner with families and communities to provide academic assistance, such as forming after-school tutoring teams composed of teachers and parent volunteers to help struggling students improve. For mental health, a three-party support network should be established: schools assign dedicated psychological counselors to conduct regular assessments, community psychological agencies provide referral services, and mental health lectures and workshops are held for both students and parents to intervene early in potential problems. In moral education, schools and communities can co-design service-learning projects—such as community cleanup, elder care, and disability support—to guide students in practicing core values and fostering character development. These activities enable the organic integration of family, school, and social education.

4.3.4 Use evaluation and feedback to deepen collaboration

Feedback mechanisms are essential for optimizing and continuously improving collaboration. Schools can conduct regular satisfaction surveys among parents and community members to collect feedback on communication efficiency, activity effectiveness, and other areas, and adjust strategies accordingly. Education departments can also consider incorporating collaboration outcomes into performance evaluations and establish incentive mechanisms to reward exemplary practices. When collaboration faces challenges—such as low parental engagement or poor alignment of community resources—schools should analyze the causes and adjust their approaches promptly. The collaboration model itself must evolve with the times, leveraging new technologies and ideas. For example, forming regional home-school-community collaboration alliances through internet platforms to achieve cross-school and cross-community resource sharing and experience exchange is a promising direction for future development.

4.4 Challenges and future prospects of collaborative education

In promoting home-school-community collaboration, it is essential to acknowledge potential challenges and formulate effective strategies to address them.

First, there are challenges related to technology and mindset. As education steps into the era of Education 5.0—emphasizing personalization, adaptive learning, and diversity appreciation [16]—all stakeholders, including teachers, students, and parents, are expected to have a high level of digital literacy and the ability to use new tools in educational activities. In reality, however, acceptance and proficiency levels vary widely across regions and demographics. Some older teachers and parents may be unfamiliar with online platforms, and underdeveloped infrastructure in rural areas remains a major barrier. Schools should therefore offer regular technical training for both teachers and parents, ranging from the use of basic conferencing tools to more advanced online collaborative teaching platforms. Many participants in our survey—both teachers and parents—expressed a desire to learn these technologies, recognizing their potential to enhance educational effectiveness and personal adaptability to future demands.

Second, effective communication and trust remain the cornerstone of successful collaboration. Even with platforms and mechanisms in place, collaboration cannot succeed if stakeholders lack the willingness or channels for communication. Thus, it is crucial to establish clear and efficient communication systems, including regular updates, feedback collection, and responsive problem-solving processes, to ensure that every voice is heard and every concern is addressed. For example, to respond to parents' concerns about their children's learning, schools could host monthly open-door sessions with the principal or grade directors. Communities could also assign education liaisons to visit disadvantaged families and assess their special needs. Such measures help resolve conflicts early and maintain strong collaborative relationships. Additionally, it is important to amplify the voices of marginalized groups to prevent collaboration from only serving families that are already highly engaged while neglecting those with limited influence.

Third, changing external conditions require flexible collaboration mechanisms. The post-pandemic era still holds uncertainties such as recurring outbreaks, economic

fluctuations, and policy shifts—all of which may impact education activities. Schools and communities should develop contingency plans and flexible strategies to adapt swiftly. For instance, in the event of a local outbreak that suspends in-person activities, an online collaboration model should be immediately activated to maintain home-school-community connectivity. If economic hardship affects certain families, schools and communities should provide financial aid or academic support promptly to prevent dropout or learning loss. Flexibility is essential for building a resilient and sustainable collaboration system.

Looking ahead, the role of home-school-community collaboration in primary education will continue to grow, and several emerging trends are anticipated:

4.4.1 Deeper integration of online and offline educational activities

As technology advances and experience accumulates, education will break through the boundaries of the classroom and digitally link the educational functions of families, schools, and communities. For example, a student may attend school during the day, join an online community interest group in the evening led by volunteer mentors, and participate in weekend community practice activities with their parents—then share their outcomes with classmates and teachers via the school's digital system. This integration will turn education into a ubiquitous, continuous experience that better meets students' individual needs and improves overall effectiveness.

4.4.2 An increasingly prominent role of the community in education

Communities will evolve from mere residential spaces into learning environments. Libraries, museums, science centers, and sports facilities will be more fully utilized for educational purposes. Schools may regularly organize “out-of-campus” courses held in museums or factories, while communities may proactively bring “social classrooms” into schools—e.g., local police officers teaching safety classes or doctors offering health lessons. This active involvement will build a supportive educational environment where students grow within a broader social context and develop a stronger sense of belonging.

4.4.3 Fostering global perspectives and social responsibility through collaboration

With an integrated platform among families, schools, and communities, regions with sufficient resources can incorporate international exchange and multicultural programs—such as virtual classroom partnerships with overseas schools or volunteer service experiences organized by community groups. These experiences will broaden students' horizons and instill a sense of global responsibility. In our survey, many parents and teachers expressed a desire for students to be “more open-minded and competitive in the future.” The collaborative education model offers this possibility—by mobilizing diverse educational resources, it extends the classroom globally. Future primary students may, with support from home, school, and community, engage in local or even global problem-solving initiatives, cultivating their awareness and capabilities as global citizens. This will help prepare China's education system for its mission in an increasingly globalized world.

5. Limitations and future prospects

While this study provides valuable insights into the reconstruction of primary education in western China after the COVID-19 pandemic, several limitations should be acknowledged. First, the sampling procedure and school selection criteria were not fully elaborated, which may limit the representativeness of the findings. Second, the study primarily relies on descriptive statistics (frequencies and proportions) without performing inferential analyses. Therefore, the conclusions should be interpreted as indicative rather than generalizable. Finally, future research should explore longitudinal approaches and adopt mixed methods to provide deeper insights into causal relationships and policy implications.

6. Conclusions

In the post-pandemic era, primary education in China is undergoing profound transformation and reconstruction. The series of challenges triggered by COVID-19 has compelled us to re-examine the roles of all educational stakeholders and their modes of collaboration. Based on a large-scale questionnaire survey of parents and teachers, this study systematically analyzes the post-pandemic changes and interactions among families, schools, and communities, and proposes strategies for optimizing the collaborative education model. The key conclusions are as follows:

First, the post-pandemic family education environment and student development exhibit new characteristics. Household economic conditions directly influence children's access to education and their psychological well-being, with an increased risk of educational inequality. Many families were forced to reduce education spending, leading to a rise in students experiencing feelings of comparison and inferiority due to financial constraints. This underscores the need for greater attention to the equitable distribution of educational resources and targeted support for disadvantaged students. As the starting point of education, families must maintain their commitment to their children's learning despite economic pressures, through careful planning and effective use of available community resources.

Second, teachers and school instruction are undergoing adaptation and change. The pandemic accelerated the development of online teaching, helping maintain instructional continuity, but also exposed shortcomings such as reduced interaction. Survey results show that most teachers support a blended learning model combining online and in-person instruction, rather than relying solely on digital formats. Future education models should better integrate the convenience of online tools with the interpersonal depth of classroom interaction, offering students a richer and more effective learning experience. Meanwhile, increasing professional stress has affected teacher stability and instructional quality. Improving teacher compensation, reducing workloads, and providing targeted training in digital pedagogy are essential to maintaining education standards.

Finally, the home-school-community collaboration model provides an effective framework for primary education in the post-pandemic era. The study demonstrates that only through the combined efforts of families, schools, and communities can we collectively meet new educational challenges and build a resilient, equitable, and inclusive education ecosystem. By promoting resource sharing, regular

communication, and joint program development, the collaborative model enhances the effectiveness of educational support networks.

In this process, the role of the community in education has expanded, offering students more holistic learning opportunities in diverse environments—helping cultivate both global perspectives and a sense of social responsibility.

In summary, the advancement of primary education in the post-pandemic era requires concerted efforts and continuous innovation from all parties. Families should strengthen their sense of responsibility and actively cooperate with schools and communities to support children's growth. Schools must open their boundaries, proactively integrate external resources, and improve the quality of education provision. Communities and government authorities, in turn, should refine policy support and offer necessary human and material resources to ensure the smooth implementation of collaborative education. Against the backdrop of Education 5.0, only by upholding the philosophy of collaboration and shared progress can we overcome the challenges left by the pandemic and lay the foundation for a more equitable and high-quality learning environment for every student. This is not only a response to the crisis but also a proactive preparation for the future transformation of education.

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Ethical considerations

All participants were informed of the purpose of this study, and consent was obtained before the survey. All data were anonymized and processed in compliance with applicable data protection regulations.

Appendix

The survey data referenced in this chapter are drawn from the following sources:
Questionnaire Survey: Impact Assessment of Post-Pandemic Family and School Education. Source: <https://www.wjx.cn/report/299965108.aspx>.

Questionnaire Survey: Impact Assessment of Post-Pandemic Family Education. Source: <https://www.wjx.cn/report/299966188.aspx>.

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Perspective Chapter: Advancing Grade 12 Mathematics Education in South African Community Learning Centres – A Framework for Equity and Innovation

Carlit Casey Tibane and Olivia Neo Mafa-Theledi

Abstract

This chapter explored the transformative potential of Community Learning Centres (CLCs) in South Africa as equitable platforms for enhancing Grade 12 Mathematics education. Born out of the restructuring of Public Adult Learning Centres into Community Education and Training Centres (CETCs), CLCs aim to address the educational inequalities perpetuated by apartheid by offering secondary education, vocational training, and lifelong learning opportunities. Mathematics is identified as a gateway subject critical for socio-economic mobility, yet its delivery in CLCs faces challenges such as resource scarcity, teacher capacity gaps, and socio-economic barriers. The chapter introduces a dual framework combining Deliverology and Implementation Science to systematically address these challenges. Together, these frameworks ensure that the curriculum is implemented effectively, catering to the diverse needs of learners. These approaches are implemented through a systematic, five-phase framework that includes needs assessment, resource optimization, capacity building, active curriculum delivery, and outcome evaluation. The framework emphasizes inclusivity, scalability, and sustainability, creating a replicable model for systemic improvement in mathematics education. The chapter concludes with policy recommendations advocating for equitable resource allocation, on-going teacher development, infrastructural investments, and collaborative stakeholder engagement. This chapter positions CLCs as pivotal in addressing systemic inequities and empowering marginalized communities through quality mathematics education.

Keywords: mathematics, deliverology, implementation science, community learning centres, grade 12

1. Introduction

Community Learning Centres (CLCs) in South Africa were established to tackle the pervasive inequalities entrenched by apartheid. Initially functioning as Public

Adult Learning Centres (PALCs), they were restructured into Community Education and Training Centres (CETCs) in 2015 to broaden their scope beyond adult literacy to include vocational training, secondary education, and lifelong learning [1]. The UNESCO [2] highlights its importance in providing educational opportunities in underprivileged communities, particularly where access to quality schooling is limited. Research underscores that CLCs are not only just educational institutions but also serve as agents of social change, addressing gaps in literacy and skills essential for economic participation. Aitchison and Land [3] argue that CLCs contribute to community development by equipping individuals with tools to navigate socio-economic challenges. By promoting equitable access to education, these centres play a transformative role in addressing the long-standing disparities in South Africa's education system.

The apartheid legacy left South Africa with an education system designed to disenfranchise black communities, depriving them of quality resources and limiting their opportunities for social and economic advancement. CLCs emerged as a critical intervention to redress these inequalities, offering tailored programs for youth and adults excluded from traditional schooling [4]. Mthethwa and Land [5] highlight the role of CLCs in bridging the educational divide, creating pathways for individuals to complete their schooling while acquiring skills that align with market demands. For learners in disadvantaged areas, access to subjects like Grade 12 Mathematics is transformative, enabling them to gain competencies necessary for further education and employment. Studies by Peou and Singh [6] emphasize that CLCs provide a vital second chance for individuals to overcome socio-economic barriers and improve their quality of life. These centres contribute significantly to fostering equality and addressing structural challenges within the education system.

2. Overview of the grade 12 mathematics curriculum

Mathematics is widely acknowledged as a foundational subject that develops critical thinking, analytical reasoning, and problem-solving skills. For South African learners, mathematics is a “gateway subject,” offering access to fields such as engineering, technology, and finance, which are crucial for socio-economic advancement [7]. Particularly for learners in CLCs, excelling in mathematics provides a means to break cycles of poverty by opening doors to higher education and career opportunities. Studies emphasize the empowering potential of mathematics education, especially in marginalized settings. Graven [8] points out that mathematics equips learners with the skills to navigate complex socio-economic environments and fosters resilience. Maharajh et al. [9] further note that proficiency in mathematics is not only a predictor of academic success but also a critical tool for lifelong learning and adaptability in a changing world. Addressing the challenges of mathematics education in CLCs is therefore essential for fostering equitable access to these opportunities.

The Grade 12 Mathematics curriculum, designed under the Curriculum and Assessment Policy Statement (CAPS), is structured to develop both conceptual understanding and practical problem-solving abilities. Key topics such as algebra, trigonometry, geometry, and calculus prepare learners for academic rigor and practical application in various fields [7]. CAPS also emphasizes differentiated instruction to meet the diverse needs of learners in settings like CLCs, where students often have varying educational backgrounds. Volmink and van der Elst [10] observe that the

inclusion of critical thinking and real-world applications within the curriculum aligns South African education with global standards, ensuring that learners acquire skills relevant for the twenty-first-century workforce. Effective implementation of this curriculum in CLCs can significantly enhance learners' academic and professional trajectories.

3. Theoretical frameworks for curriculum implementation

Deliverology, a framework introduced by Sir Michael Barber, emphasizes clear goal-setting, systematic progress tracking, and the implementation of targeted interventions to achieve measurable outcomes [11]. In education, it ensures accountability by aligning teaching practices with established objectives and addressing gaps in curriculum delivery. Implementation Science complements this by examining the contextual factors that influence the adoption and success of educational policies. Nilsen and Bernhardsson [12] describe it as a tool for identifying barriers and facilitators, making it particularly relevant for understanding the challenges faced by CLCs. By focusing on the practical application of policies in diverse environments, Implementation Science enables the adaptation of curriculum delivery methods to local needs. Together, these frameworks provide a robust foundation for addressing the complexities of curriculum implementation in under-resourced settings.

The integration of Deliverology and Implementation Science offers a holistic approach to improving curriculum implementation in CLCs. Deliverology provides a structured framework for accountability, while Implementation Science addresses the socio-economic and infrastructural constraints unique to these environments [13]. This dual approach ensures that interventions are both systematic and context-sensitive, enabling targeted resource allocation and capacity building for teachers. Research indicates that such integration can lead to more effective curriculum delivery, particularly in marginalized communities where traditional methods often fall short.

3.1 Advantages of using the dual framework

Deliverology emphasizes setting measurable goals, systematically tracking progress, and designing targeted interventions to meet specific objectives [11]. This approach ensures that educational priorities, such as improved learner outcomes in mathematics, remain at the forefront of planning and execution. It also instills a sense of accountability among educators and administrators, motivating them to focus on tangible improvements in curriculum delivery. For example, Deliverology can establish clear benchmarks for learner performance in critical topics like algebra and calculus, ensuring consistent evaluation and timely feedback. Implementation Science, on the other hand, delves into the contextual realities of curriculum implementation. Nilsen and Bernhardsson [12] describe it as a practical tool for understanding and mitigating barriers while leveraging facilitators within specific environments. This is particularly relevant in CLCs, where socio-economic disparities, resource limitations, and infrastructural challenges can impede effective teaching. Implementation Science enables policymakers and educators to adapt interventions to the unique needs of these centres, ensuring that curriculum delivery methods are relevant and effective.

3.2 The integration of these frameworks offers several key advantages

The diagram (**Figure 1**) outlines five interconnected phases of curriculum implementation, each represented by the letters A to E, and highlights the systematic flow of activities designed to improve Grade 12 Mathematics education in CLCs. Phase A (Needs Assessment and Goal-Setting) marks the foundational stage, where specific challenges and opportunities within each CLC are identified through methods such as site visits, stakeholder interviews, and data analysis. This phase emphasizes setting clear, measurable goals [11] such as improving learner pass rates—by addressing critical areas like resource shortages and teacher capacity. This ensures that the plan is both relevant and actionable. The insights gained in A feed directly into Phase B (Resource Allocation and Optimization), which focuses on prioritizing and distributing resources efficiently. Here, Deliverology guides systematic allocation [11], such as providing textbooks and digital tools, while Implementation Science ensures that the resources meet the contextual needs of each CLC [17], addressing disparities like insufficient infrastructure or lack of internet access.

3.3 Mitigating challenges in curriculum implementation

Using this dual framework can address and mitigate several challenges faced in the implementation of the Grade 12 Mathematics curriculum in CLCs:

- Resource scarcity: Deliverology’s structured approach to goal-setting can prioritize funding and resource distribution, ensuring that essential materials such as textbooks, calculators, and digital tools are made available [11]. Implementation Science can then assess the specific resource needs of individual CLCs, ensuring that distribution aligns with local priorities [17]. Together, these frameworks

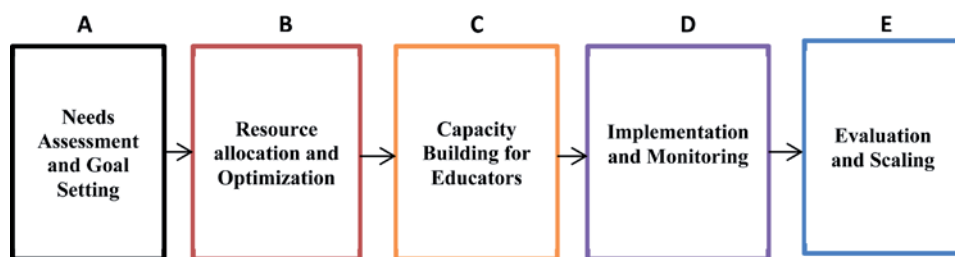


Figure 1.

Phase C (Capacity Building for Educators) focuses on empowering teachers, the key drivers of effective curriculum delivery. Through targeted professional development programs, educators are equipped with strategies like differentiated instruction, culturally responsive teaching, and technology integration [14, 15]. This phase ensures educators are prepared to overcome the unique challenges of teaching in under-resourced settings. The process transitions into Phase D (Implementation and Monitoring), where the curriculum delivery is actively rolled out in classrooms. Activities include leveraging digital tools, implementing flexible schedules, and conducting regular progress assessments to ensure alignment with established goals. Monitoring systems are vital here, as they provide real-time data to adapt teaching strategies and resolve emerging challenges [16]. Finally, Phase E (Evaluation and Scaling) emphasizes the assessment of outcomes to refine and expand successful strategies. Deliverology-driven evaluation methods analyze learner performance, resource utilization, and teacher effectiveness, while Implementation Science helps contextualize findings to address lingering challenges [11, 17]. Insights gained in this phase enable the replication of effective practices across other CLCs, creating a scalable model for improving mathematics education in marginalized communities. This systematic framework ensures that each phase builds upon the previous, creating a cohesive, adaptive approach to curriculum implementation.

can help minimize resource disparities and create a more equitable learning environment.

- **Teacher capacity gaps:** Many educators in CLCs lack formal training in advanced mathematics or exposure to innovative teaching methods [18]. Deliverology can set clear objectives for teacher professional development, such as increasing the number of teachers trained in differentiated instruction or digital pedagogy. Implementation Science, in turn, identifies the contextual factors—such as time constraints or lack of access to training programs—that hinder teacher participation [19], allowing for the design of more accessible and effective CPD initiatives.
- **Socio-economic barriers:** The dual framework acknowledges the broader socio-economic challenges that learners face, such as poverty, limited access to technology, and competing responsibilities [18]. Implementation Science can adapt curriculum delivery to accommodate these realities, for instance, by integrating flexible schedules or community-based learning supports. Deliverology, meanwhile, tracks progress to ensure that these adaptations result in measurable improvements in learner outcomes.
- **Infrastructural limitations:** Deliverology can focus efforts on infrastructural enhancements, such as providing electricity, internet access, and safe learning environments. Implementation Science evaluates how these improvements are utilized, ensuring that they directly benefit mathematics education by enabling technology integration and interactive teaching methods [11].
- **Learner engagement and performance:** Deliverology's focus on measurable outcomes ensures regular assessment of learner performance, identifying areas where additional support is needed [20]. Implementation Science adapts interventions to address these areas, such as introducing culturally responsive teaching methods to improve engagement or using technology to support individualized learning plans [17].

4. Practical application in grade 12 mathematics

In practice, combining Deliverology and Implementation Science can transform how the Grade 12 Mathematics curriculum is delivered in CLCs. For instance, Deliverology can define specific goals, such as improving pass rates by 20% within a specified period that is reasonable and realistic, while Implementation Science explores the barriers preventing learners from excelling in this area. This could lead to the introduction of targeted interventions, such as the following:

- Offering additional evening or weekend classes to accommodate working learners.
- Providing professional development for teachers focused on calculus instruction.
- Introducing online tutorials or gamified learning tools to reinforce key concepts.

Thus, this integrated approach ensures that interventions are not only strategically planned but also effectively tailored to the needs of learners and educators. Moreover, it allows for continuous evaluation and adaptation, ensuring that the Grade 12 Mathematics curriculum remains dynamic and responsive to the challenges of CLCs. By addressing both systemic and localized issues, the dual framework of Deliverology and Implementation Science offers a pathway to sustainable improvements in curriculum implementation, fostering equitable access to quality education in even the most under-resourced settings.

4.1 Challenges in curriculum implementation

One of the most significant barriers to curriculum implementation in CLCs is the lack of resources. Many centres struggle with inadequate infrastructure, insufficient textbooks, and limited access to technology, which are critical for effective teaching and learning [21]. Aitchison and Land [3] note that resource scarcity undermines the ability of educators to deliver the curriculum effectively. Therefore, addressing these challenges is vital to creating an environment conducive to learning. The shortage of qualified mathematics teachers is another key challenge in CLCs. Many educators lack formal training and continuous professional development needed to teach advanced topics or apply innovative pedagogical methods [22]. Handrianto et al. [23] emphasize that equipping teachers with modern teaching strategies and subject expertise is essential for improving learner outcomes.

In the context of this chapter, professional development programs tailored to the specific needs of CLC teachers are critical for addressing this capacity gap. Socio-economic disparities heavily influence the implementation of the Grade 12 Mathematics curriculum. Learners from low-income households often face barriers such as limited access to transportation, inadequate nutrition, and financial constraints, which impact their ability to focus on academics [8]. Engelbrecht et al. [24] observe that disparities in access to resources and support systems exacerbate these challenges, highlighting the need for holistic interventions that address both educational and socio-economic issues. Infrastructural inadequacies, such as overcrowded classrooms and outdated facilities, pose significant challenges to curriculum delivery in CLCs. The UNESCO [2] highlights that such limitations hinder interactive and collaborative learning, which are essential for effective mathematics education. Investment in infrastructure development is therefore critical for creating an enabling environment for teaching and learning in CLCs.

4.2 Teacher perceptions and experiences

Teachers' perspectives provide valuable insights into the challenges and opportunities in curriculum implementation within CLCs. Many educators report feeling unsupported due to a lack of resources and professional development opportunities, which affects their morale and effectiveness [25]. However, focus group discussions reveal that teachers often demonstrate resilience and creativity, adopting innovative strategies to address systemic barriers. Building a culture of collaboration and peer support is crucial for empowering teachers to deliver the curriculum effectively. The attitudes and perceptions of teachers significantly influence the success of curriculum implementation. Fisher and Royster [26] argue that teachers who feel confident and supported are more likely to adopt innovative teaching methods and foster engaging learning environments. Professional development programs that emphasize the use

of technology, collaborative learning, and culturally responsive teaching can enhance teachers' confidence and effectiveness. Empowering teachers in this way is key to improving outcomes for learners in CLCs.

4.3 Innovative teaching strategies and resources

Culturally responsive teaching and differentiated instruction are pivotal in creating inclusive and effective learning environments, especially in CLCs. Culturally responsive teaching ensures that lessons reflect and respect the diverse cultural backgrounds of learners. Gay [27] notes that this approach enhances engagement by connecting academic content to students' lived experiences, fostering both a sense of relevance and belonging. In CLCs, where learners often come from socio-economically marginalized backgrounds, such strategies are essential for building trust and motivation. Differentiated instruction complements culturally responsive teaching by addressing the unique learning needs and abilities of individual students. According to Tomlinson [28], differentiated instruction involves modifying teaching methods, materials, and assessment techniques to cater to various skill levels and learning styles. Research studies indicate that this approach improves academic outcomes by ensuring that all learners, regardless of their starting point, have an equitable opportunity to succeed. Furthermore, it empowers educators to tailor their strategies, maximizing the potential of each learner. Together, these methods form a robust framework for improving mathematics education in diverse and resource-constrained settings.

The integration of technology into mathematics education has revolutionized the way students learn and engage with complex concepts. Digital tools such as graphing calculators, interactive simulations, and learning management systems provide dynamic and accessible platforms for enhancing understanding. Pepin et al. [29] highlight that these resources enable learners to visualize abstract ideas, practice problem-solving in real-time, and receive immediate feedback, all of which are critical for mastery in mathematics. In the context of CLCs, technology offers an opportunity to overcome resource limitations and diversify teaching methods. Moreover, it allows educators to design personalized learning experiences that address the varying needs of their students. Despite its benefits, challenges such as limited infrastructure, lack of internet access, and inadequate teacher training often hinder the effective use of technology in underprivileged settings [30]. Addressing these obstacles requires targeted investments in digital infrastructure and professional development programs, ensuring that both teachers and learners can fully benefit from technological advancements.

4.4 Policy implications and recommendations

The success of the Grade 12 Mathematics curriculum in CLCs is heavily reliant on equitable funding and resource allocation. Spaul [31] discusses the profound disparities between urban schools and under-resourced learning centres, emphasizing the need for targeted funding to bridge these gaps. Many CLCs lack basic amenities such as textbooks, digital tools, and well-equipped classrooms, which hampers their ability to deliver quality education. Policymakers must prioritize resource distribution models that cater to the specific needs of marginalized communities, ensuring a fair and balanced approach. Furthermore, investments in sustainable solutions, such as renewable energy for electricity and mobile libraries, could significantly improve access to educational resources in remote areas. Aitchison and Land [3] note that

addressing these foundational issues is a prerequisite for achieving broader educational equity. Comprehensive and strategic resource allocation is therefore vital to ensure that every learner, regardless of their socio-economic background, has access to quality mathematics education.

Continuous professional development (CPD) is crucial for equipping teachers with the skills needed to deliver an evolving curriculum effectively. Ramnarain and Hlatwayo [25] highlight that CPD programs focusing on innovative teaching methods, technology integration, and differentiated instruction can significantly improve teacher confidence and competence. These programs are especially important in CLCs, where educators often lack formal training in advanced mathematics or access to professional learning communities. Moreover, CPD initiatives should incorporate hands-on workshops, peer mentoring, and ongoing support to ensure that teachers can apply their learning effectively. Research studies indicate that educators who engage in collaborative professional development are more likely to adopt and sustain innovative practices in their classrooms [23]. Establishing well-resourced and accessible CPD opportunities is essential for strengthening the teaching capacity within CLCs, ultimately enhancing learner outcomes.

Effective and sustainable reforms in CLCs require active collaboration among educators, policymakers, community leaders, and learners. Green [32] discusses how partnerships between CLCs and external organizations, such as NGOs and private sector entities, can provide additional resources, expertise, and innovative solutions to persistent challenges. Building these networks ensures that educational interventions are not only relevant but also supported by a broad coalition of stakeholders. Furthermore, fostering community involvement enhances accountability and ensures that reforms align with local needs and priorities. For example, mentorship programs and community-driven initiatives can address specific challenges faced by learners, such as a lack of role models or career guidance. Strengthening these collaborations creates a more resilient and adaptive system capable of addressing the evolving needs of CLCs. Thus, stakeholder engagement is a cornerstone of sustainable educational improvement.

5. Future directions and conclusion

While significant progress has been made in understanding the challenges of curriculum delivery, there remains a lack of localized research focusing on CLCs. Hanemann [33] notes that studies specific to the unique socio-economic and infrastructural dynamics of these centres are essential for developing targeted and effective solutions. Additional research is needed to examine how contextual factors, such as community involvement and teacher perceptions, influence the success of curriculum implementation. Moreover, long-term studies assessing the outcomes of learners who graduate from CLCs could provide valuable insights into the effectiveness of current strategies. These findings would inform policy decisions, enabling the development of evidence-based interventions tailored to the needs of CLCs. Addressing these research gaps is critical for advancing the role of CLCs as drivers of equitable education and socio-economic mobility.

The vision for mathematics education in CLCs must prioritize inclusivity and equity, ensuring that all learners have access to high-quality teaching and resources. Engelbrecht et al. [24] highlight the need to address systemic barriers such as teacher shortages, resource inequities, and socio-economic disparities to create a

truly inclusive learning environment. Furthermore, culturally responsive teaching practices and differentiated instruction must be central to this vision, fostering an educational experience that values diversity and promotes success for all learners. Moreover, embracing technological advancements and fostering collaboration among stakeholders are key to building a sustainable and effective education system. Aitchison and Land [3] note that inclusive education is not just about equal access but also about creating meaningful and transformative learning experiences. Thus, by addressing these challenges with strategic reforms and innovative practices, CLCs can become powerful platforms for advancing equitable mathematics education and fostering socio-economic development in South Africa.

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Conflict of interest

The authors declare no conflict of interest.

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Section 2

Digital Education, Information Literacy, AI, and Media Culture

Perspective Chapter: Empowering Digital Education through Information Literacy

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Abstract

The COVID-19 pandemic accelerated the shift to digital education, prompting higher education to move from face-to-face to open distance and digital education (ODDE) environments. This chapter examines the significant changes in digital education and emphasizes the crucial role of information literacy. Information literacy skills enable ODDE learners to effectively find, evaluate, and use information, supporting self-directed learning, critical thinking, and ethical information use. The chapter explores educational changes driven by technology and the demand for flexible learning. These include increased accessibility, blended learning, personalized learning through artificial intelligence (AI), gamification, MOOCs, and improved collaboration through digital tools. Each development highlights the necessity of strong information literacy skills. A review of research and studies on the implementation of information literacy in higher education institutions and ODDE environments is also discussed. This includes the integration of information literacy into the curriculum, provision of comprehensive library resources, and promotion of collaborative projects, including workshops and webinars in advocating information literacy. Despite challenges like diverse learner backgrounds, resource access issues, and technological barriers, the implementation of innovative solutions to address these problems is discussed. Information literacy will remain vital in digital education. It helps learners develop critical thinking, effectively use AI, and analyze data. These skills prepare learners to make meaningful contributions in a rapidly changing world.

Keywords: information literacy, digital education, open, distance and digital education (ODDE), COVID-19 pandemic, digital literacy

1. Introduction

The COVID-19 pandemic substantially impacted education, accelerating the use of digital education. Higher education institutions worldwide shifted from face-to-face to online platforms, highlighting the need for multiple competencies, including information literacy skills. Academics embraced innovative teaching methods, incorporating online lectures, digital materials, and interactive instruments to

captivate learners. The COVID-19 pandemic accelerated a global shift to digital education, forcing schools and universities worldwide to rapidly adopt online learning platforms and technologies. This transition also highlighted the significance of learners acquiring self-directed learning and information literacy skills. In addition, in the current dynamic and fast-changing digital environment where information is readily available and abundant, it is increasingly important to possess the skills that enable someone to identify their information needs, effectively search and retrieve, and use extensive amounts of data and information. This chapter examines the crucial significance of information literacy within the framework of digital education. In our modern day of technological interconnectedness, the ability to proficiently locate, assess, and responsibly utilize information has become a fundamental set of capabilities that individuals of all ages must possess. Information literacy enables learners and educators to excel in a digital education environment of continuous change and innovation. In the digital era, possessing information literacy is crucial for all individuals, particularly those engaged in open, distance, and digital education (ODDE) environments. As defined by the Association of College and Research Libraries (ACRL) [1], information literacy encompasses a wide range of abilities that include actively searching and assessing information, comprehending the process of information creation and evaluation, utilizing information to generate fresh insights, and participating lawfully and ethically in educational communities.

2. Methodology

Data and information from this chapter were gathered from online resources, including EBSCO Academic Ultimate, ProQuest Education Collection, Education Resources Information Center (ERIC), Scopus, and Google Scholar. Searches with the terms “digital education,” “information literacy,” and “digital literacy” are used. Additionally, a selection of supplementary literature and guidelines was made through citation databases and online report from authority bodies. Nonetheless, only English-language resources are used as references. To make sure that most facet of information literacy was covered, broadly specified criteria were employed.

3. Educational changes to digital education

Due to evolving pedagogical approaches, technological advancements, and the increasing demand for flexible learning environments, digital education has undergone significant transformations. These changes influence how learners acquire, access, and engage with education worldwide. Here are some educational changes to digital education.

3.1 Increased flexibility and accessibility

Digital education has democratized learning by breaking down geographical barriers and offering adaptable schedules that meet the needs of diverse learners. According to the World Economic Forum, online learning platforms have made high-quality educational resources accessible to individuals from remote and underserved regions [2]. Online learning environments suit various requirements and lifestyles, enabling learners to study at their own pace and schedule. A study by Bouchev et al.

also states that higher education institutional leaders have realized that providing online student support and accessibility serves not only to online students but also to all students [3]. Both face-to-face and online learners can benefit from the flexibility and accessibility of digital education [4].

3.2 Blended learning

Blended learning, which combines traditional face-to-face instruction with online components, is becoming increasingly prevalent. This approach offers a balanced mix of synchronous and asynchronous learning activities, enhancing student engagement and learning outcomes. The online component of blended learning enables students to have flexibility in learning at their preferred speed and at their own convenience, while also providing access to a diverse range of curriculum resources [5]. In recent years, blended learning has gained major popularity in education, accelerated by the COVID-19 pandemic [6].

3.3 Personalized learning

Advancements in artificial intelligence (AI) and machine learning have enabled personalized learning experiences tailored to the needs of each learner. Adaptive learning technologies analyze learner performance data and adjust instructional content accordingly, providing customized support and resources [7]. This approach has been shown to improve student engagement and achievement.

3.4 Gamification and interactive learning

Gamification or the application of game design features in educational settings, is gaining popularity in digital education. It increases learner motivation and engagement by incorporating point scoring, leaderboards, and badges. Gamification has a substantial impact on motivation by promoting the acquisition of knowledge, enhancement of abilities, and development of academic competencies in students [8]. Interactive learning tools, including simulations and virtual labs, provide hands-on experiences that enhance understanding and retention of complex concepts.

3.5 Massive open online courses (MOOCs)

Massive Open Online Courses (MOOCs) have transformed higher education by offering free or low-cost courses from top universities to a global audience. Platforms such as Coursera, edX, and Udacity have enrolled millions of learners worldwide, providing diverse subjects and professional development opportunities [9]. MOOCs have expanded to include micro-credentials and certifications, bridging the gap between traditional education and industry demands [10].

3.6 Collaboration through technological platforms

Digital education has enhanced learner-teacher collaboration and communication through technologies such as discussion forums, video conferencing, and collaborative documents. These tools enable real-time interaction and collaboration, creating a more dynamic and engaging learning environment [11].

3.7 Digital literacy and competencies

The shift to digital education has underscored the importance of digital literacy and skills. Digital literacy is tightly connected to the utilization of digital tools and the discerning assessment of digital content [12]. It involves a vital proficiency for the tasks of searching, storing, and transmitting digital data, as well as generating, manipulating, and presenting digital information. Students must proficiently use digital technologies and navigate online environments to succeed academically and professionally. Educational institutions have incorporated digital literacy into their curricula to prepare learners for the demands of the digital age [13]. Digital education promotes continuous learning, enabling individuals to upskill and reskill throughout their careers.

3.8 The COVID-19 pandemic's effects

The COVID-19 pandemic sparked a global shift to digital education. Educational institutions worldwide transitioned to online learning almost overnight, highlighting both the potential and challenges of digital education. This period emphasized the need for robust digital infrastructure, teacher training, and equitable access to technology [14].

To sum up, the demand for flexible learning and technology improvements has enormously impacted digital education. Because of these changes, education is now more accessible, providing customized learning programs and flexible timetables to accommodate various requirements. A growing trend in education is blended learning, which combines online and in-person training to increase student engagement. Student motivation and achievement have increased with the introduction of gamification and adaptive learning technology. MOOCs have increased access to excellent education by making courses available worldwide. The COVID-19 pandemic hastened the transition to virtual education and underscored the significance of robust digital infrastructure and equitable accessibility to technology.

These significant shifts in educational approaches and technologies underscore the evolving landscape of digital education. As institutions adapt to these changes, the need for robust information literacy skills is another crucial element that emerges. Information literacy has become increasingly important in this digital context, empowering learners to navigate and utilize vast information resources effectively. Thus, understanding the role of information literacy in enhancing the digital education experience is paramount.

4. The role of information literacy toward open, distance and digital education (ODDE)

Information literacy is essential in digital and online education since it allows learners to efficiently locate, assess, utilize and generate information. It is crucial to support digital education by providing various essential elements and skills for ODDE learners. Furthermore, many studies have shown that there is a correlation between information literacy and academic achievement [15, 16]. Several key aspects of how information literacy supports digital education are:

4.1 Supporting self-directed learning

Information literacy competencies empower ODDE learners to become self-directed learners who are capable of seeking out and understanding information without direct supervision. These skills enable learners to discern information required, to address an issue, or effectively respond to questions and studies [16]. Moreover, information literacy encompasses the capacity to think critically and exercise impartial judgment while encountering and utilizing information. According to the Chartered Institute of Library and Information Professionals (CILIP), critical thinking is essential for learners to assess sources with a critical eye, determining their reliability, relevancy, and accuracy [17]. This skill allows learners to discern the authenticity and non-credibility of a source, especially in the vast and unregulated online realm. Recognizing biases in information promotes a more equitable and discerning approach to consuming information and content. A study by Sari [18] on English language students indicates that digital and information literacy proficiency and academic achievement were significantly correlated with students' aptitude for self-directed learning. By integrating these competencies, learners become adept at independently seeking and critically evaluating information, ensuring they utilize credible and relevant sources in their academic pursuit.

4.2 Effective searching and information retrieval

Learners with a proper understanding of information literacy skills can plan and perform efficient and effective information source searches. The ability to use search engines, academic database retrieval systems, and other digital tools to find and access relevant information quickly will help learners in digital education excel in their studies. In the *Big6 Skills on information problem-solving*, information-seeking strategies and locating and accessing sources are two of the six stages to solve information problems effectively and efficiently [19]. In addition, information literacy skills will enable a learner to organize and manage digital data, including storing and retrieving information that has been collected and gathered effectively.

4.3 Improving academic performance

Students possessing strong information literacy skills can generate superior assignments that are thoroughly researched and appropriately cited. The ability to retrieve various amounts of information and data from diverse sources is one of the reasons for success in learners' academic performance. Soleymani [20] agrees that there is a positive correlation between information literacy and learners' academic achievement. Another research by Flierl et al. [21] found a correlation between information literacy and academic performance. Hence, all academic institutions should provide the necessary competencies and knowledge of information literacy skills to improve learners' academic performance. A study by Morse [22] indicates that there is a positive correlation between level of information literacy and student GPA.

4.4 Learner retention and graduation

Information literacy competencies among ODDE learners will produce learners who are capable of retaining their study progress till graduation. The competencies

enable the learners to conduct effective research, which leads to better-quality assignments and higher grades. Students who perform well academically are likelier to stay engaged and persist in their studies. According to Catalano and Phillips [23], “the ability to demonstrate information literacy skills appears to contribute to retention and graduation and, therefore, may be an integral part of one’s academic success” (p. 3).

4.5 Ethical use of information

Plagiarism is a particular facet of academic integrity that has been extensively discussed for many years [24]. Acquiring information literacy competencies and skills would help learners prevent plagiarism. These skills will help learners comprehend the significance of copyright and intellectual property. This encompasses the capacity to attribute sources and citations accurately. This measure will effectively curb academic dishonesty among learners in the digital education environment.

4.6 Adaptation to new technologies

Information literacy promotes an active and self-initiated approach to acquiring knowledge about emerging technology. Deja et al. [25] found that information literacy skills have enhanced the self-efficiency of academics in creating information, using the outcomes and making them ready for digital transformation, which results in the ability to adapt to new technologies. Within digital education, this preparedness enables students to readily acclimate to novel digital tools and platforms employed for virtual classrooms, collaborative endeavors, and scholarly research.

4.7 Lifelong learning skills

By developing information literacy skills, such as actively seeking and efficiently utilizing information, ODDE learners can continually improve their comprehension and expertise in any chosen topic to sustain and further their academic pursuits. Seifi et al. [26] find that information literacy skills improve learners’ preparedness for independent study and willingness to overcome obstacles to engagement, preparing them to continue their studies as lifelong learners.

5. Advocating information literacy in open, distance and digital education (ODDE) institutions

Open, Distance, and Digital Education (ODDE) institutions play a pivotal role in fostering information literacy among their learners. This section reviews how information literacy concepts and practices can be promoted and advocated to learners in higher education and ODDE institutions.

5.1 Implementing information literacy

Implementing information literacy involves a strategic and integrated approach to ensure learners acquire the necessary skills. The skills will enable learners to identify their information needs and locate, evaluate, and use information effectively. Some initiatives in implementing information literacy in the institutions are:

5.1.1 Integrate information literacy into curriculum

In designing a course in digital education environment, universities are recommended to embed information literacy components into their existing courses across disciplines. This could include research assignments, critical analysis tasks, projects requiring diverse information sources, and proper citation according to the standard format. Tang [27] from one of the ODDE institutions in Hong Kong has evaluated the first-year undergraduate student's information literacy skills and emphasized the need for information literacy to be covered in the curriculum.

5.1.2 Library resources and service

Another initiative that higher education institutions can implement in advocating information literacy in their institutions is by providing adequate and quality resources and services by libraries. Providing quality and relevant academic online databases, which consist of peer-reviewed journal, book, report, and conference papers, for instance, is a must in order for learners to access authentic and reliable resources for their studies. Libraries should also develop and provide access to online training, videos, and guides that cover various aspects of information literacy, such as database search, source evaluation, and academic writing. Diverse initiatives in leveraging technology to facilitate the participation of a maximum number of students in library training is also can be implemented. A research shows how online information literacy and library training modules are developed based on one of technology innovations, namely Articulate Rise. These modules have change library training mode from many in-person resources to virtual resources [28]. In addition, the library should offer virtual and face-to-face consultation services with librarians whom can assist learners regarding their research requirements and deliver tailored guidance on information literacy.

5.1.3 Collaborative assignments and projects

Most assignments and projects are executed in a group task model that necessitates collaborative study, promoting the sharing of ideas and the critical assessment of sources among peers. Institutions should also practice integrated peer review exercises in which students evaluate and analyze each other's work, specifically on assessing the reliability and trustworthiness of the sources employed, to promote information literacy practices and skills among the learners.

5.1.4 Workshops and webinars

Libraries and faculties can jointly coordinate frequent online workshops and webinars focusing on information literacy, including advanced search techniques, retrieving information from academic databases, and preventing plagiarism. The interactive seminars allow students to ask questions, participate in discussions and practical exercises. However, in providing information literacy competencies and skills to students, it is important for institutions to provide quality trainers. Many researches stress on the importance of "teach the teachers" (TTT) approach to information literacy [29]. Librarians, whom are expert in information literacy, can relinquish their expertise to others such as faculty members. Given the faculty members possessing specialized knowledge in their respective fields, they are more likely to effectively

illustrate to students the significance of information literacy within their respective disciplines. In addition, as faculty members have greater authority over the classroom and assess grades, students are more inclined to be open to acquiring knowledge about information literacy from the faculty members.

5.1.5 Technology and tools

ODDE institutions must ensure that their learners have the required technology and internet connectivity to efficiently use online resources such as academic online databases, e-books, and e-journals. Robust technical support is another element that must be provided to help students navigate online platforms and resources ubiquitously. Kowalik [30] reports a university library's effort to use a campus learning management system and rapid e-learning development software to implement online tutorials and performance assessments for information literacy education.

5.1.6 Community and peer support

ODDE institutions can implement peer mentorship initiatives to develop new learners' information literacy abilities with the assistance of more experienced and senior learners. Through learning management system (LMS), ODDE institutions will provide a platform where students can actively interact with their classmates and academics to engage in discussions and exchange information, for example, will help learners gain and comprehend information literacy skills and competencies.

5.2 Challenges in advocating information literacy to ODDE learners

The ODDE institution faces a distinct set of obstacles when implementing information literacy. The following are some of the most urgent difficulties and challenges, along with strategies for addressing them.

5.2.1 Diverse learners demographics

ODDE learners come from various educational backgrounds, age groups, work experiences, and socio-economic conditions, resulting in varying levels of pre-existing information literacy abilities and competencies. Consequently, learners possess distinct learning requirements. ODDE institution must employ flexible and adaptable instructional practices to accommodate its learners' varying learning styles and needs. They should also establish information literacy resources and efforts accommodating various learning styles, backgrounds, and prior knowledge. Various materials and guidelines in different languages to cater to a wide range of learners from various backgrounds should also be introduced to cater various learners' demographics. Learning modules and video tutorials must be available on the learning platform, which learners can access anytime at their own pace. This enables everyone to learn, regardless of background or condition.

5.2.2 Access to resources

In terms of accessibility, not all ODDE learners have equitable access to digital devices and high-speed internet. This limitation of digital access can hinder their ability to engage with online information literacy materials effectively. Another challenge

is ensuring equitable access to academic databases, journals, and resources for all learners is a further obstacle, especially in areas with limited library funding. Through institutional subscriptions, digital libraries must ensure the availability of a diverse array of digital resources, including e-books, journals, and databases. In addition, ODDE institutions must advocate the utilization of openly accessible open educational resources (OER) to alleviate financial obstacles and ensure equitable access to educational resources.

5.2.3 Engagement and motivation

Students in ODDE environments frequently require high self-motivation and discipline, which can hinder their participation in optional information literacy courses. The lack of immediate connection between information literacy abilities and learners' education or future employment might result in decreased levels of engagement. ODDE institutions must encourage their learners to engage in information literacy classes and efforts. Study credit to information literacy courses is one of the ways to motivate and reward students to involve in information literacy. Another initiative to address the challenges of implementing information literacy in the ODDE institution is the creation of interactive lessons and modules that encourage active engagement and practical application of information literacy skills. ODDE institutions can develop various educational modules such as in the HSP format to facilitate interactive learning and provide students with opportunities to engage in practice activities programs.

5.2.4 Technological barriers

Insufficient internet connectivity, differing levels of digital proficiency among students, and inadequate support from educational institutions in granting access to essential technical resources are some issues that ODDE institutions must solve to make information literacy become a driven factor in students' success. Access to technology is the first-order barrier to information literacy instruction. This includes lack of broadband internet and paywalled information/learning resources [31]. ODDE institutions can develop educational content or modules compatible with mobile devices, which requires minimal internet bandwidth. Whenever possible, faculties can provide offline access to the materials, such as study modules in PDF format. Digital libraries can also collaborate with other academic libraries to offer physical study spaces and internet connectivity as part of library services. ODDE institutions can also utilize LMS that include user-friendly interfaces, explicit guidelines, comprehensive materials, and assistance resources to facilitate students' comprehension of accessing information literacy resources.

5.2.5 Assessment and feedback

Evaluating information literacy skills can be intricate, necessitating meticulously crafted examinations that precisely gauge learners' aptitude for locating, assessing, and employing information. Providing prompt and beneficial feedback in the ODDE environment can be difficult due to the lack of real-time interaction and the large student population. ODDE institutions must employ various assessment instruments, such as assignments, surveys, feedback systems, and quizzes, to gauge learners' performance. One solution to the problem of assessing and evaluating information literacy skills among ODDE learners is to employ analytics in monitoring student

performance and engagement. This on data-driven insights analytics then can be used to adjust the information literacy curriculum. Another action is by implementing diagnostic assessment in an online format. This type assessment aims to ascertain new ODDE learners' existing skills and knowledge in information literacy.

6. Future of information literacy in digital education

Information literacy will play a crucial role in the future of the ODDE environment. Learners will acquire skills and competencies in locating and assessing information, creative thinking, and using generative AI and data analysis effectively in a digital environment. Education will focus on flexible approaches to accessing and using knowledge ethically and responsibly, preparing learners to make significant contributions in a fast-changing global society. Three key competencies that learners should possess in the future, which are in scope with information literacy insight, are as follows.

6.1 Proficiency in critical thinking

Information literacy skills improve learners' critical thinking abilities in digital education by instructing them to assess sources, identify bias, and authenticate information. Learners acquire the skill to evaluate information from many viewpoints critically, discern trustworthy sources among a vast amount of online material, and produce well-informed assessments. This skill promotes in-depth examination of intricate matters, nurtures autonomous cognition, and enhances problem-solving aptitude. Information literacy enables learners to confidently navigate digital settings, allowing them to critically evaluate information, make logical deductions, and participate constructively in discussions and decision-making.

6.2 Generative artificial intelligence (AI)

AI technologies play a significant role in enhancing the quality of learning among digital education learners. To utilize generative AI technologies effectively, learners need to possess advanced levels of digital and information literacy, regardless of whether they are in K-12 or higher education environments [32]. By possessing information literacy skills such as the capability to evaluate information sources, learners can differentiate between potentially false and accurate information by critically evaluating the authenticity and dependability of AI-generated content. Learners also can effectively apply information literacy skills and competencies by synthesizing existing knowledge with AI-generated content in assignments and research.

6.3 Data analysis

One of the essential skills in research and data analysis is data literacy. Data literacy is the specific aspect of information literacy that empowers persons to effectively retrieve, comprehend, evaluate, oversee, manipulate, and ethically employ data [33]. Possessing information literacy competencies can greatly improve learners' capacity to analyze data by equipping them with a strong framework to evaluate and comprehend data efficiently. The ability to critically evaluate sources and data, gain insight into the individuals responsible for data collection, the methods employed in the collection process, and identify any possible biases that could impact the data's reliability

will result in strong and accurate research findings and impact. Data literacy is the specific aspect of information literacy that empowers persons to effectively retrieve, comprehend, evaluate, oversee, manipulate, and ethically employ data. Finally, information literacy abilities encompass managing and organizing data efficiently. These skills can be utilized by learners in preserving tidy and well-organized datasets that are more convenient for research and learning.

7. Discussion

Integrating information literacy into ODDE environment is crucial in equipping learners with the skills necessary to thrive in the digital era. Information literacy includes a comprehensive set of abilities that enable individuals to search for, assess, understand, and use information effectively. These skills are critical in ODDE environments, where learners must navigate vast amounts of digital information without direct supervision.

Information literacy also empowers ODDE learners to become self-directed, capable of independently seeking and understanding the information needed to address questions or problems. This autonomy is essential in online and distance learning environments, where learners work independently. Information literacy encompasses the capacity to employ critical thinking and unbiased judgment while encountering and utilizing information. This skill enables learners to evaluate sources' dependability, pertinence, and precision, identify biases, and advocate for fair information consumption.

Information literacy involves thinking critically and making impartial judgments when encountering and using information. This skill helps learners assess sources' reliability, relevance, and accuracy, discern biases, and promote equitable information consumption. These skills directly impact academic performance. Learners with strong information literacy skills can produce well-researched and properly cited assignments. Information literacy competencies contribute to higher retention and graduation rates in ODDE environments. Information literacy also promotes adaptability to new technologies and enhances academic self-efficacy. It prepares ODDE learners for digital transformation and enables them to acclimate to new digital tools and platforms used in virtual classrooms and collaborative projects.

8. Conclusion

In the digital era, information literacy is indispensable for learners in ODDE environments. These skills support self-directed learning, critical thinking, effective information retrieval, academic performance, retention, and ethical information use. They also facilitate adaptation to new technologies and promote lifelong learning. ODDE institutions play a pivotal role in fostering these competencies. By integrating information literacy into curricula, providing robust library resources and services, encouraging collaborative projects, and offering workshops and webinars, institutions can ensure learners develop the necessary skills to navigate and succeed in a digital education landscape.

Finally, as the digital education environment continues to evolve, the importance of information literacy will only grow. These skills will enable learners to critically evaluate information, effectively use generative AI, and analyze data, preparing them to contribute significantly to a rapidly changing global society.

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Ten Years of Video-Based Mathematics Learning: Insights and Future AI Integration

Sidonie Costa

Abstract

Over the past 10 years, video has taken on a growing role in Mathematics teaching at the Higher Education (HE) level. This chapter draws on a decade of experience with the *b-Mat@plicada* course, which supports over 800 students each year through a collection of 45 carefully structured video lessons. Feedback and classroom experience suggest that students find these resources helpful, not just for understanding complex topics, but also for learning at their own pace. This flexibility turned out to be crucial during challenging periods like the COVID-19 pandemic, when having access to clear explanations outside the classroom made a real difference. Building on this foundation, the chapter explores how artificial intelligence (AI) could help improve and personalize this kind of learning. Some tools, like subtitles in multiple languages, video suggestions based on progress, or a math chatbot, are already within available and could offer timely help to students who need it. The goal is not to replace traditional teaching, but to expand its reach, giving students more ways to engage while keeping the teacher at the center of the process. The chapter ends with practical suggestions for future design and research, viewing AI as a useful ally in video-supported learning.

Keywords: blended learning, mathematics education, educational videos, student perceptions, course evolution

1. Introduction

The educational use of video predates digital technology by several decades. Long before the Internet remodeled educational practice, teachers were already wheeling projectors into classrooms, using audiovisual materials to enrich the traditional instruction. During World War II, American recruits viewed brief training films, marking one of the first large-scale uses of cinematic media for educational purposes [1]. In the subsequent two decades, science and history-oriented television broadcasts were disseminated to schools on both sides of the Atlantic, transforming the home television set into a supplementary instructional tool [2]. Within the Portuguese context, many learners recall the characteristic sound of 16-mm projectors and the mechanical operation of VHS decks, both evoking a time when documentaries were used to compensate for the acknowledged limitations

of traditional textbooks. By the 1980s and 1990s, the scheduled inclusion of such audiovisual segments had become routine in basic and Higher Education (HE), thereby laying the groundwork for the digital transition that followed.

However, classrooms did not completely adopt video as a personal study resource until the spread of home computers and the early web at the end of the 1990s. The introduction of YouTube in 2005 marked a significant turning point [3]: For the first time, users could upload and distribute video content globally with minimal technical barriers. This capability enabled a significant expansion in the delivery of short lectures, engaging tutorials, and demonstrations focused on problem-solving techniques. By 2024, the platform was receiving over 500 hours of uploaded video every minute, a significant portion of which was dedicated to instructional purposes, covering topics ranging from differential equations to culinary arts [4, 5].

The resulting volume of content has normalized “just-in-time” learning practices. Students confronted, for example, with the Laplace expansion theorem, can now retrieve a focused five-minute explanation, pause, rewind, and immediately apply the procedure. Empirical studies consistently report that learners value video for its clarity, controllability, and temporal flexibility [6–8].

The strategic importance of video became especially evident during the COVID-19 lockdowns of 2020. Due to the sudden interruption of in-person activities, many instructors adapted pre-existing materials, while others produced *ad hoc* recordings in improvised home studios. Consequently, video resources transitioned from being a supplementary component of blended and remote courses to becoming a central element of them [9, 10].

Mathematics remains a high-attrition subject in many undergraduate programs: Concepts are cumulative, symbolic density is high, and early misconceptions can propagate rapidly [11]. Effective utilization of video support has the potential to identify minor issues before they escalate into larger problems [12, 13]. The findings from empirical research support this assertion. In Engineering Education, López et al. observed higher course-completion rates when domain-specific videos were available [14]. Lima et al. reported improved long-term retention of complex derivations due to the opportunity for repeated viewing [15]. Rey et al. documented increased classroom engagement and enhanced problem-solving performance in a flipped-classroom model that incorporated pre-class videos [16].

Meta-analytic and theoretical work corroborates these findings. Kay (2012) highlighted the efficacy of visualizations in rendering abstract mathematical ideas more accessible [7]. Yousef et al. concluded that video elevates engagement and conceptual understanding in skill-intensive disciplines [17]. Mayer, grounding the evidence in cognitive theory, showed that the integration of verbal narration with visual cues mitigates working-memory overload and thereby enhances learning efficiency [6].

With the increased demand of students for quick access to multimedia resources for clarifying doubts and supporting their learning, the volume of available content can sometimes be too excessive, particularly for learners with less experience. In this context, artificial intelligence (AI) offers a variety of tools that can improve video-based learning experiences. Some of these include recommendation algorithms, automated subtitles and translation, learning analytics dashboards, and conversational bots.

In a world in constant evolution, the *b-Mat@plicada* initiative was developed as a local response to global educational needs, combining pedagogical clarity with accessible technology through a structured Mathematics course supported by video. The next section outlines its origins, evolution, and key milestones over the past decade.

2. The *b-Mat@plicada* course: Genesis and evolution

Although it marginally preceded the widespread adoption of educational video platforms, the *b-Mat@plicada* project was initiated at a Portuguese HE institution in 2015 [18]. The pilot phase comprised nine short modules in calculus and linear algebra, each targeting well-documented areas of student difficulty. Ten years later, the course is composed of 45 videos, produced using a methodology that considers pedagogical rigor, production efficiency, and student feedback over time.

The *b-Mat@plicada* project was created with the main objective of helping students who face difficulties in topics of linear algebra and differential and integral calculus. Many reported having trouble keeping up with the pace of traditional lectures, especially those with limited mathematical backgrounds or additional responsibilities, such as part-time jobs.

The idea behind the *b-Mat@plicada* course is to use it within a blended learning context, combining in-person instruction with video materials that students can access anytime and anywhere. The initial pedagogical objective was to deliver clear and accessible content, structured in brief segments, with the aim of enhancing comprehension and fostering independent learning. The initial collection of nine videos addressed subjects including linear algebra, integration techniques, and fundamental

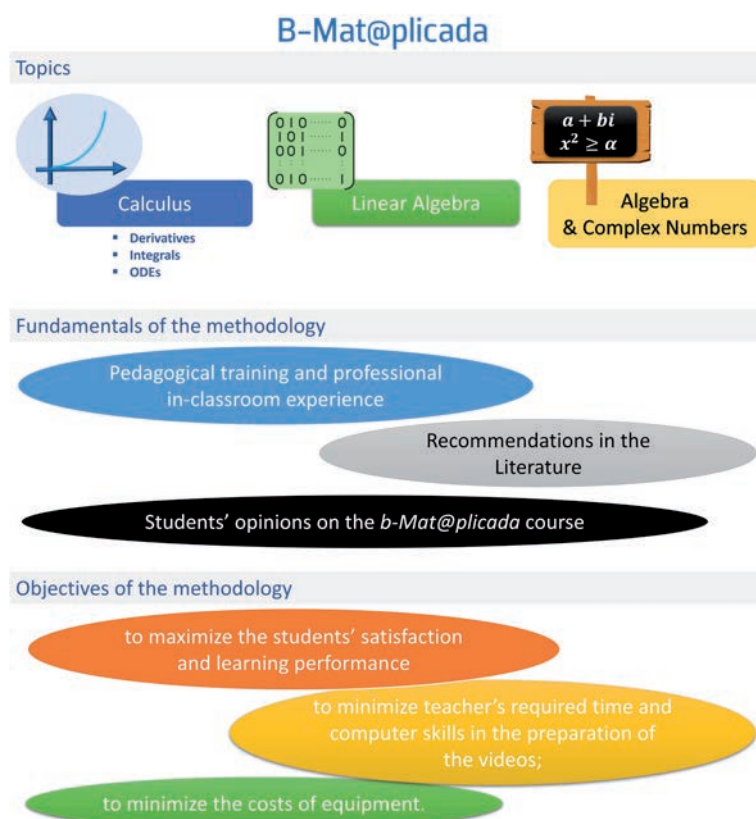


Figure 1.
 Overview of the *b-Mat@plicada* course: topics addressed, software and equipment, methodological foundations, and design objectives.

matrix operations. Their design followed the five-step methodology subsequently formalized by Costa et al. which emphasizes the quality of speech, sound, and image while minimizing production requirements [19]. **Figure 1** summarizes the main pillars of the *b-Mat@plicada* methodology, from topic coverage to production workflow, including the pedagogical rationale, technical tools employed, and design objectives.

All videos were produced with three priorities: clarity, appropriate pacing, and alignment with educational goals. Moreover, they are kept as short as possible, generally between 5 and 10 minutes, and visual cues are frequently used to enhance the comprehension of the concepts. Student feedback over the years has continuously confirmed the efficacy of this method, emphasizing its usefulness for basic understanding of complex topics and for reviewing.

Although the methodology placed a strong emphasis on student learning, the role and related workload of the teacher was also considered. Thus, to minimize production time and costs, commonly accessible tools such as PowerPoint were used, thereby reducing the need for specialized technical skills or expensive software licenses [19].

Over time, the course was progressively integrated into classroom practice. To encourage students to review explanations at their own pace, educators started recommending specific videos for them to watch before or after lectures. Assuming that students had already seen the pertinent video, several in-class activities were restructured to emphasize problem-solving. This is the first step in using the flipped classroom paradigm.

A specific YouTube channel was created to host all *b-Mat@plicada* videos in order to facilitate the growing usage of video in instruction. This platform was selected due to its accessibility, ease of use, and ability to host both public and unlisted contents. Such flexibility enables students to access materials at their convenience, without needing institutional login credentials.

Between 2015 and 2025, the catalog grew from nine to 45 videos: 38 were available by December 2023 [20], and a further seven, listed in **Table 1**, were added between January 2024 and March 2025. The collection currently encompasses fundamental domains of Mathematics: calculus (differentiation, integration, basic differential

Video Number	Title	YouTube Link
39	Addition and Subtraction of Complex Numbers (Algebraic Form)	https://youtu.be/VsEbg_VLGBM
40	Multiplication of Complex Numbers (Algebraic Form)	https://youtu.be/5Yj_aMHfcoM
41	Division of Complex Numbers (Algebraic Form)	https://youtu.be/poCIVqSJkcg
42	Inverse of a Complex Number (Algebraic Form)	https://youtu.be/g41j1ULT9ls
43	Powers of i	https://youtu.be/qsKrPCP8D68
44	Complex Numbers: From Algebraic Form to Trigonometric Form	https://youtu.be/EBsv1w9JM7I
45	Matrix Calculation – Inverse of a Matrix using Row Operations	https://youtu.be/IVNKOPXR48w

Table 1.
Newly added videos in the *b-Mat@plicada* course (2024–2025), including titles and direct YouTube links.

equations), linear algebra (matrices, determinants, systems of linear equations), and algebra (complex numbers and quadratic inequalities).

Figure 2 illustrates the main phases of the course's development, showing how it evolved over time in response to student feedback and broader changes, particularly during and after the COVID-19 pandemic.

b-Mat@plicada showed to be a very useful tool during the COVID-19 pandemic. A considerable number of students used the video explanations to maintain their understanding of fundamental mathematical concepts during the sudden shift to online learning. The increased utilization during this period demonstrated the course's adaptability, allowing it to serve as an independent learning resource in case of unforeseen circumstances [9, 21].

The institution has received the course positively, and it has been included in both internal quality reports and external academic events. Four satisfaction surveys conducted in 2015 ($n = 89$), 2018 ($n = 63$), 2022 ($n = 104$), and 2025 ($n = 81$), suggesting a sustained level of student appreciation across the assessed periods. Students frequently describe the videos as essential learning tools, emphasizing that they do not replace face-to-face classes but rather serve as an enhancement, mostly during exam preparation or when revisiting content from missed classes [19, 20].

The course is constantly refined, depending on collected pedagogical ideas and a better knowledge of student interaction with video content. The improvements performed with the most recent videos, whose attributes were refined according to prior study findings, demonstrate the project's adaptability to evolving educational demands and methodologies.

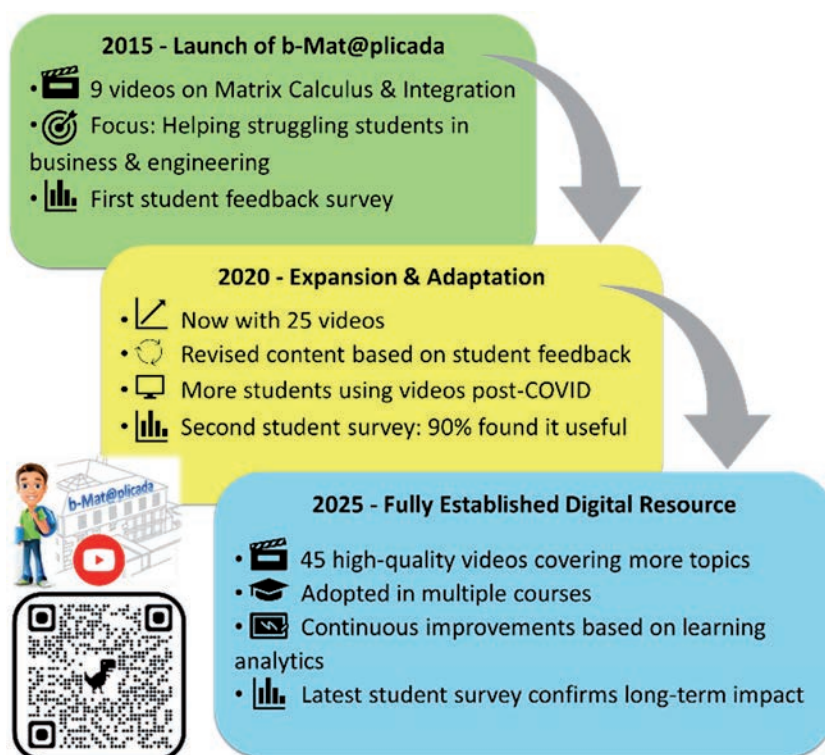


Figure 2.
 Main phases of the b-Mat@plicada course from 2015 to 2024.

3. Student perceptions of educational videos and the *b-Mat@plicada* course

3.1 How students use and judge online mathematics videos in general?

Since the first *b-Mat@plicada* baseline survey in 2015, most Portuguese undergraduates have reported turning to YouTube-style explanations when facing challenging topics or preparing for assessments. In the most recent 2024/25 cohort, 65% reported using such videos “sometimes,” with an additional 27% using them “always,” while only 8% stated they never resort to these resources. Although overall enthusiasm has grown, with 58% of the same cohort declaring that the pandemic permanently changed the way they study and made them more dependent on digital resources, students’ criticism of freely available material has also sharpened. Across three distinct studies conducted in 2018, 2021, and 2023, students consistently identified clarity of speech, image quality, and sound quality as the paramount factors for determining the quality of a learning video [9, 19, 22]. Moreover, a significant majority of students (averaging approximately 70% across the studies) expressed dissatisfaction with the inconsistent quality of online videos, underscoring the importance of well-crafted and regularly updated content based on student feedback [9, 19, 20, 22].

Despite the advancements in technology, students maintain the opinion that video serves as a supplementary resource, not a replacement for face-to-face classes. Preliminary research conducted before 2025 revealed that a significant percentage of students, ranging from 92% [19, 20] to 100% [9, 22], believed that video-based instruction could not adequately replace traditional in-person classes. This belief persisted despite the evolving circumstances and the challenges posed by the COVID-19 pandemic, which accelerated the integration of digital resources. The 2025 research, on the other hand, shows a significant change: 18% of the people who took part supported the notion of a complete replacement [23, 24]. The observed gradual change in student perspectives could be associated with improvements in the quality of educational videos, influenced by technological advancements, the widespread impact of the pandemic, and the specific attributes of the courses performed, particularly given that the 2025 cohort comprised a greater percentage of Informatics Engineering students.

A significant trend relates to the demographic characteristics of the viewers engaging with the content. The analysis of both the 2023 pre-/post-COVID comparison and the 2025 survey indicates a small-to-moderate association between self-reported mathematical difficulties and a significant reliance on videos, as evidenced by Cramer’s V values of 0.272 and 0.28, respectively [9, 23, 24]. In both cases, students who admitted to facing more frequent challenges in Mathematics showed a greater tendency to report consistent utilization of video resources. The research results indicate that videos fulfill a dual function: They act as a supportive resource for students exhibiting confidence and simultaneously serve as a form of reinforcement for those encountering more significant difficulties.

3.2 What students think about the *b-Mat@plicada* videos?

Despite the significant expansion of the *b-Mat@plicada* video library, student satisfaction has remained consistently high. The results obtained from three surveys (conducted in 2015, 2022, and 2025) reveal that ratings for clarity, usefulness, and

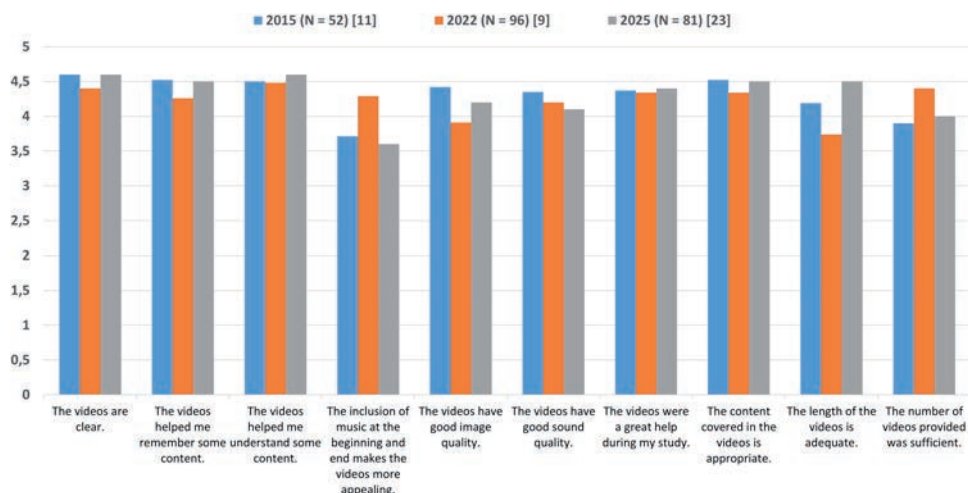


Figure 3.
 Evolution of students' mean satisfaction ratings (2015, 2022, 2025) regarding the b-Mat@plicada videos (1–5 scale) where 1 indicates strong disagreement and 5 indicates strong agreement.

overall helpfulness of the videos have remained stable, with average scores ranging between 4.3 and 4.6 on a 1–5 scale. Image and sound quality received slightly lower but still positive ratings, varying between 4.2 and 4.4.

Interestingly, even the first cohort in 2015 expressed high satisfaction, which suggests that the pedagogical quality of the videos was strong from the outset. Over the years, some minor variations emerged: For example, the opinions on video length improved notably from 3.7 in 2022 to 4.5 in 2025, possibly reflecting adaptations made based on earlier feedback. Similarly, the number of videos available was considered insufficient in 2015 (3.9), but this improved to 4.4 in 2022 and 2025, in line with the increasing size of the video library.

Esthetic aspects like the inclusion of music received more mixed reviews, with 2022 showing a temporary increase in appreciation (4.3), followed by a drop in 2025 (3.6), indicating that this feature may not consistently enhance the student experience. **Figure 3** summarizes the evolution of satisfaction ratings across the three survey waves, illustrating the sustained positive reception of the *b-Mat@plicada* videos over a 10-year period, as well as emphasizing areas where incremental improvements were made.

In this context, the *b-Mat@plicada* course has had a positive reception, due to its strong alignment with learning objectives and the continuous improvements guided by student feedback. As digital learning habits continue to evolve, *b-Mat@plicada* stands as a clear example of how well-designed video content can respond to the diverse needs of students in HE, while still recognizing the essential role of human interaction in the learning experience.

4. Experimental evidence: What students learn after watching a single video?

Understanding how students *feel* about videos is important, but demonstrating what they can do after watching them offers a more concrete measure of impact. Since 2017, three classroom experiments have been conducted in which a *b-Mat@plicada*

video served as the sole source of instruction, immediately followed by an individual exercise. Two mathematical topics were intentionally selected: Matrix Multiplication (a routine and highly visual procedure) and the Laplace Expansion Theorem (a more abstract and algorithmic concept).

4.1 Matrix multiplication experiment (2017 cohort)

Forty-nine first-year students enrolled in Engineering and Business programs watched a 6-minute video that first explained the necessary conditions for the matrix product $A \times B$ to be defined, then illustrated the multiplication process through an example using visual cues. After viewing, and without any teacher intervention, students were asked to answer two conceptual questions and perform two matrix multiplications.

As presented in **Table 2**, the results reveal two distinct layers of understanding. Conceptually, most students understood the conditions and logic behind matrix multiplication: 47 out of 49 students (96%) correctly identified when the product is defined. Procedurally, 34 students (69%) performed both matrix multiplications without any arithmetic or procedural errors. However, if we isolate the structure of the multiplication from minor calculation mistakes (e.g., sign errors or incorrect basic products), the success rate rises to over 80% in both exercises. This suggests that the multiplication algorithm itself was well understood by most of the cohort.

4.2 Laplace expansion experiments (2018 and 2024 cohorts)

An eight-minute video on the Laplace Expansion theorem adopts an algorithmic, step-by-step approach, enhanced with animated visual highlights to support comprehension. Two cohorts participated in this experiment under comparable conditions: a Business cohort in 2018 and a mixed cohort (Engineering and Business) in 2024. After a single viewing, students were asked to perform a cofactor expansion of a third-order determinant.

As shown in **Table 3**, the 2018 Business cohort ($n = 63$) performed remarkably well: 86% of students produced a perfect expansion, and the mean score was 3.8 on a 0–4 scale, where 0 corresponds to no answer and 4 indicates a fully correct response. In contrast, the 2024 cohort, which included students from multiple disciplines and had experienced two pandemic-disrupted academic years, showed a decline in performance. Only 64% reached the top score, and the average dropped to 3.2. The subgroup analysis reveals clear disciplinary differences: Informatics Engineering

Task	Indicator	Percentage
Conceptual understanding	Exercise 1 – Correct identification of conditions	96%
	Exercise 2 – Correct identification of conditions	86%
Procedural execution	Exercise 1 – Fully correct multiplication (no errors)	69%
	Exercise 1 – Correct method, with minor calculation errors	86%
	Exercise 2 – Fully correct multiplication (no errors)	69%
	Exercise 2 – Correct method, with minor calculation errors	84%

Table 2.
Outcomes of Matrix Multiplication Experiment (2017, n = 49).

Cohort Year	Sample (<i>n</i>)	% Perfect expansion	Mean score
 Before COVID-19 63 students Business Sciences 2018	63	86%	3.8
 After COVID-19 73 students Business Sciences and Informatics Engineering 2024	73	64%	3.2
Informatics engineering (2024)	40	42%	3.5
Business (2024)	33	22%	2.8

Table 3.
Results of Laplace expansion experiments (2018 and 2024).

students averaged 3.5, while Business students averaged 2.8. This decline aligns with recent studies showing that students who completed Secondary Education during the COVID-19 pandemic entered university with significantly lower mathematical proficiency, likely due to prolonged periods of remote learning and disrupted instruction [25, 26].

These results confirm that prior knowledge and recent learning experiences significantly shape how much a well-designed instructional video can achieve on first viewing. Even so, the fact that a majority of the 2024 sample succeeded in producing a correct cofactor expansion underscores the video's instructional value, even in less favorable circumstances.

4.3 Cross-experiment conclusions

The experiments had two objectives. First, they aimed to check whether students could immediately transfer what they had just seen in a video to a written task. Second, they explored how students process information that is delivered only through video, without any other type of explanation. In each case, students only had access to the video before solving the exercise. Since no additional explanation is provided, its impact on learning performance comes close to reality.

Interestingly, the results showed that a single good video can teach procedural skills on its own. But it also became clear that the learning process is improved when students have something active to do afterward. When they moved directly from watching to doing, their understanding seemed stronger.

Moreover, the topic also plays an important role. Matrix Multiplication, for example, was quickly understood after watching the video once. On the other hand, the Laplace expansion requires more time and thought, maybe because of the cofactors, or the signs, or just the abstractness of the idea. This result allowed concluding about the importance of including more visual guidance, strategic pauses, and little checkpoints along the way.

In conclusion, the experiments suggest that instructional videos, when thoughtfully designed and used in the right context, can greatly support student learning.

They help clarify difficult concepts and allow for immediate practice, especially when included in a teaching strategy that encourages students to engage actively with the material.

4.4 Limitations and future work

Even though the results are encouraging, they come from single-group post-tests with small samples and short evaluation periods. This means that questions about long-term retention and how effective the videos are compared to other methods still need further investigation. Future studies should include both pre- and post-tests, use control groups with traditional lectures, and involve a larger range of institutions. Moreover, blended learning strategies could be explored, such as guided worksheets or in-video quizzes, to conclude about the best combination, especially for students entering HE with learning gaps from the pandemic.

As a next step, the *b-Mat@plicada* course will be expanded with adaptive tools supported by AI, aiming to offer students more timely and personalized support.

5. Future perspectives: How AI could support *b-mat@plicada*?

Over a decade of deployment, *b-Mat@plicada* has shown that concise, pedagogically grounded videos can boost students' confidence and proficiency in core mathematical topics. The next strategic step is to embed these validated resources within an adaptive ecosystem in which AI personalized learning trajectories, provides just-in-time scaffolding, and widens access, while preserving the course's core instructional principles.

5.1 Personalized content pathways

Modern recommender systems analyze click-stream data, quiz performance, and interaction patterns to suggest the next video or exercise most likely to resolve a learner's misconceptions. Within *b-Mat@plicada*, such algorithms could automatically surface prerequisite material to students who repeatedly pause or rewind at specific timestamps, shortening the feedback loop between confusion and clarification. Comparable systems have already delivered measurable gains in engagement and short-term achievement in mathematics courses [24].

5.2 Multimodal accessibility

Automatic speech recognition and neural machine translation now enable high-quality captions in multiple languages and cost-effective synthetic voice-overs. Deploying these services would make the video library more inclusive for international students, learners with hearing impairments, and those studying in noisy environments. Summaries, keyword glossaries, and concept maps generated with large language models could further reduce cognitive load and support rapid review [27].

5.3 Real-time tutoring agents

Conversational agents embedded beside the video player allow learners to ask questions in natural language without leaving the environment. Early studies show

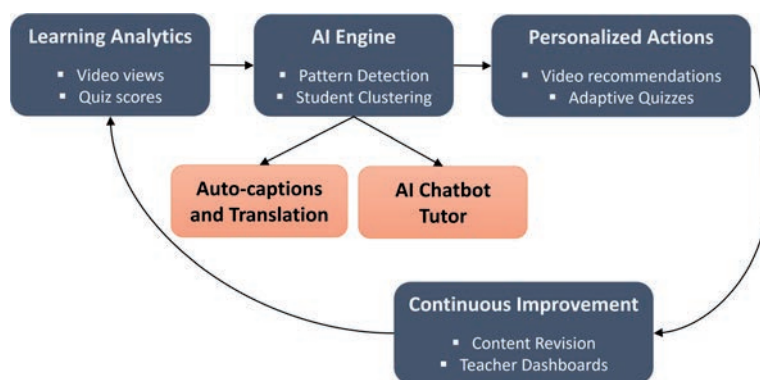


Figure 4.
 AI-enhanced roadmap for b-Mat@plicada.

that chatbots delivering step-wise hints can match teacher-recorded explanations for immediate learning gains and sustain motivation during self-paced study [28]. A domain-specific bot trained on *b-Mat@plicada* scripts and problem sets could supply definitions, extra worked examples, or targeted quizzes on demand (Figure 4).

5.4 Analytics-driven course refinement

Aggregated analytics—peaks in pausing, rewinding, or rewatching—offer instructors a continuous diagnostic of where explanations need tightening or augmentation. Dashboards visualizing these patterns at cohort and individual levels would support data-informed revisions of both videos and classroom activities, closing the loop between design, use, and improvement.

5.5 Ethical and organizational considerations

The power of AI comes with responsibilities. Deployments must comply with data-protection regulations, ensure algorithmic transparency, and actively monitor for bias. Professional-development sessions will be required so that instructors can interpret analytics and moderate chatbot interactions. These safeguards are essential because students still value the dialogic dimension of face-to-face teaching; 82% explicitly reject replacing in-person classes with video alone [23, 24].

5.6 Pilot implementation roadmap

A prudent strategy involves small-scale pilots focused on a limited set of topics. Metrics such as time-to-completion, error rates, and qualitative satisfaction should be compared against the benchmarks established in Section 4. Positive results would justify progressive expansion to the full catalog.

In sum, AI offers a means to amplify—not supplant—the human-centered ethos of *b-Mat@plicada*. By aligning adaptive recommendations, accessibility services, analytics, and conversational support with the established design principles, the project can evolve into a responsive learning environment capable of meeting the diverse and changing needs of future cohorts.

6. Conclusions

Over a decade of iterative development, the *b-Mat@plicada* course has shown that concise, carefully scripted, technically polished videos can break many of the conceptual and practical barriers that students encounter in university Mathematics. Across three survey waves, the obtained mean satisfaction scores confirmed sustained approval and reinforced student expectations that video will remain a regular support, though not a substitute, for lectures. Classroom experiments confirmed that, when followed immediately by an active task, a single six- to eight-minute video is sufficient for most students to apply new procedures correctly. These outcomes lend empirical weight to multimedia-learning theory and to the blended-learning paradigm more broadly.

As discussed in Section 4.4, these gains are limited by single-group samples and short-term post-tests; effectiveness varies with prior knowledge and plateaus when videos are consumed passively. Then, the next phase demands tools that adapt support to individual needs in real time. AI, already present in most digital tools students use daily, could be part of that next step. By picking up on what students do, that is, where they pause, rewind, or skip, the system can gently suggest next steps: a different video, a quick quiz, or subtitles in another language. It can also emphasize patterns where many students seem to struggle, giving the teacher a nudge to step in at the right moment. The first studies show that, if used properly, these tools can be added without losing human touch or student confidence.

From this work, four practical ideas emerge for educators. First, clear speech, sharp visuals, and good sound are essential. Second, shorter is better: Each video should be focused on a single learning goal. Third, each video should be followed by an exercise to help consolidate learning. And finally, any use of AI must be done ethically: It should be transparent, follow data protection standards, and maintain meaningful interaction between teachers and students.

With these principles in place, *b-Mat@plicada* is well positioned to continue as a living laboratory, where tried-and-tested video strategies meet new, intelligent tools to support learning in more flexible ways. The approach presented here offers a replicable model for institutions aiming to future-proof Mathematics education through a judicious blend of human expertise, multimedia resources, and intelligent automation.

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Conflict of interest

The author declares no conflict of interest.

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Chapter 6

Gender Stereotypes in Media History: What Gender Identity Is Reproduced in Historical Video Games? A New Analysis of *Assassin's Creed* from the Perspective of Historical Education

César Barba-Alonso and Delfín Ortega-Sánchez

Abstract

Based on the educational need to examine the gender stereotypes embedded in the audiovisual narratives and iconographic representations (visual representations for the expression of concepts and ideas) projected by historically themed video games, the objective of this research is to analyze the roles of female characters portrayed in the three most influential historical adventure video games currently: *Assassin's Creed Origins*, *Assassin's Creed Odyssey*, and *Assassin's Creed Valhalla*. To this end, a documentary sampling approach was employed, drawing from the corpus of audiovisual content generated by the main *Assassin's Creed* saga. In line with the research objective, female characters appearing in cinematic sequences retrieved from YouTube were selected, providing audiovisual registry units ($n = 614$). A total of 77 female figures were analyzed out of the 340 characters featured across the three aforementioned video games. The main findings reveal a slight increase in female representation in *Assassin's Creed*; however, Eurocentric, patriarchal, and classist perspectives persist, with female roles remaining underrepresented and strategies of pinkwashing evident.

Keywords: gender identities, media history, video games, historical education, secondary education

1. Introduction

The video game medium, along with other forms of transmedia representation (expansion of media representation in transmedia, integrating platforms to diversify and redefine identities and social discourses), constitutes the primary approach and the most common way of engaging with past realities in contemporary mass

culture [1]. It participates in various postmodern cultures as consumers of hyperrealistic products; thus, it draws upon and utilizes influences from various cultures, technologies, and other media to create hyperrealistic experiences while simultaneously consuming advancements in graphics, narrative, and gameplay. Within this context, historical video games act as a form of soft power, serving as tools for education and awareness [2, 3], capable of influencing social and cultural dynamics [4], as well as perpetuating and reproducing hegemonic elements.

Scarassati [5] argued that *Assassin's Creed* employs a blend of historical and technological narratives to create a sense of immersion in the past while simultaneously offering its own interpretation of “historical truth” and collective memory, alongside presenting a multicultural perspective that allows for various interpretations of the historical moments it depicts. In this context, Venegas [6] conceptualizes that these “retroplaces” are not limited to objectively recreating events or landscapes from the past; rather, they construct idealized spaces that align more with contemporary consumer expectations than with an accurate representation of history. These past scenarios are imbued with a commercialized nostalgia, where cultural products aim to evoke a sense of familiarity, belonging, and comfort rather than challenging or questioning the past. The repetition of images and motifs, such as medieval warriors or figures from antiquity, becomes an easily consumable and recognizable resource that the cultural industry favors for mass audience accessibility. The use of these clichés responds to a need for evocation and a commercial strategy that seeks to activate collective memory without striving to reproduce historical complexity. While this approach fulfills the objective of attracting the audience, it limits the media's critical capacity to delve into historical realities. In this sense, the challenge for cultural industries lies in balancing entertainment with knowledge.

Schwarz and Weber [7] highlight an increase in diversity within prominent historical video games, as seen in the downloadable content (DLC) *Freedom Cry* of *Assassin's Creed*. Unlike *Assassin's Creed IV: Black Flag*, where racialized characters and transoceanic slavery are relegated to the historical backdrop, *Freedom Cry* features maroon protagonists actively resisting oppression. Thus, the authors argue that the franchise makes strides toward addressing controversial or traumatic pasts (confronting difficult histories) while simultaneously engaging with contradictions. From an identity theory perspective, Keefer [8] examines representations of racialized individuals in *Assassin's Creed Origins*. Despite depicting a diverse Hellenistic Egyptian world, characters from peripheral areas of Ptolemaic Egypt are portrayed with darker skin tones and “trivialized” cultural traits, often occupying archetypal roles in the narrative.

Similarly, gender stereotypes in video games can exert soft power in ways that harm players. Curiel [9] and Pérez [10] argue that gender stereotypes, violence against women, and representations of sexual aggression in video games perpetuate the culture of rape. Likewise, Amores [11] concludes that, although the number of female characters has increased, their inclusion is often tied to male figures. Lamerichs and Rosendo [12] describe transmedia characters, such as Kassandra from *Assassin's Creed Odyssey*, as “empathy machines.” This approach closely aligns with the conclusions of Root-Williams et al. [13], who examine the development of queer representation in *Assassin's Creed*, emphasizing the significant shift observed in recent years. The rise of queer characters signifies a broader movement toward inclusion in video games, driven by a cultural shift embracing sexual diversity. However, representation often prioritizes modern sensibilities over historical authenticity, raising questions about the balance between historical accuracy and inclusivity in character and narrative creation.

In this area, Obreja [4] posits that gamer identity in postmodernity is fluid, embodying multiple complex and intersectional identities. While acknowledging changes and potential social transformations in gamer cultures, Obreja argues that video games reproduce neoliberal ideologies where sexuality, gender, and sex are performatively constructed based on hegemonic patterns, internalizing “social institutions.” These findings align with those of Barba-Alonso and Ortega-Sánchez [14], Ortega-Sánchez and Barba-Alonso [15], and Scarassati [5]. These ideas resonate with players’ perceived realism of historical video games, interpreting the phenomenon as verisimilitude in historical reconstructions [16]. However, these representations are laden with “deliberate anachronisms” and “creative licenses” to convince consumers that the past “was like this,” portraying it as a playground for exploration or as strategies for promoting historical tourism [17–19].

In their systematic review, Wang et al. [20] note that interactive experiences with gamified cultural heritage create engaging encounters, enhancing historical understanding and interest. While current research lacks consensus on their suitability for classroom implementation, there is some agreement regarding the historical narratives they generate. Despite the franchise’s efforts (Ubisoft) to create esthetically historical environments (prioritization of the visual appearance of the past over historiographical accuracy), the narratives and spaces represented grant developers ample “creative licenses” and “deliberate anachronisms” to appeal to consumers, relying more on esthetic memory than on available historiographic sources [14, 16, 18–23].

“Media-historical video games” [23], such as *Assassin’s Creed*, have recently garnered interest as potential educational tools for teaching history [24–28]. However, there is no empirical evidence specifically supporting the use of *Assassin’s Creed* in K-12 educational settings. For instance, Gilbert’s studies [26, 27] do not examine their direct implementation in educational settings but rather contribute to theoretical reflections without incorporating student-derived data or correlational analyses linking prior gameplay experience to the development of historical empathy. These studies do not involve pedagogical interventions using such video games. Similarly, research by Kessner and Harris [29] has focused on video games specifically designed for educational contexts, while Squire [30] analyzed the pedagogical potential of titles such as *Civilization*. Nevertheless, these studies do not explore the use of video games like *Assassin’s Creed* in direct interaction with students, particularly at the K-12 level. Regardless of this circumstance, the implementation of *Assassin’s Creed* in primary and secondary educational contexts (K-12) presents significant challenges. The game’s inherently violent nature makes it an unsuitable resource for these educational levels. Furthermore, attempts to adapt its content by removing violent elements—as proposed in some approaches that envision it as a tool for virtual exploration—result in a distortion of the core gameplay experience. This suppression not only diminishes its value as a medium for historical immersion but also undermines its educational potential by stripping away the mechanisms that could foster meaningful learning.

Based on the educational need to examine gender stereotypes in the audiovisual narratives and iconographic representations projected by historically themed video games, this study aims to analyze the roles of female characters depicted in three of the most influential historical adventure video games today: *Assassin’s Creed Origins* (2017), *Assassin’s Creed Odyssey* (2018), and *Assassin’s Creed Valhalla* (2020).

2. Method

2.1 Design

The present research employs a qualitative content analysis to examine the representation of female characters in historical video games through the categorization and description of their iconographic, narrative, and audiovisual characteristics. In this regard, this study utilizes a nonexperimental, cross-sectional research design with a documentary-descriptive approach. Within this framework, and following the methodology proposed by Corbin and Strauss [31], previous scientific literature was reviewed to define the a priori categories for the qualitative content analysis under examination.

The qualitative content analysis conducted in this research incorporates descriptive statistics (absolute and relative frequencies) to quantify the predefined subcategories (deductive approach) applied to the content and to reinforce the interpretation of meanings. These descriptive measures enable the identification of patterns and trends within the qualitative data, thereby complementing the interpretative analysis with a more systematic structure [32].

2.2 Documentary sample

A documentary sampling strategy was employed based on the corpus of audiovisual content produced by the main *Assassin's Creed* saga [33]. In line with the research objectives, female characters featured in cinematic sequences retrieved from YouTube were selected. Audiovisual registry units ($n = 614$) (segments of information chosen and analyzed to understand the phenomenon of interest within its context) were extracted, focusing on 77 female figures from the 340 characters across three main video games in the series: *Assassin's Creed Origins* (2017), *Assassin's Creed Odyssey* (2018), and *Assassin's Creed Valhalla* (2020). A total of 1226 minutes of Spanish-dubbed cinematics were analyzed, sourced from the YouTube channels Greed Gamer (<https://www.youtube.com/@greedgamer4072>) and Kratosworld (<https://www.youtube.com/@Kratosworld>), after confirming their suitability as repositories with the most extensive available excerpts. The selection of registry units was conducted following a suitability assessment process. This process adhered to the inclusion criteria (Spanish-dubbed cinematographic works with a minimum duration of 120 minutes, available on YouTube channels with verified-quality content) and exclusion criteria (nonnarrative content, incomplete or altered excerpts, and material featuring subtitles instead of dubbing).

2.3 Instrument

To describe the audiovisual representation patterns conveyed by the female characters (how they are presented, characterized, and represented in audiovisual images and narratives), a categorical data collection and analysis instrument was developed *ad hoc*. This instrument was adapted from the model designed by Ortega-Sánchez and Barba-Alonso [15], itself based on the validated model by Ortega-Sánchez and Pérez [34], the dimensional system by Ortega-Sánchez and Juez [35], and Curiel's actantial system (Table 1) [9].

Video game		
D	Iconographic and audiovisual narrative	Descriptor
NA	Yes ☐ No ☐	Terminological designation in the iconographic-audiovisual characterization
	Textual term used (signifier)	
RB	White ☐ Black ☐ Other ☐ Unspecified ☐	Racial identity assigned in the iconographic-audiovisual characterization
AR	Child ☐ Young/Adult ☐ Elderly ☐ Unspecified ☐	Age group attributed to the character in its iconographic-audiovisual representation
FI	Friendly ☐ Conciliatory ☐ Aggressive ☐ Sexualized ☐	Type of facial expression characterizing the character in its iconographic-audiovisual representation
SO	Heterosexual ☐ Homosexual ☐ Bisexual ☐ Asexual ☐ Unspecified ☐	Sexual orientation expressed in the audiovisual narrative
B	Sexualized ☐ Normative ☐ Heteronormative ☐	Body characteristics attributed to the character in its iconographic-audiovisual representation
C	Standardized ☐ Distinctive ☐ Gaudy ☐ Erotic ☐	Type of clothing the character wears in the audiovisual narrative contexts
V	Erotic ☐ Gaudy ☐ Harmonious ☐	Type of voice characterizing the character in its audiovisual representation
EA	Subject ☐ Object ☐ Sender ☐ Receiver ☐ Opponent ☐ Helper ☐	Functions performed by the character in the narrative plot, scene, or audiovisual passage
SC	Lumpen ☐ Lower ☐ Middle ☐ Upper ☐ Unspecified ☐	Social class or background to which the character belongs
SR	Active, contributing to social life ☐ Active, contributing to cultural life ☐ Androcentric-active in constructing the narrative's social life ☐ Androcentric-active in constructing the narrative's cultural life ☐ Passive-victim ☐	Type of social role assigned to the character, considering its audiovisual actions and the evoked textual message
Linked image		

D: dimension; NA: name assignment; RB: racial belonging; AR: age range; FI: iconographic face. This classification of subcategories, and particularly the inclusion of facial iconographic sexualization, is supported by previous studies such as Wulf [36] and Li et al. [37]; SO: sexual orientation; B: physical expression and characteristics; C: clothing; V: voice. This classification is based on a systematic analysis of the character's vocal features in its audiovisual representation. The selection of the categories Erotic, Gaudy, and Harmonious is grounded in the phonetic, intonational, and expressive patterns observed within the context of the character's actions; EA: actantial scheme; SC: social class; SR: social role. This classification enables the analysis of the representation and narrative function of characters based on their social role in the development of storylines. The distinction between their social or cultural contribution likewise seeks to identify their impact on the narrative. The specific definition of the androcentric subcategory highlights the presence of gender bias in the construction of the plot, emphasizing the role of male characters as protagonists in social or cultural development. Finally, the passive-victim category aims to make visible the role of subordinated or dependent characters within these settings. In this way, the objective is to systematize the narrative structure, its relationship with stereotypes, and the construction of meanings in video games from a critical perspective, using gender as a category of social analysis.

Table 1.
 Data extraction and analysis table.

2.4 Data analysis

Following the analytical procedure applied by Barba-Alonso and Ortega-Sánchez [38], the roles and representations of male characters in the audiovisual narratives were identified to uncover their potential contribution to the construction of gender identities among secondary education students. Qualitative data were deductively coded and categorized, as outlined in the described instrument. To identify trends and descriptive differences in the recording units of each selected unit of analysis, the data were quantified for descriptive analysis (absolute and relative frequencies).

3. Results

According to the results obtained (Appendix **Table A1**), in the “gender” category (**Figure 1**), the total absolute frequency (340) is relatively low compared to other dimensions, a result influenced by the methodology applied to identify gender identities in audiovisual narratives. This highlights a significant predominance of male characters (77.6%) alongside a limited representation of female characters (22.4%), with no transgender characters documented.

Regarding “name assignment,” the vast majority of female characters are personified (95.6%), meaning they assume or are given a proper name, while a small percentage remains anonymized (4.4%) (**Figure 2**). On the other hand, within the “racial belonging” dimension, there is a marked predominance of white women (93.0%), with significantly lower percentages of Black women (3.26%) and those from other racial backgrounds or deities (2.44%), in addition to a residual percentage (1.3%) whose ethnicity is unspecified.

Concerning “age range,” young or adult women are most frequently represented (92.51%), followed at a considerable distance by girls (4.89%) and elderly women (1.95%), while only 0.65% lack age-related information. Within the “facial iconography” dimension (**Figure 3**), the prevalence of sexualized female faces (49.02%)

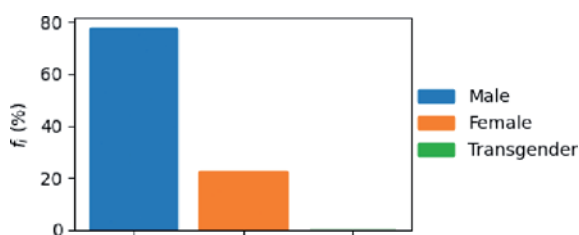


Figure 1.
Gender.

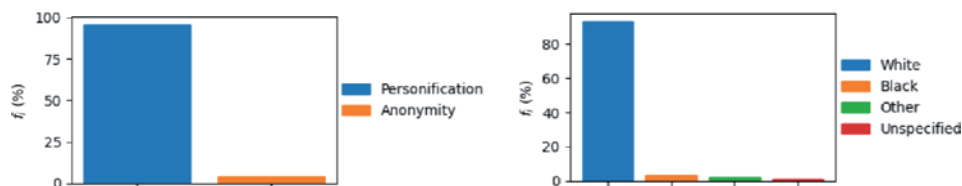


Figure 2.
Name assignment and racial belonging.

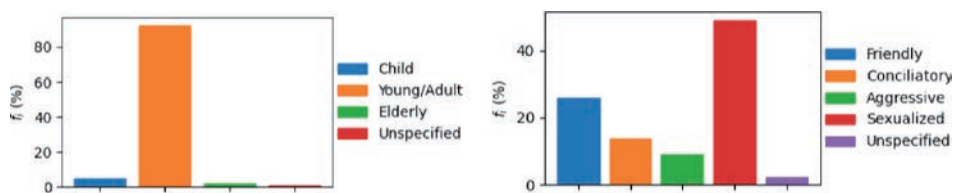


Figure 3.
Age range and iconographic face.

stands out, followed by friendly or feline-like expressions (25.9%). To a lesser extent, conciliatory (13.84%) and aggressive expressions (9.12%) appear, with a marginal proportion of unspecified expressions (2.12%).

The “sexual orientation” dimension (**Figure 4**) reveals that bisexuality is the most represented (38.76%), followed by heterosexuality (33.55%) and, in third place, an unspecified orientation (26.71%). The presence of homosexual female characters is minimal (0.98%), with no cases of asexuality detected.

Meanwhile, the “bodily expressions and characteristics” dimension shows a clear predominance of normative bodies (89.25%), a smaller proportion of heteronormative bodies (6.84%), a reduced presence of sexualized bodies (3.42%), and a very limited percentage of unclassified bodies (0.49%) (**Figure 5**).

Regarding “clothing,” distinctive attire is the most prevalent (57.98%), followed by standardized clothing (29.31%), while erotic (7.17%) and flashy clothing (5.54%) appear in notably low proportions. With respect to “voice,” the total number of recorded frequencies (841) is higher than in other dimensions due to the dual nature of this attribute in certain recording units. Within this category, a harmonic tone



Figure 4.
Sexual orientation.

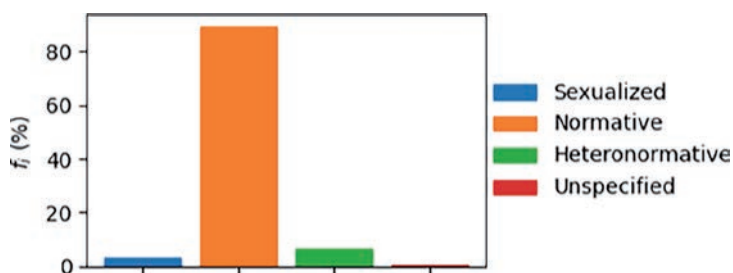


Figure 5.
Expression and body.

(59.69%) predominates, shrill voices (38.17%) appear in contexts of distress or opposition, and erotic voices (2.14%) are recorded almost marginally (**Figure 6**).

Subsequently, the dimension linked to the “actantial scheme” also presents a high total count (661) (**Figure 7**), as the roles assigned to the same character are not mutually exclusive. A clear predominance of the subject role (44.78%) is observed, driven by the high presence of Cassandra and Aya in the sample. The roles of helper (28.59%) and object (12.86%) hold a medium representation, while the roles of sender (7.72%), receiver (3.02%), and opponent (3.02%) are recorded at lower percentages.

On the other hand, the dominant “social class” is the upper class (64.33%), followed by the middle class (23.13%) (**Figure 8**). The lower class (9.45%) and lumpen class (1.46%) are barely represented, while approximately 1.63% of female characters lack clear information regarding their social group.

Finally, the “social role” dimension (**Figure 9**), similar to the actantial scheme, allows for multiple assignments, thus yielding a higher total count (1256). Active roles in cultural (32.25%) and social (31.29%) life predominate, largely driven by the centrality of Cassandra and Aya. In secondary positions are androcentric-active roles in the social (16.72%) and cultural (15.76%) spheres, while the figure of the woman in a victim-passive condition (3.98%) is scarcely documented in the analyzed corpus.

The data obtained reveal a marked predominance of male characters (**Figure 10**). Accounting for more than 50.1%, the most prevalent figure is a young or adult white male with normative bodily features, distinctive attire, and a harmonious voice, belonging to a high social class. This hegemony reinforces the notion of a traditional protagonist who frequently assumes a central role in the narrative of *Assassin's Creed*. In contrast, the percentage of female characters remains significantly below this threshold across almost all categories, highlighting their lower diversity and visibility within the cast. Although some

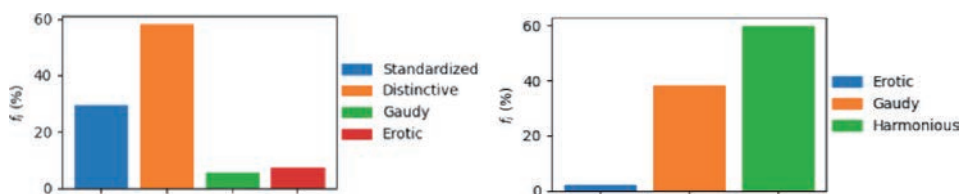


Figure 6.
Clothing and voice.

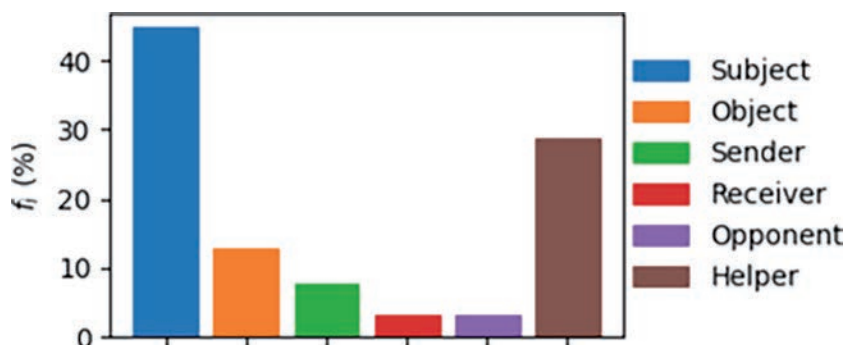


Figure 7.
Actantial scheme.

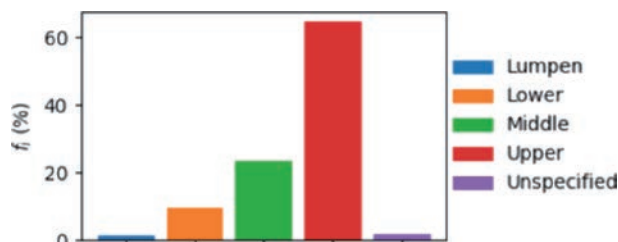


Figure 8.
Social class.

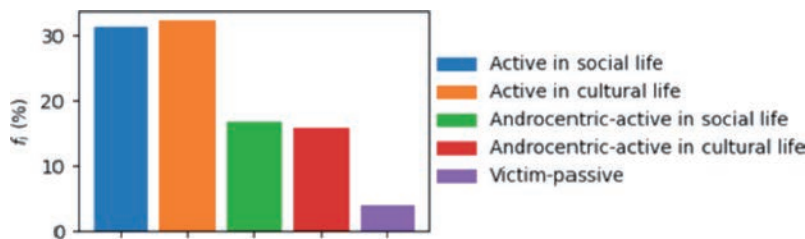


Figure 9.
Social role.

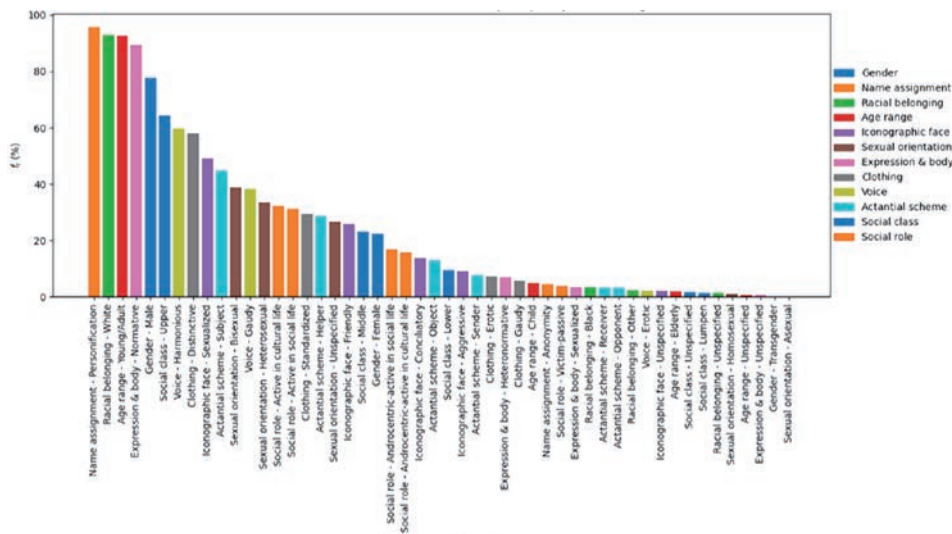


Figure 10.
General character profile.

female characters hold narrative significance, the data indicate a clear tendency toward the oversaturation of male figures as primary protagonists. Moreover, it is noteworthy that the vast majority of these characters possess a proper name, whereas anonymous profiles are exceptional. This preference for individualized characters facilitates their identification and enables the development of storylines centered around specific heroes within the broader universe of the franchise.

4. Discussion

In relation to previous studies [14, 15], despite a 10-point increase (from 12.29% to 22.4%) in the representation of female characters compared to male characters, female characters remain significantly underrepresented. Minimal differences are observed across various dimensions analyzed throughout the game series, with young/adult white female characters from middle-upper classes, normative bodies, and harmonious voices predominating. This underrepresentation extends to—or excludes—racialized characters, elderly women or girls, lower classes, and the lumpen, despite their numerical prevalence. It also excludes strident voices and non-normative bodies, though the sexualization of female characters has decreased, albeit without disappearing entirely, in order to eradicate the promotion of stereotypes and objectification. This leads us to partially disagree with Schwarz and Weber [7], who argue that there has been greater ethnic diversity in video games in recent years. While it is true that the franchise made efforts to present a counter-hegemonic narrative in *Freedom Cry*, this trend is not reflected in the other analyzed games, further emphasizing the hyper-individualization and subjectivization in the construction of the past (or memory) noted by Venegas [23, 39].

The clothing worn by female characters has tended to be distinctive and standardized (depending on their profession or social class), with gaudy outfits—those that transgress traditional gender stereotypes—or erotic clothing generally linked to sexualized characters playing minor roles. However, the iconographic sexualization of female characters' faces has increased since the early installments, where friendly expressions were predominant, while conciliatory and aggressive expressions have consistently been minority representations.

Regarding the “actantial scheme” dimension, one of the most significant changes in the series has been observed: female characters have transitioned from predominantly being helpers or objects (although these roles remain prevalent) to also being subjects of action. This shift is partly due to the influence of Kassandra and Aya within the audiovisual corpus. However, female characters rarely occupy the role of opponent or receiver of actions, positions generally reserved for male characters. Similarly, regarding sexual orientation, while heterosexuality remains predominant, bisexual orientations have been represented, particularly in *Assassin's Creed Odyssey* (2018) and *Assassin's Creed Valhalla* (2020). Nonetheless, homosexual orientations have been scarcely represented. This circumstance is confirmed in *Assassin's Creed* in its early installments, also reflected in the lack of queer visibility in video games [13]. However, the social change driven by the “Great Awakening” prompted an increase in queer representation starting with *Assassin's Creed: Odyssey*, although discrepancies with the historical contexts on which the games are based persist.

5. Conclusions

Without questioning the effectiveness of gamification in cultural heritage dissemination, as discussed by Wang et al. [20], we do not lean toward including *Assassin's Creed* as a virtual tool for heritage promotion. Other options exist that align more closely with historical evidence than those produced by a media-historical video game. Nonetheless, using media-historical video games as a critical starting point in history classrooms may be a valuable strategy to motivate students to engage with

historical knowledge and traditionally invisible realities in media contexts. In this regard, Kessner and Harris [29] emphasize that video games specifically designed for history education, such as *Mission US*, provide opportunities for the development of historical thinking skills, although they rarely demand the deep use of these skills. Therefore, the authors suggest that the game is more effective when integrated into a broader pedagogical approach rather than being used in isolation.

Just as there are creative licenses and deliberate anachronisms in spatial design, these are also present in depictions of sexuality. The sexual relationships and orientations emerging from the narratives analyzed enforce a patriarchal sexual model dominant in contemporary Western societies, ignoring the diversity of identities and sexual orientations present in the historical periods represented. It was not until 2018 that queer identities began to be visible, primarily as a marketing strategy stemming from pinkwashing to expand the franchise's market share, without actively addressing structural inequalities.

The trend across the *Assassin's Creed* series has been a slight increase in the representation of women, giving female characters more prominence as subjects of action while maintaining their traditional roles as helpers and objects. Additionally, the series has included active social roles in constructing social and cultural life and aimed to reduce their objectification. However, female characters remain underrepresented, perpetuating a Eurocentric, classist, patriarchal, and hegemonic perspective. This occurs despite the franchise's disclaimer, which reads: "*This work of fiction, inspired by historical events and characters, was designed, developed, and produced by a multicultural team of various faiths, sexual orientations, and gender identities*" [33].

Thus, the underrepresentation of counter-hegemonic characters in media-historical video games persists despite a possible false perception of equity and equality, as well as other pinkwashing strategies. Meanwhile, other "licenses" and "historical anachronisms" are sustained, focusing on making the series more appealing and playable to expand its market share. This perpetuates a hegemonic perspective of the past among students who consume these video games.

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Conflict of interest

The authors have not reported any potential conflicts of interest in relation to this chapter.

Data availability statement

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to reasons of personal privacy and to the application of ethical criteria in the processing of the data obtained.

Appendix

D	x_i	n_i	N_i	f_i	F_i
Gender	Male	263	263	77.60	77.60
	Female	77	340	22.40	100.00
	Transgender	0	340	0.00	100.00
Name assignment	Personification	587	587	95.60	95.60
	Anonymity	27	614	4.40	100.00
	Total	614	614	100.00	100.00
Racial belonging	White	571	571	93.00	93.00
	Black	20	591	3.26	96.26
	Other	15	606	2.44	98.70
	Unspecified	8	614	1.30	100.00
Age range	Child	30	30	4.89	4.89
	Young/Adult	568	598	92.51	97.40
	Elderly	12	610	1.95	99.35
	Unspecified	4	614	0.65	100.00
Iconographic face	Friendly	159	159	25.90	25.90
	Conciliatory	85	244	13.84	39.74
	Aggressive	56	300	9.12	48.86
	Sexualized	301	602	49.02	97.88
	Unspecified	13	614	2.12	100.00
Sexual orientation	Heterosexual	206	33.55	33.55	206
	Bisexual	238	38.76	72.31	238
	Unspecified	164	26.71	98.02	164
	Homosexual	6	0.98	100	6
	Asexual	0	0.00	100	0
Expression and bodily characteristics	Sexualized	21	21	3.42	3.42
	Normative	548	589	89.25	92.67
	Heteronormative	42	611	6.84	99.51
	Unspecified	3	614	0.49	100.00
Clothing	Standardized	180	180	29.31	29.31
	Distinctive	356	536	57.98	87.29
	Gaudy	34	370	5.54	92.83
	Erotic	44	614	7.17	100.00
Voice	Erotic	18	18	2.14	2.14
	Gaudy	321	339	38.17	40.31
	Harmonious	502	841	59.69	100.00

D	x_i	n_i	N_i	f_i	F_i
Actantial scheme	Subject	296	296	44.78	44.78
	Object	85	381	12.86	57.64
	Sender	51	432	7.72	65.36
	Receiver	20	452	3.02	68.38
	Opponent	20	472	3.02	71.40
	Helper	189	661	28.59	99.99
Social class	Lumpen	9	9	1.46	1.46
	Lower	58	67	9.45	10.91
	Middle	142	209	23.13	34.04
	Upper	395	604	64.33	98.37
	Unspecified	10	614	1.63	100.00
Social role	Active in social life	393	393	31.29	31.29
	Active in cultural life	405	798	32.25	63.54
	Androcentric-active in social life	210	1008	16.72	80.26
	Androcentric-active in cultural life	198	1206	15.76	96.02
	Victim-passive	50	1256	3.98	100.00

Note. D: Dimension; x_i : variable-attribute; n_i : absolute frequency; N_i : cumulative absolute frequency; f_i : relative frequency; F_i : cumulative relative frequency.

Table A1.
Descriptive statistical results.

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Section 3

Educational Agents, Futures Design, and Educational Well-Being

Teaching with What you Are: The Importance of Teachers' Positive Resources and of the Neuropsychopedagogical Training Envisioning the Future on Adolescents' Well-Being – A Correlational and Analysis of Variance Study

*Giulia Perasso, Grazia Serantoni, Carmela Lillo,
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Abstract

The literature shows that teachers' psychological characteristics can influence adolescents' mental health. Additionally, neuropsychopedagogical interventions, like the Envisioning the Future (EF) training, can positively impact wellbeing. The study aims at: (i) exploring the relationships between teachers' and students' characteristics and (ii) investigating the impact of EF on students' wellbeing. The sample consists of $N = 113$ Italian adolescents, whose data were matched with their teachers' ($N = 12$). Participants completed validated self-report questionnaires on self-compassion, emotion regulation, resilience, and an ad-hoc scale of frequency of bullying episodes. Correlational analyses highlight that: teachers' avoidance, social isolation, and self-judgment negatively correlate with the frequency with which students perceive bullying episodes; teachers' self-kindness, optimism, and self-efficacy in regulating emotions positively correlate with the frequency with which the students' perceive bullying; teachers' cognitive focus positively correlates with students' self-determination toward future decisions; students' self-judgment negatively correlates with teachers' resilience and self-efficacy in managing positive emotions, while it positively correlates with teachers' avoidance. In addition, after EF training, students had improved in negative emotion regulation, frequency of perceiving bullying, common humanity, and self-determination. The study underscores the importance of the relationship between teachers' and students' resources and the impact of EF training on adolescents' wellbeing.

Keywords: adolescents, teachers, neuropsychopedagogy, positive resources, school

1. Introduction

Adolescence is a fundamental period for the definition of personal and social identity [1–3]. The adolescent prepares for adulthood, which will require him/her to take an active role in his/her social community. This phase of life involves balancing the affective investment in social relationships: this is made possible by the development of adaptive cognitive and emotional resources [4, 5]. The family is no longer the unique source of support and socio-emotional nourishment: the peer group and other adults (e.g., teachers) gain in importance as the task of constructing one's identity is carried out in various life domains (e.g., educational, recreational, and relational domains). The young person's social horizon widens, and interpersonal connections are enriched [6–9].

School is the main socialization context during adolescence, where adolescents spend, daily, most of their time learning notions, interacting with peers, developing interests in extracurricular activities, and preparing for the future [10]. In other words, the school influences every aspect of adolescents' development, from cognition to psychosocial well-being [3, 11]. The literature has shown that teachers who are endowed with personal resources (e.g., motivation and self-efficacy), relational resources (e.g., worth of trust relationships with leaders, fellow teachers, and students), and soft skills (problem-solving, work-life balance, self-care, mindfulness) are resilient, experience well-being, and can support students in their growth [12].

In the frameworks of Social Learning Theory [13], Life Skills Education [14], and Pedagogy for the Third Millennium [15], educators and teachers are role models for behavior and moral reasoning, given the imitative learning by students [16]. Thus, the well-being of teachers is closely linked to that of the younger generation.

In this sense, neuroscience, through the identification of mirror neurons [17], describes the influence between the characteristics of individuals as central [15, 18]. Mirror neurons are activated not only when an individual is performing an action but also when the individual observes someone else while performing it: in this way, as an observer, we mirror the same neurological activity as if we were doing the action in the first person [17]. The discovery of mirror neurons poses interesting implications for the theory and practice of education and psychological well-being [19]. Indeed, the scientific literature points out that teachers' emotions, and not only their teaching behavior [20], can influence—in a direct, indirect, and recursive sense [21]—their students emotionally [22], in social behavior, emotional competence, and emotional regulation and motivation [23]. Furthermore, the psycho-emotional background of the teacher plays a major role in the student-teacher relationship as the more self-efficacious teachers perceive themselves, the more students perceive closeness and low conflict [24]. Keller & Becker [25] also point out that teachers' emotional authenticity can impact the student's emotional experience in the classroom.

It is crucial to promote three characteristics of the teacher such as: an authentic commitment to education, positive management of classroom dynamics, and high motivation to strengthen the adolescent as a student and as a person [26].

Recent studies show a link between the mental health of teachers and adolescents [27]: higher psychological well-being of teachers predicts the psychological well-being of their students, while high depressive symptoms by teachers predict higher psychological distress in adolescents.

During the COVID-19 pandemic, teachers with higher levels of self-esteem, hope, and the ability to make sense of events showed more resilient profiles [28], thus acting as a direct example of crisis and uncertainty management in the eyes of their

students [29]. A study by Ye et al. [30] pointed out that during health emergencies, relating positively to teachers was a protective factor for adolescents against bullying and cyberbullying [31]. Bullying, as a systematic prevarication among peers [32], increased during the pandemic among adolescents who experienced a high level of social isolation and mental health problems [33] and constitutes an emergency to be addressed at the psycho-pedagogical level, for the protection of the new generations.

As argued by White and Kern [34], positive education is an increasingly relevant theoretical and empirical strand for pedagogical practice, as it allows for the best teaching and learning techniques to be explored and evaluated in a relational context. With the intent not only to apply the best teaching methods but also to draw out of himself and cultivate positive resources, the teacher is predisposed to educate himself/herself to educate the other [35], constituting a model for students (e.g., in terms of global learning, cognition, social relationships). Given these premises, the present study aims to detect correlations between teachers' and students' psychological variables linked to well-being (e.g., coping, self-determination, self-compassion) and the impact of the neuropsychopedagogical intervention *Envisioning the Future* (EF) on the psychological, social, emotional, and behavioral life domains of adolescents.

2. Envisioning the future

Despite its importance for the cognitive, emotional, and social development of adolescents [3, 11], schools have been massively impacted by the COVID-19 pandemic in recent years. Schools have adapted to a new normal [36] where the promotion of positive individual and interpersonal resources (e.g., resilience, self-determination, coping, self-compassion) has become a priority [37, 38] and it is possible through specific educational training [39–41]. *Envisioning the Future* (EF) is a neuropsychoeducational training designed by Fondazione Patrizio Paoletti (FPP) and implemented in Italy for educators in the juvenile penal circuit [37, 38], prisoners [42], earthquake survivor communities [43], and Ukrainian refugee parents [44]. The 2022 edition of EF for schools was run from March to May 2022, lasting a total of 9 weeks for a total of 17.5 training hours. The training offered adolescents and their teachers a course intending to foster individual and school community well-being after the discontinuity caused by the COVID-19 pandemic. Born on the theoretical basis of the Sphere Consciousness Model (SCM) [45, 46] and Pedagogy for the Third Millennium (PTM) [15], EF offers a pathway that integrates theoretical notions on the resilient brain's functioning and techniques to manage stress, face adversity, and cultivate self-determination, promoting individual well-being and a sense of belonging to humanity. The project also included participation in live webinars with FPP trainers, who were certified in the PTM method, and access to a free digital platform.

EF training provides interdisciplinary theoretical-practical content, entitled “The 10 Keys to Resilience” [40], consisting of 10 thematic keys, equivalent to 11 sessions (delivered in a blended mode). Each session draws on interdisciplinary knowledge in the field of educational neuropsychopedagogy [15, 47] to promote the development of executive functions like inhibitory control skills, planning, problem-solving, emotion regulation, attention enhancement, and willpower in adolescents and adults [15, 48–52] even in situations of adversity such as pandemics, social and economic crises, wars, and climate change [41].

The keys/themes presented are: (1) start with what you can control and make small decisions; (2) identify an attainable, challenging, and measurable goal; (3)

several times a day, become aware of your posture; (4) be inspired by stories; (5) ask yourself what is really important; (6) cultivate gratitude; (7) appreciate the other as a resource to cultivate and expand your social network; (8) cultivate curiosity; (9) practice a few minutes of silence; (10) welcome and transform: before going to sleep generate your own tomorrow today.

Each session included three specific moments: dialogical reflection on the topic illustrated by the trainer; sharing the main neuroscientific and psycho-pedagogical discoveries on the topic, highlighting their implications on the well-being of individuals; the practice of resilience through self-training experiences related to the thematic key. In the time between the lessons, the student is invited to practice the theoretical-practical exercises independently. The training sessions are accompanied by relaxation and meditation techniques, training of the mind, guided visualizations to foster self-programming, training in proactive and non-self-judging storytelling, and the enhancement of pro-social behavior, to experience a common, positive, and generative resilience matrix.

3. Study's aim

The present study has two aims: (i) to explore the correlations between students and teachers in terms of resilience, coping, emotion regulation, self-determination, and self-compassion; (ii) to investigate the impact of the EF neuropsychopedagogical training on emotion regulation, the dimensions of self-compassion and self-determination, and the frequency with which bullying episodes among peers are reported at a bullying frequency questionnaire.

4. Method

4.1 Participants

The sample was constituted of: N = 113 adolescents with a mean age of 13.94 years (aged between 12 and 18 years; n = 58 females, n = 42 males) who came from different Italian cities (Assisi N = 10; Acerra N = 22; San Benedetto del Tronto N = 3; Oristano N = 2; Rome N = 76); N = 12 teachers with a mean age of 48.5 years (100% female) who taught in the classes attended by the adolescents.

4.2 Measures

Both adolescents and teachers completed the Self-Compassion Scale [53, 54] and some *ad-hoc* items on the frequency of bullying and cyberbullying. The Self-Compassion Scale (SCS) consists of 26 items on a Likert scale (from 1 = almost never to 5 = almost always). The scale investigates 6 dimensions, ordered in 3 different polarities: kindness toward oneself vs. self-judgment, common humanity vs. isolation, and mindfulness vs. over-identification. Similarly, both pupils and teachers completed the scales APEN/A - APEP/A (Scales of personal self-efficacy in expressing negative and positive emotions) [55] to assess the level of personal self-efficacy in expressing negative and positive emotions. These dimensions are assessed through 15 items answered on a 5-point Likert scale (from “Not at all capable=1” to “Completely capable = 5”).

Students and teachers were administered an *ad-hoc* scale on bullying, preceded by a definition of the construct, rating the frequency of bullying episodes in their school (e.g., “Can you tell us how frequently bullying g occurs?”). Participants could answer using a time-frequency scale (from 0 = never to 4 = every day). In addition, they answered two dimensions of the Self-Determination Questionnaire by Soresi et al. [56], which measures, on a 7-point Likert scale, how confident the adolescent feels about his or her choices. In particular, items relating to the young person’s sense of security concerning future decisions and their own perceived abilities were examined.

Teachers’ resilience was measured with the CD-RISC-10 scale (Connor-Davidson Resilience Scale with 10 items; [57, 58]): a self-administered questionnaire consisting of 10 items answered on a 5-point Likert scale (from “Not at all true = 1” to “Almost always true = 5”), which allows the measure of flexibility, self-efficacy, emotion regulation, optimism, and cognitive attention. Finally, the teachers’ coping strategies were assessed through the administration of the COPE-NVI questionnaire (Coping Orientation to the Problems Experienced-New Italian Version) [59], consisting of 60 items answered on a 4-point Likert scale (from “I usually don’t = 1” to “I almost always do = 4”) that measures five fundamental coping modalities: social support, avoidance, orientation to the problem, transcendent orientation, positive attitude.

4.3 Procedure

The research, developed by the Research Institute for Neuroscience Education and Didactics (RINED) of the Fondazione Patrizio Paoletti (FPP), and conducted in collaboration with the University of Padua, received the approval of the Ethics Committee of the same university (protocol number: 2023-UNPDD04–001636).).

The participants (teachers and students) were recruited through convenience sampling. Teachers come from institutions that had participated in FPP online events, accredited by the Italian Ministry of Education and Research, between February 2021 and January 2022. The students participated, with informed consent from their families, in the EF training (2022 edition) between March and May 2022. The administration of the questionnaires to the students took place at two times (t1, March 2022; t2, May 2022); the administration to the teachers took place only at t1. In order to associate data longitudinally (administration to students at t1 and t2), a pseudonymization was required (e.g., first two letters of the municipality of birth and the last four digits of the mobile phone number). The pseudonymization process made it possible to conduct statistical comparisons over time while protecting the anonymity of the participants.

4.4 Statistical analysis

To explore the first research aim, correlation analyses (Pearson’s r) were carried out to understand statistically significant associations between teachers’ and students’ scores on the coping, emotion regulation, self-determination, and self-compassion scales. Correlation analyses have been conducted associating students’ scores in t1 (i.e., before EF) and teachers’ scores in t1 (i.e., before EF). Concerning the second research aim, analyses of variance within subjects (ANOVA) were carried out to compare negative emotion regulation, self-determination, perception of a sense of common humanity, and perception of bullying in a group of adolescents, before and after (e.g., t1,t2) the EF neuropsychopedagogical training.

5. Results

Pearson correlation analyses show that several teachers' variables correlate with the frequency with which the student reports episodes of peer bullying. Avoidance ($r = -0.281$, $p < 0.05$), social isolation ($r = -0.475$, $p < 0.05$), and self-judgment ($r = -0.385$, $p < 0.05$) on the part of the teacher correlate negatively with the frequency with which students report bullying episodes at the bullying questionnaire. Conversely, teacher's self-kindness ($r = 0.481$, $p < 0.05$), optimism ($r = 0.250$, $p < 0.05$), self-efficacy in regulating negative ($r = 0.344$, $p < 0.05$) and positive ($r = 0.246$, $p < 0.05$) emotions positively correlated with the frequency with which the students reported bullying responding to the questionnaire. The results also show that the teachers' cognitive focus correlates positively with the students' self-determination toward future decisions ($r = 0.189$, $p < 0.05$). Students' self-judgment is negatively correlated with characteristics such as teachers' resilience ($r = -0.200$, $p < 0.05$), teachers' general self-efficacy ($r = -0.208$, $p < 0.05$), and teachers' self-efficacy in managing positive emotions ($r = -0.194$, $p < 0.05$). Similarly, students' self-judgment is positively correlated with teacher avoidance ($r = 0.202$, $p < 0.05$). Finally, teacher avoidance emerges to have a negative correlation with students' self-judgment ($r = -0.194$, $p < 0.05$).

Analyses of variance show the effects of the neuropsychoeducational training EF on adolescent students (**Table 1**). From pre- to post-training, there is a statistically significant increase in students' self-efficacy in the regulation of negative emotions $F(1,112) = 4.56$, $p < 0.05$, $\eta^2 = 0.01$, sense of common humanity $F(1,112) = 11.28$, $p < 0.01$, $\eta^2 = 0.81$, self-determination for future decisions $F(1,112) = 45.05$, $p < 0.001$, $\eta^2 = 0.86$, and frequency of reported bullying $F(1,112) = 14.85$, $p < 0.001$, $\eta^2 = 0.32$.

6. Discussion

6.1 Correlation analyses between students' and teachers' characteristics

Correlation analyses highlight that teacher characteristics are correlated with the frequency with which students report bullying episodes, with their levels of self-determination toward future decisions, and with their levels of self-judgment and self-kindness. The findings emphasize the importance, for adolescents, of the relationship with adults outside the family [3, 7], in the framework of socialization and cognitive, psychological, and social development offered by the school context [10, 11, 60].

	Mean (t1)	Mean (t2)	F	p
Self-efficacy in the regulation of negative emotion	23,58	24,81	4.56	0.035*
Common Humanity	2,63	2,97	11.28	0.001**
Self-determination toward future decisions	24,38	28,12	45.05	0.000***
Frequency of reported bullying	0,85	1,315,227	14.85	0.000***

*=significance level in statistics.
Note: *= $p < .05$; **= $p < .01$; ***= $p < .001$.

Table 1.
The effects of envisioning the future on adolescents ($N = 113$).

Furthermore, as teachers' avoidance, social isolation, and self-judgment increase, the frequency with which their students report bullying episodes decreases. The result concerning avoidance could be read in the framework of the Social Learning Theory [13] and in the neuropsychopedagogical framework of the Pedagogy for the Third Millennium, which examines the educational and social implications of the discovery of mirror neurons [15]. Adolescents exposed to the example of adults who avoid dealing with problems imitate this behavior concerning the bullying issue, even when it concerns the peer group. In addition, it must be taken into account that teachers are fundamental examples for the development of their students' social and moral behavior [4, 16]: teachers who are poorly embedded in a supportive social network and at risk for developing work-related stress may not convey the construction of a sense of community and responsibility toward their group. Finally, as self-judgment is associated with depressive symptoms and rumination [61], teachers who are strongly marked by negative self-judgment might be less attentive to the social context and fail to catalyze their students' attention toward the bullying issue.

Differently, when teachers' self-kindness, self-efficacy in regulating positive and negative emotions, and optimism increase, the frequency with which students report bullying increases. In a broader sense, people with greater self-kindness—defined by Neff [53] as the ability to be tolerant with oneself even when making mistakes—and the ability to regulate their emotions—meant as the ability to monitor and control the intensity and frequency of emotional states [62]—are more likely to feel empathy toward others [63]. Furthermore, optimism is positively associated with individual interpersonal skills [64]. Therefore, teachers with such characteristics could convey to their students the example of greater sensitivity toward themselves, others, and interpersonal relationships, which is necessary to notice and report bullying episodes and, more generally, to strengthen young people's interpersonal skills [9].

Plus, adolescents' level of self-determination toward future decisions increases as their teachers' cognitive focus increases. In Connor and Davidson's [13] resilience model, the cognitive focus is a key component of resilience, which allows persons to remain focused on their tasks without being reminded of adversity. In the significant correlation that emerged, the exposure to this characteristic teachers can work as an example for the student to imitate [13], conveying the ability to focus on personal characteristics and make decisions for the future [56].

During adolescence, a delicate phase for identity construction [1, 2, 5], self-judgment can lead boys and girls to psychological distress and depression [65]. However, the more their teachers are resilient and self-efficacious in maximizing their positive emotions, the less the adolescents seem prone to self-judgment. The relationship with a teacher who is resilient, self-efficacious, and able to regulate emotions appropriately could transmit to the adolescents the idea that difficulties can catalyze improvement. Moreover, it can help them to understand their own characteristics and appreciate their lives, reducing self-judgment and, indirectly, increasing an attitude of self-compassion toward themselves [53].

In summary, the findings highlight that teachers' characteristics are central to adolescents' psychological well-being, since positive adult resources can generate positive outcomes for adolescents [27, 30, 66, 67]. Teachers with positive characteristics (e.g., resilience, self-efficacy, emotion regulation) can convey several positive examples to their students, such as: the ability to emerge strengthened from adversity [68], the ability to identify and achieve goals [69], and the ability to maximize joy and appreciation in everyday life [70]. At the same time, in line with previous studies [20, 24, 25] negative characteristics, related to the behavioral, emotional, and psychosocial life domains of teachers, can negatively influence adolescents [3, 39].

Exposure to the example of an adult who tends to flee from stressors using avoidance as a coping [71] could lead students to question whether they can face adversity (or not), with a risk of greater self-judgment, and—consequently—depressive symptoms and rumination [61].

6.2 The impact of the neuropsychopedagogical training “Envisioning the Future” on adolescent students

Deepening the impact of the EF training on adolescents, the results of the analyses of variance show an increase in adolescents’ self-efficacy in managing negative emotions, sense of common humanity, self-determination toward future decisions, and the frequency with which bullying is reported at the questionnaire after the training.

Specifically, perceiving oneself as self-efficacious in managing emotions refers to two constructs: self-efficacy, defined by Bandura as the individual’s perception of the ability to achieve specific goals (1995), and emotion regulation, as the ability to regulate the intensity and frequency of emotional states [62, 70]. Managing negative emotions implies, for adolescents who have participated in EF, not being overwhelmed by anger, irritation, despondency, and discouragement. This capacity acquires fundamental importance in adolescence, theorized by Erikson [1] as crucial for identity development. Since adolescence can be a particularly difficult period, permeated by the polarization between ego-definition and role confusion, not being overwhelmed by negative emotions makes adolescents able to deal with complex crises and life transitions [5, 39].

Similarly, EF seems to foster adolescents’ sense of self-determination in the making of future decisions: according to Soresi et al. [56], this process allows people to actively engage in and control the direction of their lives. It is an active and continuous process that involves making decisions and taking actions that reflect personal values, beliefs, and goals, assuming responsibility. This variable is a key factor in promoting well-being and overall quality of life [56]. Stimulating this capacity through a neuropsychopedagogical training can help adolescent boys and girls to positively catalyze their commitment, resources, and motivation toward future choices for healthy identity development [2]. The two constructs (e.g., self-efficacy in expressing negative emotions and self-determination in future choices), enhanced by EF, refer to an individual emotional and cognitive domain; however, the training also positively influences adolescents at a socio-relational level.

Indeed, there is an increase in the perception of a sense of common humanity and in the frequency with which bullying is reported by adolescents after EF. The sense of common humanity is a dimension of self-compassion [53] that implies the perception of belonging to a community and, in a broader sense, to the human species or ‘family.’ Bullying, on the other hand, includes a broad constellation of verbal, physical, and psychological, recursive and deliberate behaviors toward subjects perceived as more fragile, enacted by an individual or a group [32, 72]. The spread of the phenomenon among adolescents is increasingly widespread [72, 73], also thanks to social networks [31], and has not been halted by the COVID-19 pandemic [33, 74], representing a psychological emergency among the new generations. EF seems to counteract bullying by improving adolescents’ sense of common humanity and their ability to notice the frequency of peer bullying episodes. EF effects could indirectly increase prosocial behaviors [75–79] that positively influence the processes of decision-making, moral choice, advocacy of the other, compassion and understanding of the other, and improving the socio-relational climate in the school context, and, in particular, in relationships with peers. It is important to specify that the positive effect of the training emerged in a group of adolescents who were supported by their teachers in the acquisition of the notions

and techniques offered by the EF training. This contextual data corroborates scientific evidence regarding the role of the teacher-student relationship in the psychological [27, 67] and emotional well-being of adolescents [20–25, 66], especially in the pandemic and post-pandemic periods [30]. Furthermore, starting from the premise that school massively and multidimensionally influences adolescent development [10, 11], research highlights how positive psychology can play a key role in the pedagogical practice [34], especially in the form of the neuropsychopedagogical approach [15].

6.3 Limits and future directions

The research presents methodological limitations. Firstly, the use of self-report questionnaires may have induced social desirability bias in the questionnaire responses [80]. The compilation by pseudonymization (e.g., through the use of identifying acronyms), which was adopted to ensure the correspondence between the t1 and t2 responses, may have given the respondents a greater sense of spontaneity. It is also important to notice that this research presents limits in data generalizability: (i) as regards the students, the study has a limited geographic representation, with the majority of students from a school in Rome; (ii) as regards teachers, the gender imbalance among the participants (i.e., all teachers were females) may not fully represent the perspectives and experiences of the overall teachers population. Future editions of the project will furtherly expand the samples to guarantee results' generalizability on a national level. A further limitation is the lack of longitudinal data on teachers, which hindered the possibility of implementing regression models to investigate the interactions (e.g., mediations and moderations) between the measured variables [81]. Further studies could investigate these aspects by collecting teachers' data on t1 and t2. Finally, future research could implement a follow-up data collection (t3, at least 3 months after t2) to assess the long-term duration of EF benefits and compare the training outcomes with a control group [82]. Despite these limitations, the study is innovative since: (1) it investigated in-depth the relationship between teachers and adolescent students in the light of some of the principal constructs of cognitive and socio-emotional psychology; (2) it analyzed the positive impact of a neuropsychopedagogical (EF) training on adolescents' well-being on multiple levels (e.g., emotion regulation, self-determination, and social relations).

7. Conclusion

The present study offers insights into the relationship between teachers' and adolescent students' characteristics. The research shows that specific teachers' resources are related to the frequency with which students report bullying episodes, their levels of self-determination toward future decisions, and their levels of self-judgment and self-kindness. Moreover, the study analyzed the impact of a neuropsychopedagogical (EF) training on the same sample of adolescents, identifying positive effects of the program in terms of: an increase in self-efficacy in managing negative emotions, in the perception of a sense of common humanity, in the adolescents' self-determination toward future decisions, and in the frequency with which adolescents report peer bullying. The results draw the attention of teachers, psychologists, educators, and researchers to the interdisciplinary practices that integrate neuroscientific knowledge about brain functioning. Teaching practices can protect and increase the well-being of adolescents since teachers' well-being can improve adolescent students' quality of life on multiple levels (e.g., emotions, cognition, relationships).

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Design Futures: Cultivating Strategic Foresight Competencies in Design Education

Noha Essam Khamis

Abstract

Future thinking and speculation practices can be seen as a crucial premise to approach solving a problem in an innovative way. It is profitable at circumstances in which challenges are complex. Future thinking incorporates two particular approaches: diverging and converging. It requires a flexible way of understanding, to come with different thoughts. This chapter reviews the literature crossing Strategic Foresight and Design disciplines with the accentuation put on how innovation design students, educators and design practitioners may engage with the future. Combining Foresight and Design, as part of Strategic Planning processes, can help the emergence of new possibilities, cultivate the incorporation of diverse stakeholders, and provide for continuous learning through experimentation by utilizing design approaches to attain more profound knowledge and arrangement around current reality. A framework was presented to integrate speculation in design education highlighting the significance of the strategic foresight approach and explaining the theoretical background behind creating the framework. A participatory design workshop was conducted to explain methods used to validate the results of the theoretical background in order to further develop the framework. This framework can be adopted in the design field in order to facilitate the process and to support practitioners' decisions to select suitable tools.

Keywords: strategic foresight, speculation, future thinking, design education, innovation

1. Introduction

Throughout history, people have made an effort to predict what will happen in the future. Futurology, trend forecasting, foresight, and predictions are a few terms used to describe the concept of “looking into the future,” but they all involve predicting the future in some way. It is clear that progress is being made as more people acknowledge the value of trend information in design and a larger business network. Presently, a new paradigm and perspective are being signalled by the database and the new conditions brought about by communication and information technology in design

activities. Design thinking offers problem-focused, critical thinking strategies while enabling innovative mindsets to research and analyse design solutions. The overlap increases when user-centric designers are unable to provide information on end users because they will not exist for at least 10 years. It is difficult for future-focused design and systemic design inquiry to make projections into the mid- to long-term future since key components' values are always changing. In order to shed light on current systems and aid in short-term forecasting and decision-making, researchers make an effort to gather as much data as they can while designing for the present. Nevertheless, future reality is not a one-size-fits-all scenario. Researchers' subjective hypotheses about how outside factors might affect a system will take an infinite number of different turns [1].

The research problem is caused by the lack of information on the use of foresight research in design education. The following questions need to be brought up, looked at, and resolved:

- Why is it important to incorporate foresight research methods into design education?
- How might the foresight techniques employed in design education affect coming up with original ideas?
- What kind of effects would implementing strategic foresight in design education have on learning experiences?

The main idea of this paper is that the results of innovative design courses might be affected by a pedagogy that adapts the strategic foresight approaches in design practices. The objectives are to highlight existing approaches that might be expanded into more formal methods. A case study was employed together with background literature-based research to create the framework for the approaches' selection. The paper is structured like follows: First, the activities in strategic design—which may provide opportunities for future product, service, or integrated system innovations—are compared to the strategic foresight process as a traditional practice for dealing with the future and its inherent limitations towards long-range planning. The design-inspired foresight method is described. It aims to gather viewpoints on problems that could be affected by upcoming events and, as shown by applied research, could define design education in the far future. As a result, significant lessons are offered for modifying design-inspired foresight techniques in design education. An example outcome demonstrates the Delphi method, which allows designers and interdisciplinary teams to engage with futures in the form of scenario statements. Derived through synthesis and consensus from industry and academic experts, these statements are their shared visions for desirable futures.

2. Background

Those who can think strategically and analytically as a team to solve problems are in great demand today and tomorrow. Technology breakthroughs have fundamentally altered how information is gathered, created, and communicated. It is questionable if education can produce critical and creative thinkers who can satisfy the demands of the social and economic environments of now and future [1].

2.1 Strategic approach in design

Strategic design are activities that integrate systems of products, services, and communications in organisations highly dependent on shared value creation across different groups of participants, clients, and relevant stakeholders. Using strategic design activities as a tool for decision-making, the designer can weigh the rigid constraints imposed by an organisation (internal environment) against ecological and social impacts, as well as the cultural sensibilities and symbolic meaning that shape the external environments in a society that is rapidly changing [2].

In the past, Product Service Systems (PPS) have relied heavily on strategic design to move the innovation focus from product (or service) design to an integrated product-service solution. Yet, growing corporate complexity and the dangers it entails, as a result of globalisation, technology improvements, and a shift in power towards the consumer, place new expectations on strategic design that go beyond achieving short-term innovation goals [3]. In fact, strategic design activities used in foresight may give decision-makers a comprehensive understanding of impending problems. Here is where visualisation, prototyping, and creative thinking can advance more future idealised visions [4].

2.2 Design-inspired foresight

The creation of future value and the development of perceptions about the future that may guide decisions or strategies needed to prepare for a desired future are notable intersections between business and design practice. Evidence reveals that businesses that have acknowledged the value of strategic design are indeed those that attain long-term competitive advantages [5]. This development highlights the importance of theoretical and practical knowledge in design-related strategic foresight initiatives. In fact, the goal of using a design-inspired foresight approach is to integrate expert insights with trend analysis, early change indicators, and signs of change to create a deeper knowledge of viewpoints that could help shape the future. A design-inspired foresight strategy also offers chances for storytelling and visualisation design to increase the impact of the study's findings. So, futures thinking improves the anticipatory consciousness, as Glenn [6] suggests. We are often reminded that sometimes the apparent advantages of foresight may only become clear in retrospect [7].

2.3 Strategic foresight design framework

The incorporation of foresight methods into design education calls for a holistic viewpoint supported by contextual data on the market and its many sectors, as well as trade shows, exhibitions, market reports, etc. [8]. By examining expected economic trends across nations, potential business developments are suggested [9]. Two crucial characteristics of using foresight techniques must be taken into account in order to better grasp future views and the methodology and strategies required to involve company stakeholders in futures thinking: Regarding the types of research (qualitative, quantitative, or semi-quantitative), as well as the techniques used to collect and process data [10]. Researchers frequently must rely on the opinions of specialists who are better aware of what is going to happen in the future when using foresight approaches like issue identification [11]. Experts can identify the most crucial uncertainty because they have tacit knowledge of particular business factors. The

Delphi methodology, first proposed by the RAND Corporation in the 1950s, is one of the recognised foresight techniques. The Delphi method is a qualitative research approach that is particularly well adapted to capturing experts' forward-looking viewpoints since it is structured and enables a group of people to collectively think about, reflect on, and express opinions on challenging subjects [12]. While foresight provides scenarios based on trends and uncertainties that are feasible, design futures thinking is more likely to produce situations that are preferred [13]. When dealing with complicated topics, it has proven to be a popular tool to involve experts in group communications, elicit individual perspectives, and then seek group consensus. The fact that experts stay anonymous throughout the Delphi conversation, which makes this method more conducive to independent thought on the part of each participating expert, is frequently cited as a major strength by studies that have used the Delphi method [14]. The ability of experts to be geographically scattered is another advantage of the Delphi method. Participants can communicate around the issue and receive sequential feedback during numerous rounds of inquiry without ever having to come together as a group [11]. While the aim of futures studies is to find external changes that may reveal prospective ramifications, a horizon (environmental) scanning model serves as an acceptable theoretical framework to direct a Delphi futures study.

In order to help management plan the future course of action, horizon scanning can be defined as “the collecting and use of information regarding events, trends, and relationships in an external environment” ([15], p. 84). While several horizon scanning models have been created by foresight practitioners, the central processes of scanning, analysing, and synthesising are shared by all of them [16]. The “Three Horizon Model,” which Baghai, Coley, and White first proposed, is a useful horizon scanning model (1999). The “Three Horizons” paradigm, as suggested by Curry and Hodgson [17], enables various futures and strategic approaches to be integrated into systems and structures and related to various speeds of change as necessary (**Figure 1**).

According to the schematic, potential transition points can be picked out depending on whether they are likely to be disruptive or incremental innovators. As a result, the first horizon concentrates the discussion on the current systems; it has a strong strategic fit with the objectives of the study. Nevertheless, as new forces or elements enter the picture over time, it starts to lose its fit. The third horizon, on the other

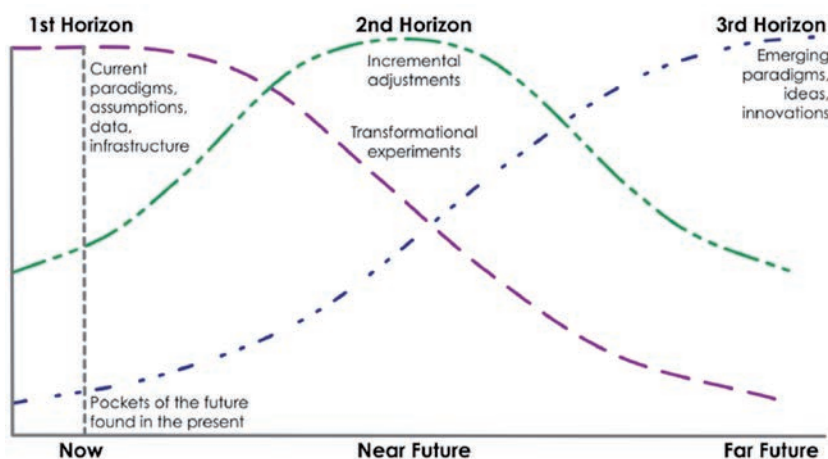


Figure 1.
Three horizons paradigm—the schematic of the futures-orientated three horizon model.

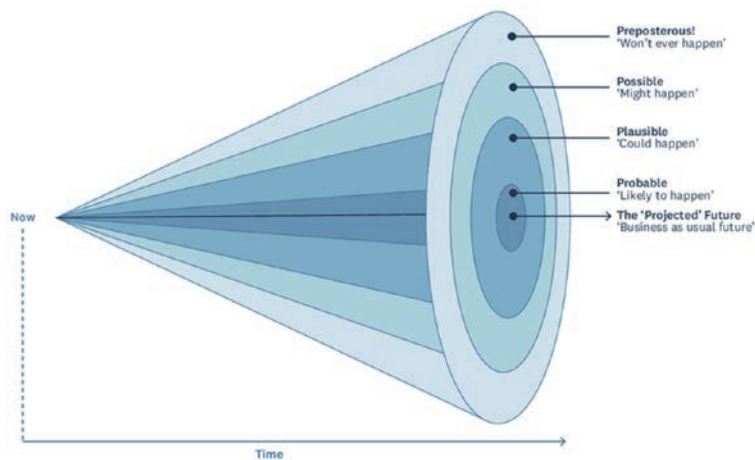


Figure 2.
“Cone of plausibility” designed by Charles Taylor in 1988.

hand, is concerned with flimsy arguments, options, or indications regarding the development of systems that may have an impact on the status quo of the environment. The space (referred to as the second horizon) between these two horizons is where systems generally become unstable as they move from the known to the unknown (or untested).

Essentially, foresight procedures incorporate foresight tools like macrotrend analysis and subject matter expertise to investigate potential futures [12]. Hancock and Bezold’s [18] futures cone (**Figure 2**) serves as a useful metaphor of four categories of alternative futures (possible, plausible, probable, and preferred), with the focus being placed on imagining (or constructing) preferable futures in order to engage people in futures thinking. The futures cone’s power rests in the methodology used by its users, as the cone enables planners to watch pertinent developments and compare them to the scenarios’ plausibility in a methodical and logical progression.

A design-inspired foresight approach, chosen methods, and techniques used in the 2030 futures study are provided as stakeholders become more aware of the reforms required to adapt to the relentless transformation of the business environment. Furthermore covered are key takeaways for applying or modifying foresight methodologies in the design and innovation process [19].

3. Methodology

A design-inspired foresight approach is presented through applied research. The methodology followed in this research is qualitative, accompanied by a participatory workshop in the form of an attempt to integrate strategic foresight approaches in innovative design education. In order to develop the framework, the author employed qualitative data collection and analysis techniques. This was to assess the outcome of the process. The methodology of anticipation follows a systematic inquiry during the workshop followed by a comprehensive analysis of results. The workshop consisted of three panels with eight participants in each and 24 participants in total. Participants were chosen from different backgrounds and professions (design researchers, academics, professionals, sustainability experts, entrepreneurs, etc.) to understand

further implications for the diversity of disciplines and backgrounds. Participants were invited to participate in the participatory workshop and study. First, participants filled out a preliminary online questionnaire set (e.g., demographic data, profession, implicit knowledge of futures studies) prior to the workshop. A few days later, they were randomly assigned to an analytical study of employing the foresight approach in solving an environmental issue. This induction was supposed to generate some expectations regarding their capabilities regarding employing foresight techniques [20]. However, before the workshop, participants were given an opportunity to assess themselves by having an enhancing, neutral or detracting effect on their test performance. Finally, manipulation and suspicion checks were implemented.

3.1 Research design: Theoretical framework

The “Three Horizon” model (see **Figure 1**) served as a theoretical framework that gave study participants the chance to simultaneously engage in short-, medium-, and long-term futures thinking, thereby approaching a particular topic over three different time horizons [21]. For instance, participants were given an introductory question that was relevant to the present in order to engage Delphi specialists across several time horizons: What are the significant topics that constitute the business, and which will need to be defended and keep expanding? This inquiry dealt with issues relating to representations of ongoing expansion and was related to the first horizon [22]. Participants in the Delphi panel were invited to reflect on the following questions as they explored topics pertaining to the third horizon: What are the significant change drivers that will fundamentally alter in 2025 and 2030? The Delphi participants were required to identify with a variety of perspectives that were taken into consideration when designing the survey questions. For instance, a response to the industry and consumer viewpoints were sought.

3.2 Data collection: Delphi method

The primary goal of Delphi is to obtain an understanding of how different academic and industrial experts respond to a series of survey questions and the synthesised opinions they are given in succeeding survey rounds (**Figure 3**). An online

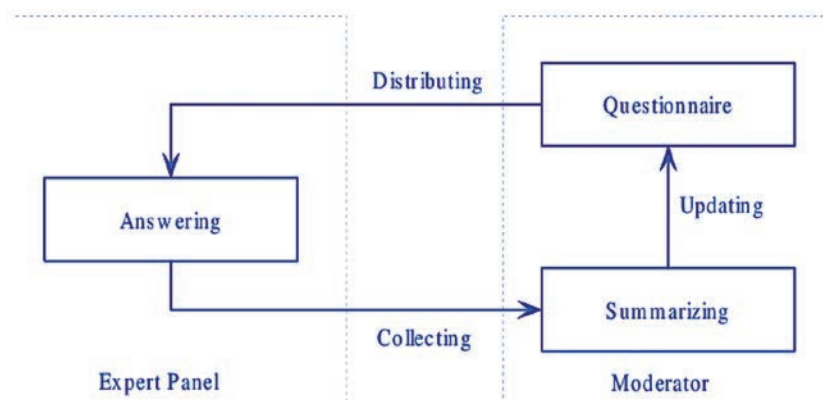


Figure 3.
Procedures of Delphi methodology of data collection.

(web-enabled) survey tool is used to offer a set of introductory questions to the Delphi panel as part of the actual procedure. After each expert has finished answering their own questions, the information is compiled, and new questions are created in light of the results of the first round. Thereafter, until agreement is attained, this procedure is repeated [23].

Although the Delphi method is widely used across most research fields [24], there are still several difficulties to be overcome throughout the application stages. This is valid, especially for those who are using this strategy for the first time [25]. In order to overcome these difficulties, toolkits have been created for the study of particular topics of inquiry, such as sustainability and wellbeing [5], heritage and urban planning, resilient community management [26], design management, and others [27]. Day and Bobeva's [28] "Generic Delphi Toolkit" (GDT) is a toolkit that has been shown to be useful in foresight surveys [29]. It helps direct the consensus stages. Today, we can expect to use the Delphi method, including artificial neural networks, genetic algorithms, and artificial life, to manage the demand with incomplete information. Artificial neural networks are developed because they can describe complicated, nonlinear processes without requiring an assumption about how input and output variables should be related.

3.3 Data analysis: Foresight research

A broad inductive strategy of data analysis is advised when gathering qualitative data using the Delphi method [30]. The main emphasis is on the conclusions that

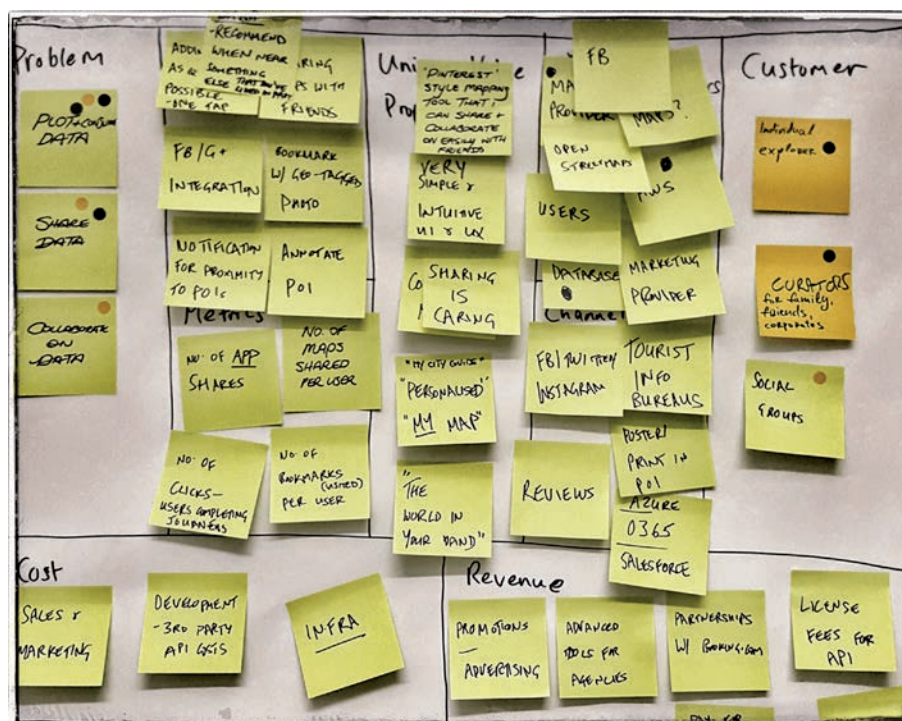


Figure 4.
 Samples of process discovery during the participatory workshop.

result from the identification of the issues and the justifications that each individual expert offers for the issue they propose [31]. By this method, the information gathered can be categorised and sorted according to different time frames (e.g., 2020, 2022). This strategy adheres to the guidelines for coding and analysing qualitative data [32]. Data reduction, according to Miles and Huberman [32], refers to the process of choosing, abstracting, and altering the data that appear in notes or transcriptions (p. 10). The authors also emphasised the advantages of employing a matrix technique to analyse huge volumes of data (**Figure 4**).

3.4 Scenario-based futures

In order to create a vision of desirable futures, key creative industry stakeholders and planners are becoming more reliant on the usage of scenario building and analytic tools [33]. New creative thinking approaches are required to define the future vision [34].

4. Results and discussion

Producing futures scenarios that aid in preparing for, or even actively shaping, views of the future is a fundamental goal in conducting a design-inspired foresight study because foresight approaches are typically qualitative rather than quantitative in nature. In foresight, the emphasis is placed on “...the world as it could be, through the conception and realisation of possible futures,” to use Grand and Wiedmer’s words from 2010 on page 2. In this way, a design-inspired foresight approach is based on original interpretations of diverse trends, STEP (Socio-cultural, Technological, Economic, and Political) drivers of change, and the insights of subject matter experts. Hence, a design-inspired foresight approach can enable key stakeholders to think strategically and make sense of complexity while organising creative resources at all decision-making levels [35]. The design-inspired foresight paradigm can also be seen as a collective problem-solving and preferred-change because designers and interdisciplinary innovation teams depend on multidisciplinary participants to work together to eliminate uncertainty and anticipate potential futures [36]. The focus is on identifying the primary research topic, therefore, getting ready for a Delphi survey is probably crucial to a successful conclusion. At this phase, the research team must choose and recruit experts, design and evaluate a data collection technology, create a set of thoughtful survey questions, and pick a framework for data analysis [28]. The study’s purpose and objectives’ overarching aspiration should be taken into account when drafting the problem statement. According to Andranovich [37], the study problem (purpose) and questions should align with the participants’ interests. It is advised that researchers planning a design-inspired foresight study give themselves time to articulate the research problem and objectives and choose the experts who will serve on the Delphi panel to produce the desired results [26].

An 8-step analysis process was established for this case study; the processes are listed in the following table (**Table 1**).

Using this data coding procedure, more analysis in the form of “key words” can be gleaned from the justifications each panellist gave for the subjects they had chosen. The results led to a series of scenario statements that summarised the consensus views of the expert panel. In order to investigate topics in greater detail, scenario statements were created as a synthesis [38]. This provided panel members with an articulation

Data coding method: Round 1 of Delphi
1. Data capture: Round 1.
2. Issue type analysis of the data (current and emerging).
3. Analysis of the data for “units of meaning” (emerging issues and themes).
4. Data analysis to identify issues and themes.
5. New kinds of data.
6. Data arranged by topics, themes, categories, and spans of time.
7. Data synthesis from four viewpoints.
8. Scenario statements for each perspective and subsequent Delphi rounds across the time horizon.

Table 1.
Data analysis: The eight process stages.

of an idea generated from their combined responses in following Delphi rounds. The outcomes revealed the selections’ diversity, but almost 98% of participants strongly agreed that the scenarios selected include updated information, which scored the biggest number of agreement among almost all. This design-inspired foresight study’s data analysis was planned to yield a number of future scenario statements that encapsulated the collective insights acquired from the Delphi expert panel. At the start of the second round of the survey, the first Delphi round results are presented to the expert panel. Participants are given the chance to analyse the remarks and confirm the main points of their collective thoughts on the matters that were deemed crucial, both now and in the future, as those discussed in this paper. Design-inspired foresight activities aim to equip stakeholders to create the organisations’ future present, as well as these anticipated futures ([17], p. 2). In the second Delphi round, experts were given 10 scenario statements to choose from, each of which reflected concepts that had been researched and synthesised from their combined first round responses. Each statement was given a likelihood of occurrence rating index, which was created as a consensus-reaching indication using mean value analysis of the group’s agreement. Results were analysed; each scenario has been examined to investigate the terms with a higher level of selections from the participants and in which category. For example, Scenario 1 and 2 have been classified as a “Goal and Familiar with” by participants, then concept scored 75% while scenario 3 scored 50%. Elimination of selections has been done based on the selections of the participants and on the elimination exercise.

5. Conclusion

This paper responds to calls for a deeper comprehension of future views as well as the approaches and strategies required to involve stakeholders, designers, and interdisciplinary innovation teams in futures thinking [39]. This study focused on foresight in design as the imagination and development of potential futures, looking beyond strategic planning in business based on historical and present knowledge and trends [40]. Through applied research, a case study that emphasises the value of foresight as an emerging activity in strategic design and innovation introduced a design-inspired foresight approach. Techniques for forecasting and planning were extrapolative and predicated on the idea of continuity [13]. By using a design-inspired

foresight methodology, the emphasis is placed on acquiring deeper insights through Delphi-like procedures, departing from conventional management strategies that include making predictions about the future based on what is known today [41]. The objective of the 2030 futures study described in this report was to assist individual stakeholders in identifying and settling on desired futures. It is difficult to connect the present with desired futures in a way that "...helps to recognise the diverse futures which may develop as a result of conflict between the embedded present and these envisaged futures," as experienced researchers in foresight acknowledge [38]. The value of using a design-inspired futures approach, on the other hand, comes from creating futures scenarios that transform into potent visions of ideal futures. Designers and multidisciplinary innovation teams can work with decision-makers from this vantage point to create innovation strategies and routes that could help the company accomplish its goals over a range of time horizons [42]. As a result, significant advancements in theoretical and applied knowledge of design foresight processes can be made, and design researchers can learn how to adapt current foresight techniques like those discussed in this study. Design-inspired foresight activities aim to equip important stakeholders to create the future present, as well as these anticipated futures ([17], p. 2). The study calls for some future modifications in the context of embedding futures thinking in the design curriculum that include adopting interdisciplinary approaches in design education, Investigate recent pedagogies and strategies to optimise the innovative design educational process, developing creative scenarios and imagination skills, using forecasting methods in design education to generate creative practices and innovation in education, and engaging students and practitioners in more collaborative learning activities.

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Section 4

Higher and Professional Education: Policies, Internationalization, and Futures of Work

Magicalizing Numbers through the Strategic Use of Econometrics, Liberal-Metrics, and Politico-Metrics in Higher Education in Nigeria: A Paradigmatic Approach

Ikyer Godwin Aondofa

Abstract

An empathetic of the contemporary value of numbers is increasingly gaining ground in higher educational institutions in Nigeria and around the world. These numerical relations to higher education quality parameters, the dive to the market, and the desperate search for students and prestige have gained influence. These desires create an undue obsession, even worship, with perspectives of academic exercises and administration. From the institutions in Nigeria, National Universities' Commission ratings of universities, academic and non-academic staff yardsticks, students and prospective students' enrollments and ratings, journal impact factor and citations, the sacred assumptions of numbers and number-targets have become sacrosanct, both as evidence of fairness, prestige, and as a measure of performance, even non-performance, thus requiring academic inquiry. This paper, using ethnographic data and exploring historical accounts, investigates the unexplored mystic dive toward number-data in higher education in Nigeria. The researcher conjectures that the wholesome investment in the cult of numbers generates inconsistent value, is illusory, and inconsequential. The paper advances that the longing for numbers in econometrics, liberal-metrics, and politico-metrics in Higher Education in Nigeria arises from a neoliberal economic process, harsh political and socio-economic realities, and uncertainties, which are invested with the corollaries of inequality and magicalities of the marketplace.

Keywords: marginalizing numbers, econometrics, liberal-metrics, politico-metrics, higher education institutions, Nigeria

1. Introduction

One inescapable measurement yardstick which, of course, is a traditional view, is the approximation of numerical relations to the manifestation of infinite quantities

and qualities. While this perspective sounds worthy enough, especially having been tested over time, it offers itself to misleading conceptions, calculations, and judgments in contemporary representational situations in higher educational institutions. This misleading outset comes about because there is a relation between the numbers and standard operational and representational semantics of measurement. This is in spite of the fact that the estimated values accorded to numbers seem untenable and out of tune with other variables, such as the genuine commitment to work rather than merely attain specified criteria.

It is widely known that increased calculations and quantifications have long drawn out and flourished, especially in governance and the market, thus highlighting the relevance of numbers in the systematic arrangement of ideologies, legislations, conducts, market evaluation, prestige boosting, and relationships. Numbers matter, and the regime of numbers has in its stable indicators, scores, and ratings, which is believed to convert qualitative differences into quantitative ascriptions, and is motivated by ideas of transparency, accountability, and evidence-based appraisal. John Conley is emphatic that “Numbers don’t lie” ([1]: 593) because you are what you measure. This is to showcase the certainty that follows the use of numbers.

Bearing these postulations, one would say that numbers are imbued with ontological, mythic, and contemporary power and relevance to be ignored. “Governing by numbers” is a melting pot and the audit culture is “where the financial and the moral meet” ([2], p. 1). Also, Sally Merry observes that number “indicators are rapidly multiplying as tools for measuring and promoting reform strategies around the world” ([3], p. S52). The number-certainty can be called upon to savage a deteriorating political and socio-economic downward spiral. There now exists governance by numbers, performance measurement through numbers, and political, social, religious, and economic kindred calculations and relationships using numbers, which give the impression of connecting more than ancestral relationships. This is arising from a clear crisis of faith, financialization challenges, and neoliberalism that usher in a “governance of numbers” ([4], p. 1), in which “authority is increasingly expressed algorithmically” ([5], p. 9). The objectivity, accuracy, impartiality, and certainty accorded to numbers show that numbers rule the world in all spheres of human activity, including the complex and contextual gauges in the academia.

The recourse to numbers is not accidental since the downturn of socio-economic finances, ethos, and the prevalence of uncertainties around countries of the world have dealt a severe blow. In the context of higher education in Nigeria, as elsewhere in Africa and the world, numbers have become unavoidable in evaluating research, teaching, and learning quality, performance indicators, and raising institutional prestige. This is in spite of the fact that these gauges are borrowed items from other climes and contexts, which comparisons may lead to improper results as well as illogical and subjective evaluations. However, the perceived safety belt has also raised impassioned conundrums about subjectivities, democracy, and negotiated concerns of the things plausible to measure, such as quality undertaken in higher educational institutions.

In the educational system, which is knowledge-based, the quantifiable qualities are converted into ratings, ratios, indices, and rankings as parameters and paradigms for knowledge construction, quality, and rating. This work traces the multifaceted measurement tools that relate to numbers and all forms of metrics of quality, quantification, and administration, investigates the shifting character of measurement and governance flairs, the fashion for numbers, the sorting out of the economy, and the assumed social relations in the magicalities of numbers and metrics in higher institutions in Nigeria.

Higher institutions in Nigeria have increased the potency of the magicalities of numbers as a regular ritual to strategize, move up the ladder, and maintain their edupreneurial status as both a knowledge reserve and a financialization institution. Numeric data has become increasingly deployed in the higher institutions in Nigeria as a measurement criterion. For instance, the number of years put at work, the number of hours per week, the number of courses taught, the number of courses registered, the number of points gained to qualify for promotion, the number of Quartile one (p. 1) publications one has, the number of citations, the number of quality and quantity of infrastructure [6], class of certificate produced, student-teacher proportion, and other Key Performance Indicators (KPI) and ratios of various measurements that stand as the standard yardstick for performance ratings are all conferred number values. These numbers are accompanied by economic sensibilities and ambitions and may be rooted in mythic notions of the magical. All these add up to the general proportionate reasoning that determines the ideas of “improvement” or “underachievement” in contemporary higher institutions in Nigeria and around the world.

While we all need numbers in science, administration, ranking, performance, markets, and other spheres of human activity, higher institutions tend to mix the quantitative with the qualitative, a strife-induced false dualism, that goes all-out to “economize the social” ([7], p. 307) by framing numbers to economic gains in the competitive markets, and using number-rituals and metrics in higher educational activities, some of which are qualitative. Kruger reiterates that “The production of bibliometric data has thus become decoupled from their application. Bibliometric data has turned into a self-serving end while their providers are constantly seeking for new tools to make use of them” [8]. These number and metric indices are fatal attractions and are misleading because the risks are diverse, the uncertainties numerous, the power exercise undemocratic, and tyrannical, and the gains temporal and ambiguous. The idea of quality clashes with the implementation of the quantifiable, and in the march to development, performance collides with the taste for numbers [9, 10].

The development process and the reward of results rest on quantifying performance, making hyped media publicity of the results and sharing the rewards based on the taste of numbers. These evaluations and sharing processes result in the what Jerry Muller calls the “tyranny of metrics” (Muller 1) that aim to not only mimic the market but also to ratify its overriding predilections. In contemporary wealth generation in higher education institutions, there is a clear connection between academic value and its monetization through the obligation of the “law of value” ([11], p. 67). From one level to another are the scales of measurement of heterogeneous academic activities drawn with equal quantity of labor. There are individual, departmental, faculty, student ratio and ranking, university, national, continental, and international levels as key indicators of the number metric phenomenon.

The contemporary time may be the trending moment for the metric market, a creation of a fashion in an unequal playing field, but Foucault, using the ordoliberalism of the Freiburg School of political economy opines that this relationship between the state and the market, guided by neoliberalism, is odd, temporal, and antithetical, a relationship that perpetuates continuous competition, “a state under the supervision of the market rather than a market supervised by the state” ([12], p. 116). The quantification of knowledge and performance both twists and befuddles higher education, what Jerry Z. Muller calls “the tyranny of metrics” (p. 1). To Muller, the metrics “may provide us with distorted knowledge – knowledge that seems solid but is deceptive” (Muller 3). This is a similar paradox presented by Marx between the laborer separated from his labor, in which the result becomes overturned: “These things, far from being

under their control, in fact, control them” ([11], pp. 167–168). Much can be learned from the version of this magicalization of numbers in Nigeria’s higher education system experience.

2. Metric mania and fakery

The idea of metrics came into the force of measurement significance in the higher education system as “a dialogue on turning towards alternatives,” [13] the dynamics of social services, certainties, and ideologies reflecting this transformation. Over the last two decades, there has been an increasing prioritization of research evaluation, citation analysis, and bibliometrics, which aim to fashion out comparative university ratings and national and continental standards. Some argue that these developments permit greater transparency and choice-making for students, university administrations, and governments) [14–18]; some went further to state that the system has pernicious and perverse effects not least on university faculty and students, tilting knowledge to corporate thinking using the unobtrusive determinant of number metrics. Yet there are adherents of the number value who insist that it restores performance, quality, and provides prestige to institutions [1, 19–21].

Themetric mania is without its biases and contextual reservations. During the 2016-2017 World University Rankings, for instance, Hedman and Artukka aver that “There are no institutions in the top 200 from Latin America, Africa or the Middle East, or, indeed, the Pacific or smaller island regions ([22], p. 679). For Ralf St. Clair, the absence amounts to “marginalizing the marginalized” of the Global South ([20], p. 133). The selection process too, according to Rauhvargers, is flawed because an “analysis of the procedures through which global rankings select universities for inclusion in rankings indicates that the methodologies used by the main global rankings are not geared to covering large numbers of higher education institutions, and thus cannot provide a sound basis for analysing entire higher education systems” ([23], p. 17). This suggests that the criteria for evaluation are exclusive and unfair.

However, as Shore and Wright point out “Quantification and statistics have long served as instruments of governance and state power.... in recent decades new systems of measurement and rankings have emerged that operate both beyond and below the nation-state” ([24], p. 22). The metric mania has created undue competitiveness, generated hasty and unfair evaluation, hence separating faculty from management, and created a neoliberal “reputation race” that dives for accountability rather than responsibility and highlights the study and display of power. This metric mania makes it possible that “The things that get measured may draw effort away from the things we care about” and that “the self-congratulation of those who insist upon rewarding measured educational performance to close achievement gaps come at the expense of those actually engaged in trying to educate children” ([25], p. 24). This suggests that other factors such as the tumbling economy, the state actor’s lack of proper inventiveness, the uncertain, unprepared, and abrupt dive to globalization by marginal communities, the equally rushed acceptance of neoliberalism and similar theories capable of swapping original values, the failure of democracy to fully respond to lack of will and express taste for power, and the lack of brave confrontation to the dynamics of transitions in society account for themalaise.

The move to metrics mania may tumble when allowed to be guided by individual analysis and when it does not induce the workers to obey and be accountable rather than be responsible and explore their deeper thoughts toward the goals of the

employer. The benefits of metrics may be easily quantified, but the metrical evaluation of outcomes does not necessarily lead to “progress” or better outcomes but responsibility and judgment. Donald Campbell avers in his “Campbell’s Law” that “The more any quantitative social indicator is used for social decision-making, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the social processes it is intended to monitor” ([26], p. 67). The crux of Campbell’s statement is that as a society is religious about new fashions of things, there lies beneath them extreme tendencies and complications not measured by fair judgment and contexts. Not everything can be measurable, but the yearning to substitute proficient verdicts with numerical gauges of performance, the impression that making metrics public guarantees an organization’s reputation, and the effort to associate these metrics with money and status may cause fakery. The fallacies leading to fakery include market motivations for students and wealth, prestige boosting, corporate sensibility that replaced social knowledge system with thoughts of money value, and the politics of governmentality.

The Leiden Manifesto for research metrics reads, mindful of the money motivation that, “The problem is that evaluation is now led by the data rather than by judgment. Metrics have proliferated, usually well-intentioned, not always well-informed, and often ill-applied. We risk damaging the system with the very tools designed to improve it, as evaluation is increasingly implemented by organizations without knowledge of, or advice on, good practice and interpretation” ([27], p. 429). The thing about its fake-ness lies in its uncertainty, its undemocratic nature, neglect of local urgencies, and its inconsiderate concoctions that offer little prospects to solutions.

The fixation with metrics discourages aspirations for genuine goal targets, diversion of meaningful productive time to adhering to the dictates of the metrics, creates weakening effectiveness, dampens risk-taking, depresses novelty, and wearies collaboration and shared determination, all amounting to what Pierre Bourdieu and Loic Wacquant term “cultural imperialism” ([28], p. 41).

Moreover, there are variations in the number of outcomes from different measurement corporations in the same university. For instance, in Nigeria, the University of Ibadan has received different positions from different number corporations in 2024 alone. The QS World University Ranking published on June 4, 2024 placed the University of Ibadan in the 1001 position, and Scimago Institutions Ranking published on March 6, 2024 ranked the University of Ibadan in the 2066 position. The Webometrics Ranking Web of Universities of July 12, 2024 has the University of Ibadan as the highest of 55 universities ranked in Nigeria while the latest CWTS Leiden Ranking from Centre for Science and Technology Studies, Leiden University, Netherlands of July 3, 2024 listed only two universities, and US News: Best Global Universities of June 24, 2024 listed the university of Lagos as the highest ranked of six universities listed in Nigeria. A day after the ranking of Best Global Universities, June 15, 2024, Nature Index – Top Academic Institutions by Subject (Health Sciences), Redeemer’s University emerged as the highest ranking among universities in Nigeria ranked 1085. There is little proof, if it at all exists, that there are drastic changes in these universities during these number mania fakeries. It is doubtful whether this number metric is democratic, fair, and accomplished in real terms. Also, the mission of the various universities is ignored even if such is being realized. The geographical context is equally overlooked because numbers do not lie and so should be deployed where they would lie!

One prominent journal since 1983, *Prometheus*, rejects the metric mania stating that “Prometheus is particularly attracted to papers that challenge prevailing views, and it encourages debate” and in defying convention “Prometheus has pushed against

the boundaries surrounding the understanding of innovation” which is why it is not upset about the number metric mania of “impact factor and does not want one. The journal will have nothing to do with the ranking and gamesmanship that have done so much to damage academic publishing” ([29], p. 1).

3. Magicalizing numbers and divining governance and growth

One of the magical realities of contemporary existence in higher education in Nigeria is the magicalization of numbers both as a measure of evaluation and as a shifting mode of prestige, power, and governance. The abstraction exists in the conceptualization of the idea of the qualitative being subdued to the criteria of the quantitative to divine power, governance, and growth. This magicalization has entered the realm of the invisible and, like witchcraft, generates a potency that, as Foucault states, is akin to “the mobile effect of a regime of multiple governmentalities” ([12], p. 77).

In countries around the world, numbers are contextualized for divination, as symbols, for lottery gambling, for historical dates, for mathematical calculations, and in incantations, certain number values are used. The 13th floor (triskaidekaphobia) is excluded from buildings of other climes and the 4th floor (Tetraphobia) for other locale, the number four and death being similar in sound. The three witches of Shakespeare’s *Macbeth* are representative of the strands of birth, life, and destiny [30, 31]. In Greek mythology by Hesiod, written roughly around 700 BC as a poem called *Theogony*, it reveals the fates related to the past, present, and future.

*"And there were three who sat round, each one on her throne, the Fates...
Lachesis, Clotho, and Atropos...
Lachesis singing the things that were.
Clotho the things that are...
and Atropos the things that are to be [32]."*

The number three is also significant in early Greek religion, when Hecate was a goddess of magic, night, and crossroads, exactly where three roads meet. Modern models of ideology and practice have adapted Hecate’s “magic,” “night,” and “crossroad” paradigm. Thus, the magical meets the material in the search for solutions to life and living.

The number ‘666’ has been employed since the 1970s in films to stand for anti-christ, thus creating a connection between numbers and the magical [33]. The potency of numbers seems so supernatural that suggests a parallel with mystic or enchanted forces. Tiv ethnographic notions surge in the knowledge of contemporary parallels of numbers, power, and the magical.

Among the Tiv of central Nigeria where I come from, numbers have been used to sort out divination, mystic, and physical things. The most prominent of the numbers, to my knowledge, is number two, even as the number one is seen as the singular, purposeful, and superhuman one (one plus two is three, the one being the Being, and the two others, in dual relevance, standing for the two sons of Tiv). Number two is the most secular even in its mystical manifestations. The Tiv, the progenitor of the race, stands alone as a lonely but powerful one unequaled, a view which makes the Tiv believe in a oneness “chorus as” ka se “(We are one) despite the divisions of the sons of Tiv into two. The idea of “ka se” suggests “oneness” found in the number one that represents the progenitor of the group or of the supreme being called by the Tiv as *Aondo Abaver Ijua* meaning “the great creator-God-ancestor of the weighted penis” ([34], p. 63).

The Tor Tiv, the paramount ruler of the Tiv, is one singular chief in the world irrespective of your geography of birth, standing as a singular representative of the Tiv nation, as the progenitor of Tiv. The Tor Tiv may have come from one of the two sons of Tiv, but as soon as he is made the Tor (chief), he is no longer of the subgroup but of all Tiv, suggesting a collective representation. In Tiv genealogy, the Tiv have two sons, the Ipusu and the Ichongo. The sharing of roles and responsibilities is based on the two sub-families, the Ipusu and the Ichongo. Be it in politics, mythic sharing, the Tor Tiv installation, or whatever, the two numbers seem sacrosanct. No sub-group can rise to say they just remembered that they were discrete from the others and should have their distinct divisions, to allow for sharing among these emerging groups. Such group (s) action may be rebuked as a repugnant act against the two inviolable numbers, and no significant result can be expected in such resistance to the established numbers.

Although a number of strings for divination is seven, the overall number that covers all earth, two numbers are used to divine between the good and the bad when a diviner would say dialectically “Isho i kondo, Ibo I sen” (Innocence Ascend, Guilt Descend) ([34], p. 68). The ascending one stays with the mighty in unambiguousness but the guilty descends to the pit of troubles. This is a religious declaration and divination that affects one as innocence or guilt can be proven in a secular or religious sphere. There are two vivacious religious power forces among the Tiv—the Tsav (witchcraft) and the Adzov (Sprites) worthy of mention here. The Tsav, the dominant force of Tiv religious life and living, has two parts and its exercise entirely depends on the possessor and not the Tsav itself (much as numbers in themselves are harmless but the user of the numbers) – the original tsav (or mbatsav udedoo/the one that repairs the land) and tsav (mbu pupuu/witchcraft that damages the land). Although witchcraft connects to dreadful invisible mystic powers, it becomes a threat if not well regulated. Numbers may have a particular certainty but may be used undemocratically, in a culturally imperialistic way, or to sideline the marginalized.

The second number in the religious space of the Tiv is the Adzov (sprites); they are divided into two Adzov a pupuu (white sprites), which are “harmless, friendly and helpful” and the Adzov a nyian (the red sprites), which are “capricious, malignant, and vindictive” ([34], p. 68). Yina avers that the white adzov are “benevolent, harmless and friendly” and successful, skillful, or prosperous persons in society ascribe their worth to the benevolence of the white adzov, in which case it is said that “Ijov I na ana” meaning “it’s the gift of the Ijov” (p. 51); Hagher believes that the adzov are “so crucial to the understanding of Tiv social behaviour and religious conception that it is a great wonder that Tiv ethnographers and scholars have not given it greater emphasis” ([35], p. 22). Rupert East in his *Akiga’s Story* told by Akiga himself sees adzov as “what appears in human shape but no one who sees it knows that it is Ijov” ([36], p. 49). The adzov may appear in human form but possesses spiritual root, thus making the connection between the spiritual and the social.

The Adzov, such as the mbatsav or even the numbers under discussion, could be good or bad, seen or unseen, physical or metaphysical, and gratuitous or nefarious, a duality that is determined by the prevailing dynamics of power and governing relations between “measurement, classification, and aggregation” ([37], p. 225). The Adzov desires the things of this world and if rejected by the holder of such precious or cherished thing (s), the Adzov may visit you with pestilence or some other drawback. This attests to the power and governance relations of the Adzov to the things it confronts. The Adzov are political for they can also spoil the quality of products in a market, especially if the market holds on their purported day or a day one person

creates the wrong impact (Interview with Elder Asase Sende 2024) [38]. Thus, the impact created by a person on Adzov, just like the impact factor of the number metrics in higher education rating and ranking, is important in determining the score impression from Adzov. The Tiv ethnography thus parallels the new culture of numbers in rating, ranking, and governance decisions in higher educational institutions. Once you violate the values necessary for a super impact, ratings will be lower for you and prospects of profit elusive to you.

Once in the recorded history of the Tiv, one Ikaragbe, who had violated the values of the land, was asked to surrender to the ethics of the land for which he refused and fled to unknown destination. While trying to rescue the integrity and repair the land using expiation, two great personalities, equal in prowess to Ikaragbe, were sent to haunt and arrest him for admonishment. The two great men were Kpamberakpa and Anyamagere. They tediously went, searched for, and brought Ikaragbe home for reprimand. The two personalities were welcomed home with a victory song:

Hee-e-e! Anyamagere kor or va nam a! (Wonderful! Anyamagere has caught a deviant man for me!)

Hee-e-e! (Wonderful!)

Kpamberakpa kor or va nam a! (Wonderful! Kpamberakpa has caught an aberrant man for me!)

Hee-e-e! (Wonderful!) [39].

Although the narrative ended with the two personalities, such as number-value, Anyamagere and Kpamberakpa, suddenly getting swollen stomach and dying to show that killing Ikaragbe for a purported crime without the benefit of mercy was unacceptable, for which such persons would also die, the extended narrative could be a topic for another time. The fact remains among the Tiv that the number two relates to power, the politics of governance, and mythic ancestral relationships.

Also, Tiv divination uses three or seven stones or strings as divination instruments to determine or predict the results of happenings. The Tiv number three is equally important in its supreme being depicted and the call for supreme help in times of systemic, human, and natural disorders. In parallel to the Christian Trinity, the Tiv uses three personalities, which had become sort of legends, to intervene in trying times with the Tiv God. The reputable Tiv elder of the moment would call out the three legends believed to be allied to Aondo (God), with a loud shout:

"Hae! Aondo u Gbayange Ato! (Oh! God of Gbayange Ato!)

Aondo u Ityevajir! (God of Ityevajir!)

Aondo u Abaverijua! (God of Abaverijua!)

Umbur ityenzewa you averse (Remember your promise to us!)

The promise was that of the continued presence of peace, a promise extracted from Aondo to Tiv, and the disorder would cease! Number counting thus may be traced to ancient rituals and forecasts (Adzege [39], Seidenberg 9, 2, 32, [40], Wood 10, [41]), as reflected in the spiritual connection of the Tiv and their God.

Another akombo (rite) among the Tiv is the Swem rite, (both a rite and a place of visit for healing and blessing) and the people have a life-sustaining or destroying belief about swem. It is said that once every year, mostly at the dawn of the dry season when birds emerge from the east flying in great flocks around the sky, Tiv elders travel to swem from the sections of the land. As they change into birds and fly

off, their mission primarily was to “sor tar” (set the land right). The repair mission accomplished, they assemble the gifts to take home to their respective sub-sections. The indifferent elders take home unfair and distorting items, such as hunger, small-pox, cough, birds, and pests that destroy the farms, and other bad things that set the sub-group on the path of extermination. The good elders’ homecoming from the swem is with prosperity, fertility, social services, and gerontocratic stability (the Tiv practice – the governance system of gerontocracy). People and values are not sold off but made to feel the essence of their being and the responsibilities that lie ahead of them in the achievement of the ethnic mission (Adzege 34–5, [39], East 396, 25 [36]).

The comparisons are necessary here to show the parallels and connect links between numbers and the mythic realms. Karl Marx makes a similarity “To find an analogy, we must have recourse to the mist-enveloped realms of the religious world. In that world, productions of the human brain appear as independent beings endowed with life and entering into relations both with one another and the human race” ([11], pp. 1, 2). This origin of numbers to the mystic past may probably project what Mark Maguire suggests to be “the magic and necromancy inherent in rendering into numbers” ([42], p. 434), and echoed by Seidenberg that “Counting itself may be logical, but particular ways of counting are not” (Seidenberg 2 [40]). The counting of higher education seems suspicious of cultural and ideological impositions from model setters to model receivers. Geschiere reiterates that “both statistics and its nineteenth-century counterpart, spiritualism, were basically about acquiring an extravisionary capacity – a “supervision,” as Pels calls it. Indeed, in many respects, statistics have become the modern language of divination. Like the language of the nganga [occult practitioner], statistics have acquired a sacrosanct status, although this status is open to different interpretations and very hard to verify” ([43], p. 177). While it is not easy to predetermine what each elder of the Tiv may return home with, even as assurances may be decipherable from their antecedents (the Tiv believe that the mind is itself a group of people), what may be brought home may make or mar the community. Thus, quantifying the performance of an elder completely may be difficult, even misleading as quantifying the quality of higher educational institutions in Africa.

Divining numbers for governance and growth is therefore a contested terrain even as Nikolas Rose first, explicates how and why “numbers here are an intrinsic part of the mechanisms for conferring legitimacy on political authority” ([44], p. 673). The numbers, the magicalization process in higher education, and the divination toward biopolitical governance and growth all tailor to what Schulze-Cleven et al. call “academic capitalism,” “quasi-market,” and academic “oligarchies” ([45], p. 798) within “neo-feudal structures” where in “quasi-markets only change the justifying procedures or produce a shift from mere feudal dependency to courtly status competition” ([46], p. 351). Status competition, economic sustainability power, and authority and governmentality have become the newer academic oligarchies clothed in neo-feudal structures to justify market values.

4. The econometrics, trading away rights, and customer relations

The new reality of higher education is the scarcity of funding and the resort to a mix of funding patterns that compensate for diminished government sponsorship. The situation leaves the government and the corporate world to establish a multifaceted relationship, an “administrative lattice” ([47], p. 1), which create what Slaughter and Leslie (p. 6) brand as the “academic capitalist knowledge-learning regime” ([48],

p. 15). This “Rentierism” logic is at the core of the econometrics (economically determined metrics of output, governance, and growth) in higher education in Nigeria.

This section examines the new economic paradigm of econometrics, the trading away of human rights and ushering in a “new set of customers” ([49], p. 27), and the customer relations of post-socialist higher education of the 1990–2024 Nigeria. The tuition fee for students of higher education in Nigeria has more than doubled, thus making the students customers rather than beneficiaries of the provision of social facilities. The students provide the financial means for the upkeep of their institutions but have nothing to say about their governance. Also, the right of the students to education has been denied by the state as attempts are to make prestige and money rather than cater for the yawning population yearning for education. The Academic Staff Union of Universities in Nigeria is also enmeshed in this absence of freedom of operation because there is no “free interplay of different opinions in the pursuit of learning” ([50], p. 20). The students can hardly be called by their names by lecturers and other staff groups but by their numbers, the numbers being the economic medium for sustaining the institutions.

The argument may be put forward that all higher education institutions do not have one collective mission nor do they have similar environmental context, research productivity, class of student-customers, or corporate collaboration to belong to the same “Harvard-ometer” ([51], p. 385). Universal criteria for evaluation are inconsiderate of the age of the institution as if age does not equate to maturity; they are therefore unfair, undemocratic, and out of joint with the mission and development goals of such institutions. The inspiration from econometrics denies human rights as higher educational institutions are subject to the gain targets of the market and governance.

The economic market is growing in higher education institutions in Nigeria as education is commodified with students being customers and staff made to be service providers for knowledge goods. Thus, distinguishing a university from a corporate organization, for instance, becomes problematic as the boundaries are blurred. Market values overtake social values because of the entrenchment of “The new corporate university” where “leaders of higher education wear the badge of corporate servants proudly” ([52], p. 32). The situation has made some academics in Nigeria stressed, exhausted overloaded, suffer from insomnia, and such other threatening crises of work because of the quantitative value attached to the economy of knowledge. This moment of the metrics, of number and numbers, and other scales of measurement all fold into one indivisible complex data box for prestige, capital, and power relations. De Angelis and Harvie so skillfully express it:

Armies of economists, statisticians, management scientists, information specialists, accountants and others are engaged in a struggle to connect heterogeneous concrete human activities based on equal quantities of human labour in the abstract – that is, to link work and capitalist value... [there is now an] ...attempt to (re)impose the 'Law of value' through...measuring...immaterial labour...[in] higher education in the UK Socially necessary labour-times of 'immaterial doings' are emerging and being driven down at the same time as heterogeneous concrete activities are being made commensurable. ([53], p. 3)

The subordination of higher education to econometrics, once subtle and subdued, has been boldly prioritized in the increasing economic supporters gained. The former president of American University, Milton Greenberg, argues that “it is an utterly romanticized supposition to suggest education is not a business,” aided, according to

him, by another myth “that the substance of teaching, research and learning – protected by academic freedom and professional standards – is not ordinarily subject to profit-and-loss analysis” ([1], p. 11) because education and training for employment are similar. To Greenberg, the product of education is to be sold to the market. This perspective is echoed by a discredited “rector of Kaunas University of Technology, Lithuanian Petras Baršauskas, (who incidentally was recently publicly accused of engaging in plagiarism some twenty years ago while obtaining his habilitation and finally resigned) who insisted that business and research should be looking for each other” ([54], p. 1) Baršauskas:

A university has to be international, interdisciplinary, and capable of developing entrepreneurial relations with business. There has been a lack of cooperation between the university and business earlier [in Lithuania – A.S.] because both partners weren't ready and there was little synergy and profit seen in this kind of cooperation. However, now the situation has changed radically – research and business are both in need of each other. (quoted in Samalavičius [55], p. 34)

Should these views hold ground, John Palattella observes that higher education will merely “serve as personnel offices for corporations” and swiftly hand out the historic burden ([56], p. 73). In this instance, learning will no longer be employed “to expand the public good, create a culture of questioning, and promote democratic social change” ([57], p. 42), as Chomsky opines, “in order to help us find our way to a more human future” ([58], p. 34).

John Dewey states, in proffering a solution of resistance, that both the academics and the civic society need the courage to refute fake assertions believing that higher education is progressing off-color in the context of a careering neoliberal values that vends off public goods and subject all non-commodified democratic values to the prescriptions of the market. He states that “democracy needs to be reborn in each generation and education is its midwife” ([59], p. 134). The new generation needs to wrestle control over institutions and ideologies and partake in critical citizenship using pedagogical and collective political resistance. According to Comaroff and Comaroff, it is proper to resist the attempt “to displace political sovereignty with the sovereignty of the market, as if the latter has a mind and morality of its own” ([60], p. 332). The market seems to have more relevance than human beings in contemporary times, in which the desire for corporate habits overwhelms the rendering of services. Literary theorist Bill Readings in “The University in Ruins” states that consumer-oriented corporations characteristic of higher institutions are more concerned about accounting than accountability, thus stampeding efforts aimed at addressing pressing social and ethical matters [61].

5. Libera-metrics and the leasing of higher education in Nigeria

This section attempts inquiries into neoliberal measures and the discourse on the capitalist university and ways the discourse shapes the realities of higher education business in Nigeria, as elsewhere. It is not completely hidden that the politics of neoliberalism inevitably collapsed into our social, economic, and cultural lives, the triggering of which results in perceivably distant predicaments, uncertainties, and violence of values. When the metrics of the market are religiously employed in higher education, to sell education, research, and trade itself for enrichment, national and

global standards, the expectation is that titles would rudely overrun quality. There would be titles of degrees for money, class of degrees for money, fakeness of number titles each year for prestige of ranking, and titles of employed graduates in private and public services at the expense of contexts, mission, and resource base of the institution (s) concerned. The odd coupling between higher education with liberal metrics (the use of neoliberal measurement for fake market-driven results and control) is suspicious and denies efforts at rendering services and enforcing the human rights of education. The façade of “education for all” in Nigeria is a neoliberal deception as tuition fees skyrocket and other requirements are subjected to market values.

Restructuring has dealt a terrible blow to the revenue allocations to the Nigerian universities forcing them to source for funds. By 2001 during the Obasanjo Administration, the committee of Vice Chancellors observed with dismay that “From the beginning of this year, the universities have received only 40 percent of what is required to pay salaries monthly. Consequently, many universities have been unable to pay salaries as and when due ...” (Cited in Onyeonoru [62], p. 7). In the Nigerian higher education system, student enrollment has more than doubled as a neoliberal strategy to earn from the market, not minding the infrastructural capacity or staff ratio of the institutions. In many, if not majority, higher institutions in Nigeria at present, there is no lecture, library, hostel, water fetching, even food vendor spaces for students yet their money counts in reviving the fortunes of their institutions. This shows that it is not the quality of their studies or living that is important than the class of degree they come out with for the prestige of the school. Federal University Wukari, where I teach is a classic example as most lecturers get lost trying to mention each student by name as was previously the case because of the increase in student intake.

Uruguayan Eduardo Galeano categorizes the farcicalities of neoliberal mentality in his *Upside Down: A Primer For a Looking Glass World*, using posers:

*In the jungle, do they call the habit of devouring the weakest, the "law of the city"?
From the point of view of sick people, what's the meaning of a "healthy economy"?
Weapons sales are good news for the economy. Are they also good news for those who
end up dead? ([63], p. 115).*

The above posers display the fake side of neoliberal philosophy that the higher education institutions have entered into to accumulate capital and compete in the prestige-making mission of ranking. It will not be surprising to me that sooner than later, the higher education institutions would enter their names to compete in the Nigeria Stock Exchange Market with corporate institutions for greater gains, enter the lotto draws for student and university standing, and the chair of the governing council or the vice chancellor may be renamed the Chief Executive Officer (CEO), as his/her function is increasingly becoming. The university has taken on a corporate culture, thereby creating an identity steeped in commodified commitments to the knowledge economy that changed the face and character of education and higher education generally.

The culture is increasingly dominant and represents an assault on teaching and learning, an infiltration into logical scientific inquiry, university cultural ideas, autonomy, and ethical culture, domination and occupation of the critical space, open discussions, and conversations. Samuel Weber echoes that the corporate culture is a displacement and showcases “a fundamental and political redefinition of the social value of public services in general, and of universities and education in particular”

([64], p. 60). The corporate university has overtaken the traditional university with a speed close to that of a zeppelin and the leasing, according to Giroux, marks “the death of the social, the devaluing of political agency, the waning of noncommercial values, and the disappearance of noncommercialized public spaces” ([65], p. 46). The language of corporate culture permeates the environment-selling of titles, advertising and offering admissions in the hundreds or thousands per department, advertising university corporate names and ranking research results, commodifying beds and other spaces, leasing out spaces for hostel accommodations, selling spaces for billboards, small shops, and shopping malls, leasing rights to vendors and commercial businesses hawking Points of Sale (POS) machines and money, and several other commercial activities. This marriage of convenience of commercial and educational values distorts distinctions between the two and offers the impression that “to gain education is to buy all the values thereto.”

Higher education institutions are increasingly turning to the dictates of the market, and market forces are highly unpredictable, contextual, and fully against ethical provisions. The market has become the hallmark of governance, power, and corporate managerial culture in higher education in Nigeria. Certainly, Nigeria has entered the global arena of market governance, and whether the doses given may intoxicate or heal remains to be evaluated. The corporate value is the surrogate for knowledge since the thrust is the “commodification of ideas and the accumulation of profits” ([66], p. 39). While neoliberalism has come to stay, bearing its rude and overwhelming intrusion into the affairs of established values, some of the many things gone are the hope to end poverty, the sensibility to true human feelings, civil rights, social equality, compassion, decency, ethics, willing productivity, the critical acumen, and other forms of democratic power, all having been subjected to the dictates of market forces and values. The new twin (university and corporate institutions) has produced a “privatizable” knowledge factory and is creating a “new map of knowledge” ([67], pp. 19, 15) using magical market means.

6. Politico-metrics and the paradox of ranking

The fact that higher educational institutions been governed by numbers as a quantification instrument for ranking has been stated. The obsession with the number metrics leads to a biopolitical perspective attuning to the political undertones of the exercise. This part of the research examines the political forms of metrics and the possibility of the use of contextual frames in such number governance. This part also investigates the paradox of ranking in its politico-metrics (the politics informing the ranking) state.

It may be stated again that quality assurance is a process of facilitating choices in the face of competition but the design and implementation is, as Morley states, “a socially constructed domain of power” (2), a “field of power” [68] and amounts to a skirmish about what is and what should be, what Ordorika calls “conflict” [69].

From the global arena, there is a glaring political disparity between the Global South with the Global North in terms of setting the rules and standard yardsticks much against considerations of geo-political, social, and cultural contexts, and the mission of such institutions. In the Global South, Marion and Imanol Ordorika contest that “institutions are forced to compete on an uneven playing field while adhering to rules determined in the Global North” ([70], p. 386). By establishing subjective standards, state and national aspirations are ignored, social exclusion

is inserted, and thus reinvigorating the North-South separation. The duo contest further that “Institutions must vie for access to funding (both public and private) and students (who are increasingly seen as customers) to survive in an increasingly fierce global market. Furthermore, in relying almost exclusively on easily quantifiable data, the rankings assign greater value to certain areas of university activities; for instance, they prioritize research over teaching and the hard sciences over the humanities – hierarchies which are largely arbitrary in nature” (p. 27). Other political disparities include the prioritization of research over teaching, the exclusion of institutional contribution to its location, the hierarchical placement of the sciences over the humanities, and the general lack of defense for democracy [71].

In Nigeria, Heads of Departments, Deans of Faculties, and even Vice-Chancellors are appointed rather than elected, to show the corollary between power, governance, and higher educational institutions. Students of each department are made, unconscious of the implication, to dress corporately and generate a corporate culture to identify their department and sell their prestige, a market-driven prestige. Also, university unions are cast against each other, against the ministries of education and labor and employment, professors against their junior ones, lecturers against students, all due to quantification-inspired skirmishes. These are some of the ways governance by numbers and numerical data infrastructure is premeditated. There are also ways of measuring learning gains that may be unpopular with the staff, such as being evaluated by the student who may be tailored or indisposed to a lecturer making the exercise subjective and illogical. In departments where there are no specialists in an area, the market looks the other way pretending that other related resource persons may take care of the situation, thereby creating inefficiency and overload to such a lecturer. The “ranking boom” through numbers has made numbers inviolable as “the number... becomes an end in itself” [72], p. 11). The lack of neutrality of the exercise has made critics resist the ranking as a display of the dominant dogma of a dominant cultural hegemony. Certain factors hinder placements to top positions, even as such institutions have been fulfilling their core mission in environmental and cultural contexts.

Also, institutions ranked higher than others may not be factual as the criteria are deceptive and not agreed to by other institutions, some of which may not be selected. Starting from the fake nature of make-believe department presentation for accreditation and rating by the National Universities’ Commission by universities (NUC), the display of a political alliance nature, the pretense of a true value of accreditation by the NUC, and the paradox of the actual, all attest to a fakeness associated to neoliberal modernity. Department with “borrowed” professors, books, and facilities got higher percentage to the ones using actual but higher manpower, books, and facilities. The evaluators are fully aware of this contradiction (having been to these universities as visiting professors, on workshops, conferences, as examiners, and other capacities) yet close their eyes to the facts of the matter.

The deans of faculties, heads of departments, institutes, and centers are mindful that their appointments are not democratized and their tenureship are at the whims and caprices of those appointing them (contingent upon their cooperation, by not offering contrary views), and, in layered consideration, some workers may get through undue measures to gaining subsidiary appointments, special treatments, and promotions bearing the pressures of publish or perish, pass promotional examination or never get promoted, and subdue contrary views or never get favors. These string-pulling attitudes are projected out of desperation, show lack of democracy, and display lack of logicity, fairness, and objectivity in the exercise of numbers without due considerations to contexts and missions of the higher institutions.

Factors of a serrated nature include the uneven distribution of research grants and aptitudes, the neglect of some disciplines for grants due to undue prioritization of disciplines, the brain drain of indigenous resource flights to bigger climes, and the control over knowledge propagation. The outcome of these drawbacks is the “Matthew effect,” in which the rules of the game tend to favor past winners, further increasing their power and prestige” (Lloyd and Ordorika 29).

The compressions of globalization, principally neoliberalism, and capitalism, have compellingly pushed higher institutions to the marketplace with knowledge as the chief commodity. This ensures the reinforcement of ordinal compares making higher institutions caught up in the competitive corporate sphere. To achieve a “world-class status,” higher institutions are aggressively engaged in a struggle aimed at nurturing competition, encouraging research and development, and exercising ways to generate reference values for their assessment. The paradox of ranking therefore creates the fear of an academic race hardly measurable in standards and, a reduction in quality, creates a prestige effect for the institutions making students, parents, and the public scramble for institutions ranked higher. The ranking is predisposed “in terms of ranking values and are somewhat flawed in their methodology” ([73], p. 3). Index progress is a fixation that is decontextualized, disrespectful of local indicators, and has magicalized mangling reality like the Tiv witchcraft and Adzov workings attest.

7. The state and the assault on higher education in Nigeria

The public mission of social services is gradually giving way as the leadership of the institutions is “being stripped of any viable democratic vision” (Giroux 10). Corporatization has launched a right-wing assault on the system, the bruises of which are “disposable futures” (Giroux 1). Bronwyn Davies and Peter Bansel reiterate the state through its neoliberal position “withdraws value from the social good. Economic productivity is seen to come not from government investment in education, but from transforming education into a product that can be bought and sold like anything else” ([74], p. 11).

Beginning in the 1980s in Nigeria, there was a shifting provenance between the state and its institutions as there were international monetary directives for the deregulation of its capital base. There has been a comprehensive domination of Nigeria’s economy and politics by the Bretton Woods Institutions (IMF and World Bank) that set up policies inimical to the welfare of the civil society. The situation took a worse turn with the gradual entrenchment of democracy, and with it, ideological precepts such as globalization, neoliberalism, and capitalism at their “second coming” (Commaroff and Comaroff [75], p. 293) set in. Utilities and social services were surrendered for the dictates of the market. The state relinquished responsibility and the burden of sustaining its institutions, higher education being one of them. This is the point at which there emerged “the conjuncture of the strange and the familiar, of stasis and metamorphosis, plays tricks on our perceptions, our positions, our praxis. These conjunctures appear at once to endorse and to erode our understanding of the lineaments of modernity and its postponements” (Commaroff J. and Comaroff, J.L 3).

While the essential scheme of capital seems fulfilled in this state surrender, globalization and neoliberalization agenda continued into the deep fabrics of state institutions, notably the higher education institution turning it into a corporate investment. The demise of the state is the smile of neoliberalism and the rupturing of a history once cherished by civil society, which itself seems comatose. Lukacs predicts that “in the long run,

the power of the state, of centralized government, will weaken everywhere, an inevitability which will change profoundly the very texture of history” ([76], p. 157). David Korten notes the neoliberal sensibility that “driven by the imperative to replicate money, treats people as a source of inefficiency” ([77], p. 13). The conditions of material existence with its “spiritual and occult persuasions” (Wood 22) may account for the slippery relationship between the state and higher education in Nigeria, and being dozing, the state and its others may well sound the trumpet for losers and winners.

8. Conclusion

The study investigates the magicalization of numbers through the strategic use of economic, neoliberalization, and power-prone metrics in Higher Education in Nigeria. The perspective of the proponents of the essence of numbers as a strong instrument of measuring standards, ensuring productivity, and earning economic dividends is foregrounded against those who believe the number magic is occultic in origin, undemocratic in structure and orientation, subjective, market-prone, unrealistic, and inconsiderate of the basic mission and context of the institutions concerned.

The number metrics is employed within the space of other operative systems, such as economics, market rules, and the politics of power and governmentality. These are intricate combinations in which threads are inseparably tied; it becomes difficult to separate knowledge from the market or capital, numerical evaluation from progress, neoliberalism and deregulation or leasing, education from corporate capitalism, journal impact factor from quality, the Tiv witchcraft or Adzov from the impact of the market, numbers from the mystic, and the quantifiable from the immeasurable. All these collaborative elements lead to the domain of power, prestige, and prosperity otherwise absent in the conspicuous contemporary economic downturn, uncertainties of various kinds, and the frontal challenge to the ontological crux of humanity.

Even through the deployment of magic, in which numbers owe their origin, it is difficult to quantify the quality; the latter being incalculable and unequivocally opposed. Human ingenuity, critical judgment, and the history of the present are the areas of quality not to be quantified even if it is to stir up magicalities. The disposition to magicalize numbers, good as it is as measurement criteria, may be inappropriately deployed in the absence of a contextual consideration. Certainly, numbers magicalized and over-targeted on the market-driven goal of “quality,” “excellence,” and “impact” may neglect practical contextual, mission, fair, and democratic apprehensions and need not be fetishized. Quality, for instance, is inherent and imperceptible and cannot be calculated as the quantity of things. The number metric magicalization has the neoliberal capacity to gauge quantity and quality wielding market economy consciousness to enchant knowledge commodities at its outward advent. For the Global South, there are far greater imbalances to be redressed than the enchantment to the magicalization of numbers to showcase market-driven quality, impact, and prestige, especially, using metrics of incomparable contextual status and domain.

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Perspective Chapter: Future Trends of the Internationalization of Higher Education – The Case of China and Spain

Yinglong Qiu, Adela García-Aracil and Rosa Isusi-Fagoaga

Abstract

The economic, cultural, and political recession caused by the global pandemic COVID-19 and geopolitical problems has impacted society. This entails a challenge to the internationalization of higher education as a tool for countries' socioeconomic and productive growth, fostering human resources and local development. In this context, China is increasingly seeking cooperation with Europe because of the restrictions the United States sets vis-à-vis China. The general objective of this chapter is to examine the possibilities of collaboration between China and Spain in higher education and its impact on international competitiveness and local and sustainable development in the post-COVID-19 era. We focus on Spain because both countries, China and Spain, are facing challenges such as the decrease in the number of international students, the limited offer of programs in English, the lack of scholarships for student mobility promoted by joint programs between universities in China and Spain (currently with few international agreements for funding), and barriers for the mutual recognition of credits between universities, among others. Addressing these problems requires strengthening international cooperation and strategic planning in universities that would improve the attractiveness of higher education and, thus, the country's quality of education, productivity, and competitiveness.

Keywords: internationalization, higher education, sustainable and local development, China, Spain

1. Introduction

According to Jane Knight [1], the internationalization of higher education (INHE) is the process of integrating international, intercultural, or global dimensions into the goals, functions, and delivery of higher education (HE). The main aim is to improve the quality of education for the entire academic world and to make a significant societal contribution [2]. In this context, internationalization has multiple benefits for institutions, teachers, students, and society, such as increased competitiveness, mobility, cooperation, diversity, innovation, and social impact [3]. Other studies have

recognized the relevance of the INHE for a nation's economic development since it influences per capita income, human capital development, employment, well-being, and citizen participation [4, 5]. In contrast, cross-border internationalization of higher education (CBINHE) refers to the movement of people, programs, providers, policies, and projects across national borders. That is, it is a subset of internationalization that specifically involves physical mobility and transnational academic activities [6].

Both internationalization and cross-border internationalization contribute to the global dimensions of HE, but they differ in scope, implementation, objectives, and challenges [7]. For instance, INHE includes activities both within and beyond national borders. It incorporates curriculum development, international partnerships, exchange programs, international research collaborations, and global engagement strategies. It does not necessarily require the physical movement of students or faculty but focuses on integrating global perspectives into the institutional framework [8]. However, CBINHE refers to the transnational movement of educational resources, such as student mobility, faculty exchanges, offshore campuses, joint degrees, and online education initiatives across different countries [9]. CBINHE presents regulatory and logistical challenges in this framework that are less prominent in broader internationalization efforts. Countries implement different policies on foreign university operations, accreditation, and quality assurance, which can affect the effectiveness of cross-border initiatives. Political, economic, and legal barriers can hinder the success of branch campuses and joint programs [10]. In contrast, general internationalization strategies can be implemented more flexibly within a country's existing education framework, making them more sustainable and adaptable [2].

Therefore, INHE seeks to enhance the quality and relevance of HE by exposing students and faculty to global perspectives, fostering mutual understanding among nations, and improving the overall competitiveness of universities in the global knowledge economy. It is a long-term strategic approach to embed international dimensions into academic and institutional cultures [7]. However, CBINHE is often driven by market forces and the demand for global education. It enables institutions to expand their brand, generate additional revenue, and attract a diverse student body. While it promotes knowledge exchange and intercultural learning, commercial interests can also influence it, leading to concerns about education quality, accessibility, and equity [9].

In this chapter, we focus our attention on the INHE, as attention to the internal process has a particularly strategic value in the context of the increased accentuation of the internationality of the university as an institution of production and dissemination of knowledge in the era of globalization [11]. In this context, INHE is a commitment supported by integrating international and comparative perspectives in teaching, research, and training. In other words, internationalization is a strategic element in transforming the HE system to define regional perspectives on an international scale [12]. China and Spain, two countries with unique educational landscapes, are shaping their international HE policies to align with future global trends. Understanding these trends will provide insights into how both nations aim to attract and retain international talent, foster cross-border academic collaborations, and enhance the quality of their educational systems [13].

2. Evolution of the internationalization of higher education

After the Second World War, to avoid future wars and catastrophes, the countries of the continent began to seek international cooperation that would contribute to

peace and shared prosperity, with the creation of international organizations such as the United Nations and its specialized agency in education, UNESCO-1945, initiating the INHE process [14]. With the emergence of exchange programs, such as Fulbright-1946 in the United States and the creation of the Erasmus+ Program in Europe-1987, student and academic mobility was encouraged [15]. This process of broadening and deepening cooperation and economic and political integration within Europe increased the mobility of people and the need for talents capable of understanding and adapting to different cultures. Since then, the demand for international education has become a significant trend [16].

The original Erasmus+ Program was primarily a mobility program due to the traditional narrow conception of internationalization as synonymous with mobility (the original objective was set up to reach 10% of students' mobility). Later, the process of European integration and globalization drew attention to the development of an international perspective and intercultural competence in education, and attention began to be paid to the need to offer internationalization opportunities to the 90% of students who did not have the opportunity for mobility [17]. Consequently, from the mid-1990s onwards, although mobility remained a central theme in the INHE field, its dominant role diminished. Since then, the internationalization of curricula and institutions has become a new focus of attention. In this context, the Erasmus program has attempted to shift the paradigm by strengthening curriculum development and fostering a more diverse and inclusive educational community [18].

With the Bologna Process and globalization, there was a shift in the funding of INHE by governments and institutions from initially focusing on staff mobility to globally funding institutional internationalization [19]. Moreover, the advances of information and communication technologies (ICTs) and the liberalization of markets facilitated the growth of global networks between universities and fostered greater international collaboration in research. Universities began to form strategic alliances, create international campuses, and design joint educational programs for students from different countries [20].

In the twenty-first century, INHE is reaching unprecedented levels with the design of dual degree programs and the adoption of hybrid and online educational models, facilitating global access to HE [21]. This means that the concept of internationalization entails not only student and faculty mobility but also knowledge transfer, the creation of international research networks, cooperation in key areas such as sustainable development, and collaboration to address global challenges such as climate change, diversity, intercultural understanding, innovation, and social inequality [22]. The INHE is also entering a new phase with a strong focus on encouraging mobility for a small elite of students, faculty, and administrators to foster an INHE that is more carbon neutral [2], promoting the importance of the contribution to sustainable development and linking the global to the local [13]. In other words, the aim is to reduce short-term mobility to less than 8 weeks, also reducing the need for administrative travel and supporting more active virtual exchange and collaborative international online learning [2].

The INHE development model in Europe is a model for other countries developing INHE in the world. China has been learning and borrowing from the European development model since its reform and opening up in 1978 [23]. Since China acceded to the World Trade Organization (WTO) in 2001, China's economy has been rapidly integrated into the global economic system. The HE system has also been internationalized, with its particular INHE model with Chinese characteristics, but defining a Chinese-foreign institution's and program's cooperation model similar to the Erasmus+ Program [24].

In September 2003, China's State Council began implementing the People's Republic of China Regulation on Chinese-Foreign Cooperation in School Management [9]. The 2003 legal document promotes cross-border HE, in particular by encouraging local universities to collaborate with renowned foreign HE institutions in launching new academic programs to improve the quality of teaching and learning, as well as introducing outstanding foreign educational resources to local institutions [25]. According to the data from China's Ministry of Education, from 1978 to the end of 2021, the number of students going abroad in China was around 8 million, and the number of students returning to study abroad after completing their studies was about 5.5 million. The number of students studying abroad has spread to more than 10,000 colleges and universities in more than 160 countries and regions worldwide. According to the statistics from the U.S. Institute of International Education [26], in 2022, countries with large numbers of Chinese students in HE included the United States (290,086), Australia (152,715), the United Kingdom (150,720), Canada (105,265), Japan (94,063), Germany (40,122), Russia (39,939), France (27,939), Italy (16,754), Spain (12,542), and New Zealand (11,880). In the particular case of Spain, it is essential to note that this figure represents a significant increase compared to previous years. For example, in the 2017–2018 academic year, the number of Chinese students in Spanish universities was 10,588, indicating an increase of 26% over previous years [27]. This growth reflects the growing interest of Chinese students in HE in Spain, motivated by factors such as educational quality, the offer of Spanish programs, and the opportunity to have an international experience in Europe. Below, we present relevant efforts to promote the INHE in China and Spain.

3. Current landscape of internationalization of higher education

China and Spain have actively pursued INHE, though their approaches differ due to distinct political, economic, and cultural contexts [20]. While China has emerged as a top sender and receiver of international students, Spain has leveraged its participation in the European Higher Education Area (EHEA) and mobility programs like Erasmus+ to attract a diverse student population. This section describes these strategies in detail.

3.1 China's strategies

China has positioned itself as a major player in global HE, driven by strategic government policies and substantial financial investment [28]. One of the initiatives to promote the INHE has been the Double First-Class Plan, launched in 2015. This initiative builds upon previous policies such as Project 985 and Project 211. Project 985 (May 1998, the date of the announcement 98/5) involved both national and local governments in allocating funding to certain universities to build new research centers, improve facilities, hold international conferences, attract faculty and visiting scholars, and help Chinese faculty to attend conferences abroad. The purpose was to promote the development and reputation of the Chinese HE system by funding some world-class universities (at the beginning, it sponsored 9 universities; later in 2009, 39 universities). Then, Project 211 was set up ("twenty-first century, 100 universities"), which aimed to strengthen 100 key universities to improve research capacity, teaching quality, and global competitiveness to modernize the Chinese HE system and develop

a knowledge-driven economy. While Project 211 played a crucial role in transforming China's HE system, it was phased out in favor of the Double First-Class Initiative, which shifted the focus from a set list of universities to specific world-class disciplines across institutions [29, 30]. In 2021, the 140 universities considered first-class accounted for about 4.65% of the 3000 mainland China's universities, representing the most elite portion of Chinese HE institutions [17].

Aligned with China's Belt and Road Initiative (BRI), which is a global development strategy initiated by China in 2013 to improve regional connectivity and economic cooperation by building infrastructure and expanding trade links in Asia, Europe, and Africa, Chinese HE institutions have established cooperation agreement with universities in BRI countries to promote academic exchange, joint research, and cultural understanding [31]. Moreover, China's Confucius Institutes, which promote Chinese language and culture abroad, play a key role in fostering academic diplomacy and attracting students from BRI partner nations [32].

With all these programs, China has experienced an exponential increase in the number of international students. In 2018, there were 492,185 international students in HE institutions in China, an increase of 106.6% from 238,184 students in 2009. China has become an attractive destination due to its scholarships, the quality of institutions, and the expansion of Chinese as a global language [20]. 63,041 international students obtained scholarships from the Chinese government in 2018. The UNESCO Institute for Statistics has indicated that China is the leading sender of students abroad, sending large numbers of students to universities in the U.S., Europe, and Australia [33]. China has also invested in developing joint research centers with foreign universities. These physical research centers, located mainly in coastal provinces and economically developed municipalities, have been agents of trade and migration flows that have historically benefited from preferential tax policies for economic experimentation. This has provided a favorable environment for innovation and has encouraged Chinese cities and universities to host joint research centers, including the financial benefits derived from the expropriation and reconversion of rural land [34]. For instance, the Oxford Suzhou Centre for Advanced Research (OSCAR) is Oxford University's first overseas physical and engineering sciences research center. It is an international partnership between Oxford University and the Suzhou Industrial Park in China's Jiangsu province. The center aims to promote collaboration between Oxford and existing research partnerships in China and identify new collaborations for the future [35].

3.2 Spain's strategies

Spain's approach to internationalizing HE has been influenced by its integration into the EHEA and active participation in European mobility programs. Spanish universities have benefited significantly from the Erasmus+ Program, which facilitates European student and staff exchanges. This program has helped Spain become one of the most popular study-abroad destinations for European students. Additionally, Spain has worked to attract more students from Latin America, leveraging historical and linguistic ties to expand its global reach [36]. In addition, research programs funded by the European Union have facilitated international research collaborations such as Erasmus+, Horizon 2020, and Horizon Europe. These programs have encouraged joint research projects, knowledge exchange, interdisciplinary cooperation, funding mobility grants, collaborative research centers, and technology transfer initiatives, strengthening the INHE in the European Union [37].

In addition to the Erasmus+ exchange program and the international research initiatives supported by Horizon 2020 (in the past) and Horizon Europe (at present), other strategic initiatives have been established to foster the INHE in Spanish universities. Among them are the University 2015–2020 Strategy, University 2021–2027 Strategy, and University 2030 Strategy. These initiatives were policy frameworks established by the Spanish government to modernize and enhance the competitiveness of the Spanish HE system. They aimed to align Spanish universities with global academic and research standards, improve internationalization, and promote innovation and employability. The strategy is built upon previous reforms linked to the Bologna Process and the EHEA, addressing structural governance, funding, and research challenges. Thus, in the academic year 2021–2022, Spanish universities welcomed 135,474 foreign students, 7.8% more than in the pre-pandemic years (academic year 2018–2019) [38]. Public universities have a more significant number of international students (91,985 students), more than doubling the number of private universities (43,489 students). However, proportionally, foreign students represent 18.82% of private universities and 7.85% of public universities [39]. In the 2021–2022 academic year, Navarra (20.45%), Cantabria (13.5%), and Castilla y León (12.9%) were the autonomous communities with the highest percentage of international students enrolled. The internationalization strategy included, among other aspects, teaching degrees in other languages, creating joint degrees with foreign universities, and international internships. However, in the academic year 2021–2022, only 12% of the degrees offered by Spanish universities will be taught in a foreign language. In comparison with other European countries, Spanish universities have very low percentages in this respect [38].

4. Trends and challenges of the internationalization of higher education in China and Spain

As mentioned before, the INHE has become a key priority for both China and Spain as they try to enhance their global academic presence, attract international talent, and foster cross-border collaboration in education, research, and knowledge transfer. While China has positioned itself as a significant global education hub through government-driven policies, Spain has strengthened its international engagement fundamentally under the Erasmus+ Program. In this framework, both countries have faced significant opportunities and challenges alongside the obstacles that may hinder their progress.

One of the most prominent trends in the INHE in China and Spain is the continued expansion of student and faculty mobility. On the one hand, China is facing challenges in language barriers, cultural differences, and geopolitical tensions, which influence academic mobility and collaborations. Additionally, policies such as stricter visa regulations in Western countries have impacted the flow of Chinese students abroad. Despite these challenges, China remains committed to globalizing its HE system as part of its broader strategy to enhance soft power and economic influence [20]. On the other hand, Spain has tried to increase its English-taught programs to attract students from beyond the Spanish-speaking world. However, challenges persist, including the need to further internationalize faculty, enhance research collaborations with non-European institutions, and overcome bureaucratic hurdles in recognizing foreign qualifications [36].

Another significant trend is the digital transformation and the growing role of online education. China is at the forefront of artificial intelligence (AI)-driven education, integrating Big Data and online learning platforms into its universities [40]. Spain also invests significantly in digital learning infrastructure to expand online and hybrid degree programs. The rise of blended learning is expected to attract more international students who prefer flexible education models [41]. However, the metaverse (understood as a term that refers to a shared virtual space that integrates multiple digital platforms and enables social interaction, content creation, and sensory immersion [39]) offers new possibilities for HE for both countries in terms of access, personalization, collaboration, creativity, and motivation, as well as ethical, legal, pedagogical, and technical challenges [42]. The educational use of the metaverse refers to implementing immersive virtual learning environments to create a more personalized and engaging learning experience [43]. In these environments, which can be further extended through the use of extended reality technologies, students can safely interact with virtual content and gain hands-on experience [44]. The metaverse is revolutionizing the INHE in this framework by creating immersive, borderless learning environments [45]. Through virtual reality and augmented reality, universities can offer students interactive, high-quality educational experiences without requiring physical mobility [40]. Therefore, the metaverse fosters cross-cultural engagement, making global education more inclusive and accessible while redefining student mobility and collaboration [46]. China has embraced the metaverse more extensively than Spain due to its strong government-driven investment in digital infrastructure, AI, and virtual education. In contrast, Spain, while participating in European digital initiatives, faces slower adoption due to limited funding and a traditional academic structure that has been slower to integrate immersive technologies into HE [40].

Another major focus of the INHE for both countries is strengthening research collaboration, industry engagement, and innovation. The Chinese government invests heavily in research and development, particularly in AI, biotechnology, and renewable energy. Increased joint research programs with European and American universities are expected, despite geopolitical tensions. There is also a greater emphasis on interdisciplinary research to solve global challenges, including climate change and public health [20]. In contrast, Spain continues to benefit from EU research funding, particularly through Horizon Europe, and is strengthening partnerships with Latin America. Universities are increasing collaborative Ph.D. programs to enhance global research impact, while the focus on applied research and technology transfer is expected to grow, improving university-industry-society partnerships and facilitating knowledge commercialization and international collaboration [22].

5. Conclusions and policy implications

Although both China and Spain are making significant efforts to increase their INHE systems, both countries are adapting their educational policies to an increasingly competitive and connected global environment. In recent years, China has been leading the digital transformation in HE, while Spain, especially with the COVID-19 pandemic, has accelerated the adoption of digital platforms. In this context, the modes of support through funding, national and regional/local institutional environments, and economic development both tangible (e.g., regulatory frameworks)

and intangible (e.g., networks, embeddedness, and soft infrastructures), as well as pedagogical approaches and appropriate teaching and learning contents to promote local development are relevant to define educational policies which encourage the INHE in both countries [28, 41].

Policy reforms and government support for internationalization play a crucial role in shaping the future of HE in China and Spain. China's Five-Year Education Plans emphasize the need for deeper international academic collaboration. Visa policies for foreign students and faculty are being streamlined to attract top talent, and the country is introducing incentives for foreign universities to establish joint campuses in China. Spain's University 2021–2027 Strategy enhances global partnerships and makes Spanish universities more competitive. Government initiatives support dual degrees and joint research projects with non-EU institutions. At the same time, increased scholarship opportunities for students from Latin America and Africa aim to diversify Spain's international student body.

On the other hand, INHE also involves challenges and complexities, such as inequality, homogenization, commercialization, dependency, and loss of identity [21]. Although the importance of linguistic diversity and multilingualism is often mentioned, English has been consolidated as the dominant language of HE [47]. However, there is still no specific model of international cooperation considering English as a priority, as is the case in Spain. Spanish is the second language in the world and, particularly, international mobility actions have become a priority, placing Spain in first place in sending and receiving students under the Erasmus+ Program, even though good results are obtained in this program, there is great room for improvement in Spanish universities, for example, in terms of the number of degrees or disciplines taught in a foreign language [36]. Then, while Spain struggles with the challenge of incorporating English into its international HE programs, China faces a broader issue. Beyond language barriers, there is pressure to align its educational system with Western models, often at the expense of its own epistemological foundations, language, and cultural heritage [48]. In this sense, China and Spain have similarities and differences in their internationalization trajectories, models, policies, and practices, and their current and future opportunities and challenges. It would be relevant to explore possibilities of collaboration and shared learning among both countries, such as: (i) facilitating bilateral and multilateral collaboration agreements between Chinese and Spanish universities that encourage academic exchanges and joint programs; (ii) increasing scholarships and economic support that facilitate the mobility of students, academic staff, and researchers; (iii) recognition and validation of studies and academic credits obtained abroad; (iv) creating joint or dual degree programs in English to attract more international students and increase the prestige of the institutions; (v) implementing regulations that promote the inclusion of students of diverse nationalities and socioeconomic backgrounds in universities (equity and diversity policies); and (vi) promoting the creation of transnational campuses that offer joint programs with local universities, allowing national and international students access to transnational education.

Finally, the use of new technologies is a driver for future INHE. Although transnational distance education is not yet recognized in many countries due to concerns about the quality of education, the use of technology will facilitate the INHE in the future, especially by reducing the costs of communication, transportation, and accommodation, as well as the diversity of classroom formats. Fostering international education through the use of technology remains a challenge given the current level of technological development, policies, privacy, and academic perspectives.

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Conflict of interest

The authors declare no conflict of interest.

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Perspective Chapter: A First Look at How Professionals are Trained and Developed to Meet Industrial Needs – An Indian Perspective

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Abstract

Burgeoning and competing society accelerates the expectations of employers on recruiting professionals' with qualities who meet their immediate requirements. Typically, training ameliorates the prowess and abilities of an individual to vanquish challenges. Based on the need, usually employers offer training and expect positive personality changes. Despite the number of such training and personality development training program, a large number of trainees in Tamil Nadu, India, still remain ignorant about personality development and training. Emphasis is placed on integrating new technologies like AI, machine learning, IoT, and robotics into training programs to keep professionals updated with industry trends. Hence, we would like to make our readers to have an insight into the training and personality development from a unique perspective scientifically.

Keywords: industrial needs, personality development, training, trainees, inter-personal competency, organizational analysis

1. Introduction

In this competitive world, without practice one cannot be perfect in his/her work. One must learn many things in and around the world, to get right practice to excel in the work. Training is the best method to put someone into the practice. The previous finding of the research works states that the human value can be restarted through consistent training [1–3]. The study deals with an insight into the training and personality development for professionals to meet industrial needs.

Training is the imperative for the professionals to increase the confidence level, to meet the industrial needs, to equip with the knowledge, and to improve skills to perform in the best manner.

Without training, it is very difficult to match oneself with today's environment [4–7]. Keeping that in mind, authors have selected the above topic. In this study, we have elaborately explained the training needs, methods, procedure, and principles.

According to Dale Yoder [1] et al., training is essential to avoid personal obsolescence, to develop new skill, and to promote high, job performance levels. It is equally important in preparing persons for jobs and responsibilities. Training programs emphasized learning whatever knowledge and skill were required for satisfactory job performance.

According to Dale S. Beach, “Personality Development is a systematic process of training and growth by which individuals gain and apply knowledge, skills, and insights meanwhile manage work organization effectively.

In the words of Adams and Griffin, “Training is acquisition of knowledge and skills, often manual, for particular job and Personality Development is improvement and growth of individuals faculties, attitudes, insights and traits.”

In this study, we focus training on students who are the future professionals. In the days of students’ learning, all the necessary training should be given so that when they march out from the college and step into the industry, they become a complete and perfect citizen.

A trainer must be aware of the best approach to distribute training if they are to successfully instruct trainees. In addition to trainers, trainees who gain all the necessary information and abilities also benefit because it makes it easier for them to overcome barriers and achieve both personal and professional goals. Researchers have also emphasized that training will undoubtedly foster positive personality development and explain all benefits and drawbacks gradually [8–13]. In order to meet industry needs, all professionals must receive training. Our economy will expand as they satisfy our industrial needs, and India will transition from a developing to a developed nation.

2. Industrial needs

Based on Norman’s five higher order classification, a person’s personal traits can be classified as the following categories.

2.1 Openness

Qualities:

- More creative & adventurous
- Broad range of interests
- Inquisitiveness
- Thirst & appetite for knowledge
- Adaptability

2.2 Conscientiousness

Qualities:

- Tidy
- Organized & mindful

- Responsible Scrupulous
- Persevere

2.3 Extroversion (surgency)

Qualities:

- Sociable
- Loquacious
- Valiant
- Acquaintanceship
- Feels energized when around other people

2.4 Agreeableness

Qualities:

- Content
- Gregarious
- Compliant
- Cooperative

2.5 Neuroticism (emotional stability)

Qualities:

- Poised-timid
- Calm-violent
- Tranquil-deluge
- Higher rates of mood swings

3. Classification of OCEAN personality traits

Industrial needs are limitless, so training should be provided to ensure that learners have the skills necessary to address even the most basic needs. Problem-solving is also continuous; once one is resolved, a new one always arises. Similarly, training is cyclical; after the first level is completed, a new level of training begins.

3.1 Needs of training

Understanding the need for training is necessary before delving into specifics. A lot of trainees only show up for the name tag or time. Trainees must therefore first understand the needs.

Dale S. Beach reports that he found that when an industry experiences low productivity, high costs, poor maintenance control, poor quality, and excessive scrap and waste, as well as strikes, grievances, rules of conduct violations, high employee turnover, excessive absenteeism, and delayed production, training becomes necessary. Training is necessary, in my opinion, to avoid all of the issues. It ought to be provided well ahead of time, to avoid issues. As a result, we achieve all of our greatest successes.

In order to foresee future problems, he claims that training is necessary. In my view, training is necessary not only to anticipate future problems but also to provide solutions. That will undoubtedly lead to company expansion to satisfy the demands of globalization, the production or introduction of new goods and services to keep clients, the development of new designs to compete with rivals, and the construction of new machinery, plants, and technological infrastructure to quickly fulfill the enormous demands [14, 15].

3.2 Personality development

In order to foresee future problems, he claims that training is necessary [16–25]. In my view, training is necessary not only to anticipate future problems but also to provide solutions. That will undoubtedly lead to company expansion to satisfy the demands of globalization, the production or introduction of new goods and services to keep clients, the development of new designs to compete with rivals, and the construction of new machinery, plants, and technological infrastructure to quickly fulfill the enormous demands.

The abilities and education needed to do the work at the required level will be shown by this analysis. Here, the emphasis is on the individual worker, his aptitudes, talents, and the resources needed to do the job. Man analysis is useful in determining whether a person needed training and, if so, what sort.

Recognizing that people comprise every business is crucial. Additionally, the training that staff members need to receive is very specialized and requires careful planning.

4. Industrial perspective of training and personality development

It is exceedingly challenging to manage an industry and demonstrate success in entrepreneurship in the current climate. The market's competitiveness and globalization constantly make it important to stay up to date on the newest trends and technologies. They should be excellent at demonstrating their human resource management in order to address the obstacles. As a result, they give training and personality development more attention.

4.1 General principles of training

Training in the topic matter aids in acquisition. It also aids in modifying their conduct and attitude. It aids in the practical application of concepts. One of the

main benefits of training is being able to recognize one's own strengths and weaknesses and then address them. Additionally, teamwork and how to solicit labor from others are taught in training. It improves the trainees' problem-solving strategies. Training will encourage ongoing development and learning. Training is necessary to close the performance gap between the predicted and actual levels. They will be able to carry out their responsibilities and roles more efficiently with training. And such trainings must include the development of an appropriate blend of behavior and technical proficiency to increase productivity on both personal and organizational level.

4.2 Difference between training and development

While development is intended for executives, training is intended for operators. The goal of training is to provide a person certain abilities. The goal of development is for CEOs to grow as whole persons. Training is a one-time event. The management is the one who initiated the training program. Most of it is the outcome of some external drive. It is a setup to take care of an employee's immediate demands. The process of development never stops. The person taking the initiative is themselves. It is the outcome of motivation from within. It is a prelude to the executive's future requirements. While development is a reactive activity, training is a proactive one.

4.3 Steps in training program

Training initiatives are expensive and time-consuming to administer. As a result, they must be properly drafted. Generally speaking, the procedures are thought to be essential for planning training programs.

Training is a major plan even though it only lasts a short while. Finding the training needs is the first step. It is necessary to ascertain the subject the training is being provided for. After organizing the programs, trainees must be assembled accordingly. Provide the learners with a clear and concise explanation of operations and information. They will next give the performance a test run. The program must be evaluated or followed up on in order to identify any deviations and make the required corrections for future seamless operation.

These operate similarly to cyclical processes, whereby the completion of one training need initiates the next. Similarly, instruction ought to be provided whenever needed or in accordance with a prearranged timetable. Only when it is believed that a training program will aid in the resolution of certain operational issues should one be formed. To identify "the trouble spots" where training could be required, the most crucial first step is to do a complete examination of the entire business, including its operations and human resource availability. Three different types of analyses are included in the identification of training: worker, organizational, and operational analyses.

Determining an organization's goals, its resources, and how those resources are allocated in relation to those goals is the main focus of organizational analysis. A clearer definition of training needs to be incorporated within the framework established by the analysis of the corporate goals.

Operations analysis necessitates a thorough investigation of every task, the actions necessary to complete it, and the operational environment in which it is to be carried out. They will specify the types of jobs that are done and the kinds of workers that can do them.

Employee knowledge, attitudes, and abilities are reviewed by workers analysis, which then establishes what knowledge, attitudes, or abilities the incumbent in the easy position needs to acquire and what behavioral changes he needs to do in order to contribute satisfactorily to the achievement of corporate objectives.

4.4 Techniques of training

4.4.1 On-the-job training

Commonly referred to as OJT, each employee essentially receives OJT upon joining the organization. It is the most typical, extensively utilized, and approved kind of instruction. During this training, learners practice the task in an actual work setting while learning it under the careful supervision of a master craftsman. The following are the benefits of on-the-job training: the trainee has experience using real tools and environments while learning the profession. It is extremely cost-effective as it does not require extra staff or infrastructure. By watching the day-to-day applications, the trainee picks up knowledge about procedures, practices, rules, and so on beneficial for imparting knowledge and skills quickly.

Through coaching, a trainee's learning process is developed independently along with his operational skills. The superior serves as a mentor and teacher. The objectives are to provide guidance on what to do and to rectify problems. Regular reviews assist the student in reaching the objectives. The primary goal of coaching is to help the trainee learn and develop while also providing guidance and support.

Another name for job rotation is the "channel method of development." It is a great way to expand the employee's horizons. It facilitates workers' transition from specialists to generalists. It is a deliberate process designed to teach CEOs the several facets of management.

Workers are cycled across several divisions or departments. The goal is to convey general knowledge and skill in a number of fields. They are switched between jobs, from staff to line positions, or the other way around. Most job rotations are horizontal and dependent on needs.

Also being studied is the attachment method. Under a fully trained professional, an understudy picks up the subtleties of the work with the goal of eventually taking over from him. The apparent heir is the trainee who was selected. Understudy also includes internships. Understudy can also refer to a post of the "assistant to" variety.

Juniors are nominated to committees and invited to participate in the deliberations through special assignments or committees. Real-world issues are discussed, opinions are exchanged, and decisions are made during these meetings. They learn up knowledge from observing others. Interim assignments have the potential to be both fascinating and fulfilling. The juniors' perspectives are expanded, and they are given chances to develop. Initially, the executives typically acquire "firsthand experience in procedure and problem-solving." Apprenticeship Training is the most traditional and widely applied approach. Training might last anywhere from 3 years to 5 months. Trainees are expected to spend the majority of their time "on the job productive work" in addition to theory lectures.

Both the cost of training and the trainee's comprehensive learning of the job are reduced. For instance, the Apprentices Act of 1961 provided training for engineers, diploma holders, and ITI trained individuals working as artisans in the trades of fitters, turners, welders, draftsmen, and carpenters, among others. It is also known

as “step-by-step learning” or Just in Time. The procedure is in four steps. Getting the student ready for instruction is the first stage. Clearly preparing the instruction is the second step. Testing to see if the student has grasped the instructions is the third phase. Allowing the trainee to work alone while having the trainer check in with him on a frequent basis is the fourth and final phase.

In the United States of America, this technique is often utilized to train personnel for supervisory roles.

4.4.2 Off-the-job training

Training that is received outside of the workplace is referred to as off-the-job training. It could take place in the company’s training facilities or with associates who take on the role of trainer.

Another name for conferences is discussion methods. It is a specially purposed meeting that has been meticulously arranged. Discussions among participants “confer” to talk about the particular topic. It is more participatory in culture and focused on the group. The agenda is carefully thought out, and the meeting is managed in a proper manner. It is a useful tool for training and facilitates learning from others’ experiences. Not only that, but respecting the opinions of others on a subject also helps. Conferences come in three varieties.

Guided conversation in which the teacher modifies the conversation to clarify any unclear facts, ideas, or concepts. During training conferences, the instructor gathers the group’s past experiences and expertise in order to try and acquire different perspectives on certain issues, seminars in which the instructor outlines the issue and invites discussion from the audience.

This is a very good way to gain conceptual understanding. The conference technique is ineffective as a training program since it only addresses a small group, moves slowly, and allows extraneous concerns to slip in.

The traditional classroom approach of transmitting knowledge is called the lecture method. It is the oldest approach that is out there. The trainees receive a direct oral presentation of the lecturer’s expertise. The topic is delivered after being well prepared in advance. Questions are welcome, and answers are provided to allay any uncertainties. Its simplicity and suitability for large gatherings are its main selling points.

Role-playing mimics actual situations. It is a useful technique for introducing real-world scenarios into the classroom that would not be feasible otherwise. It is necessary for the trainees to act out the roles that have been allocated to them in a simulated scenario. “Method of Human interaction, which involves realistic behavior in the imaginary situation” is how the approach is described.

A case study approach involves providing an audience with a thorough account or narrative description of a problematic circumstance, either verbally, in writing, on video, or through a combination of both. It serves as a training assistance as well as a method. It facilitates a thorough group debate about actual situations. This method’s fundamental tenet is that studying, reflecting about, and debating real-world examples is the greatest way to develop managerial understanding and competency. Harvard Business School developed the methodology. During this procedure, participation, problem-solving, and conversation all aid in learning. This approach allows for experiential learning.

Case studies typically pique participants’ interest since they are based on actual experiences and challenging circumstances. It boosts the capacity for critical thought

and improves problem-solving skills. It helps people become more adept at making artistic decisions.

Panel discussions are used to debate a certain topic. It is used to convey multiple people's perspectives on the same issue to the trainees. Typically, outside resource individuals are brought in to lead the participants. They will summarize the shared opinions on the matter based on the expressed diverse opinions.

Short-term training sessions, lasting no more than 2 or 3 days, are called seminars. Seminars are held to discuss a topic in-depth from a variety of perspectives. Papers on diverse authors' topics are presented in seminars, and then, there are discussions, Q&A sessions, and replies. Attending seminars aids in the trainees' knowledge and perspective expansion. Participants may make recommendations at the conclusion of the session.

Corporate games is a training approach where groups of trainees are put together to meet, talk, and make decisions on marketing, production, and so forth. It is an exercise that takes place in an administrative or corporate setting.

Day-to-day environment is duplicated, and participants are allowed to apply their knowledge and skills to find out solutions. The decisions taken are analyzed either manually or through computers, and feedback is given to the participants.

Business simulations may demonstrate how leadership develops, what forms of communication work best, and how internal group strife can impede progress. Additionally, games show how stress affects players. The games are expensive, realistic, and frequently rigged, which are the drawbacks.

Kurt Lewin created sensitivity training initially in the United States. Other names for it include group dynamics, T-group training, and action training. The training is predicated on the idea that information alone cannot bring about changes in behavior and that human relations practice fosters an environment conducive to changing attitudes and methods. Its goal is to increase people's self-awareness and empathy for others. It aims to develop in participants an awareness of their own and others' unconscious influences. Aspects like the capacity to communicate, listen to others, accurately diagnose human problems, and comprehend the intricacies of group dynamics are the emphasis of the sessions. It is a very unusual way.

Only qualified trainers should be used, and only managers who volunteer to participate should attend the program.

It is a method of group training. This training's two key components are active participation and prompt feedback. As this training is centered on self-reflection, feedback, and transparency or openness, the trainees bear the final say in how things work out. During this training, the student provides feedback to others and gets feedback in return. As a result, it increases the trainees' sensitivity and self-awareness. It also aids in reforming and readjusting his way of living, including his beliefs and attitudes. The working schedule is always made up of a small group of ten to fifteen trainees. The group talks, and occasionally, even tense, uncomfortable, or emotional issues among the participants come up. Occasionally, the instructor steps in as needed.

In T-Group training, the program ranges from 2 days to a week depending on the purpose of the training. The trainers use T-groups, exercises, and instruments all in the program.

The most crucial information is separated for decision-making after data collecting. Eric Berne created the transactional analysis technique by examining everyday interpersonal events and describing them in plain, untechnical terms. In T.A., three key ego states are used: child, adult, and parent. T.A. Harris popularized this subject even further in his book "I am ok; you are ok (1969)." He promoted the "storing" notion, which might be plastic (artificial), negative, or positive. He added that there

are two parts to any transaction: the stimulus and the response. Naturally, the actions shown during a transaction fit into one of the three ego states. The goal of the T.A. technique is to motivate managers who are participants to act like adults.

It enhances interpersonal competency. It also aids in the development of his managing style and understanding of the issues with interpersonal relationships in the workplace. A learning strategy called “input buzz” involves breaking up a speaker’s presentation of material at predetermined intervals—roughly every 5 minutes—with a buzz group discussion.

4.5 The benefits of training

Increased profitability and/or more favorable attitudes toward profit orientation are the results of training. It enhances employee morale, subordinate–superior relationships, and job knowledge and abilities across the board in the organization and aids in fostering identification with corporate objectives. Better corporate image creation, learning from the trainee, assisting in the preparation of work rules, providing knowledge for future needs in all areas of the business, and enhancing decision-making and problem-solving skills are all benefits of training.

Understanding and implementing organizational policies, organizational development, advancement opportunities, leadership skill development, motivation, loyalty, improved attitudes, and other traits of successful employees and managers are all made easier with training. It also helps to increase output and/or the caliber of work produced.

Osborn et al. concluded by summarizing existing guidance for practitioners and suggesting two future research streams: (a) controlled evaluation of training outcomes and (b) exploration of the proposed mechanisms of action in personality-based training.

It lowers expenses in a variety of ways. For instance, production management and so forth enhances labor–management relations, fosters a sense of accountability to the company for knowledge and competence, and lowers the expense of outside consulting by leveraging effective internal consulting. Rather than fighting fires, it promotes preventive management, removes suboptimal behavior, and establishes a suitable environment for development and communication. It enhances interpersonal skills and offers information on various administrative rules and legislation of the government. It makes the organization’s laws, rules, and regulations workable; boosts employee morale; fosters group cohesion; creates a favorable environment for learning, development, and coordination; and enhances both the work and living environments within the organization.

5. Methodology

For the study, an average of thirty students from each of the three admissions groups are included. The sample sizes were taken as a total of 90. Over 70% of applicants are accepted each year into this average-standard college. We note that while some of the pupils are from urban areas, the majority of them come from the rural site. Thirty-five of the ninety students are accepted into the hostel; these students come from locations other than the college. The norms and requirements of education 5.0 and industry 4.0 are currently being discussed in industrial education systems; however, students from the society are not aware of this.

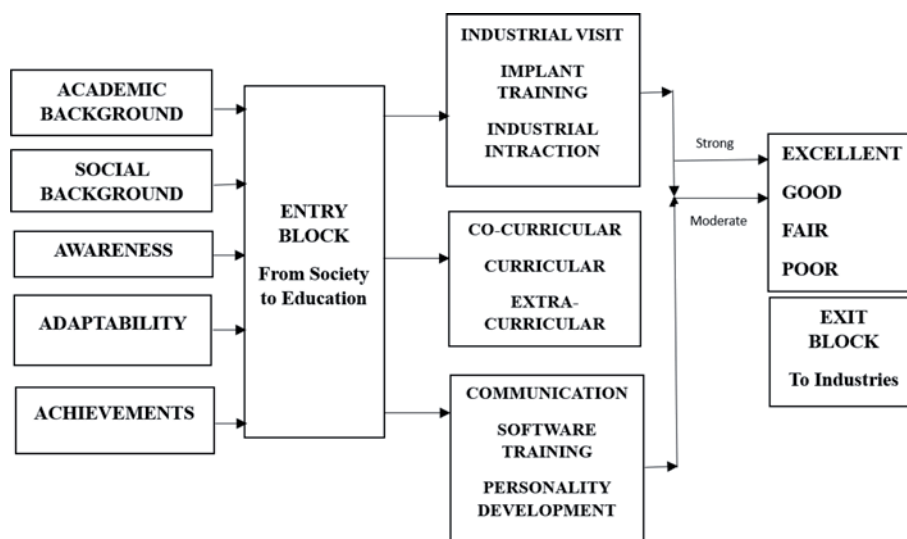


Figure 1.
Diagram showing prerequisite to meet industrial needs.

However, they are aware that, provided we are appropriately suited to the system, there is a life expectancy in professional studies. They come from a wide range of socioeconomic and academic backgrounds within society, and in more than 70% of the sample, there is a significant gap. The requirements to suit the needs of industry are shown in **Figure 1**. The purpose of orientation programs, motivating classes, and awareness programs is to help students adjust to the prerequisite requirements of professional courses. Over sixty percent of the pupils report feeling better than they did during their typical pre-university coursework.

Expanding the quantity and quality of programs to alter or transform the entry level of student confidence to a level appropriate for meeting the demands of professional studies and their accomplishments in the near future. Students are also shaped in large part by the confidence level and teaching style of the faculty. This encourages students to apply and utilize their knowledge of that particular subject in the actual world.

The following are some of the main factors that alter and influence a person's personality and skill level in order to suit industrial needs:

Survey data from the industry side are analyzed to examine expectations related to teamwork, agility, positive confidence, language skills, communication, soft skills, technical applied skills, flexibility, learning push, and dedication. Every year, the programs are designed to help students adapt to these industrial demands, and their effectiveness is evaluated at the conclusion of the academic year. Naturally, a collection of skill sets like a positive attitude and learning push are measured in 4 years at the end of the first year. It demonstrates the significant difference—nearly four times the observed improvement—between managing these kinds of changes and not managing them.

We are combining the language proficiency and confidence level in teamwork at the end of the second year. Care for these kinds of variables and their corresponding trainings has undergone significant adjustments. Students are evaluated on their communication, soft skills, flexibility, and dedication at the conclusion of their third year. Students

who do not have backlogs are better equipped to adjust to the changes. We discover that in order to satisfy the anticipated needs of the industry, appropriate student involvement and training must drastically alter either behavior or skill sets, or both.

We put the students' knowledge to use at the conclusion of their third year, when they complete a curriculum-required mini-project. In their final year, they do a major project.

Engaging students in their projects in a suitable manner allows for the measurement of their ingenuity and creativity.

In order to ensure that they are aware of the difficulties that exist in the industry in real time, the students are given the opportunity to select problems from the industries prior to the commencement of the project as part of the internship training program. Students who complete their projects successfully have the ability to influence the future in all record dimensions at various levels.

6. Result and discussion

Using a student level-measuring rubric, **Table 1** displays the various industrial needs and the associated expected outcomes from the students. A variety of industrial needs, including collaboration, problem-solving strategies, teamwork, communication, knowledge, and skills, are represented by the first column. The several levels of the pupils' outcomes—below expectations, meets expectations, and above expectations—are measured in columns.

Table 2 shows the entry-level student attributes measured by column, including motivation, awareness, potential, achievements, and innovative/creativity, with a classification of highly competent, competent, and novices.

The contrast between the actual and current approaches to student and personal-ity development is shown in **Table 3**.

A block diagram in **Figure 1** illustrates the students' required degree of proficiency to suit industrial needs. They have distinct academic backgrounds at the entry

Industrial needs	Below expectations	Meets expectations	Above expectations
Cooperation	Do not have any adjustment ability and do not work together	Having ability to adjust but not always	Very adjustable and always cooperates
Problem-solving techniques	Unable to identify the problem itself	Able to identify but not able to give right solution	Able to identify the problem, able to give right solution, and able to evaluate
Team work	No leadership quality at all	Possess all qualities but no accomplishment of goals	Possess all leadership quality and accomplish the goals
Communication	Language barrier	No language barrier but not able to use right channel of communication	No language barrier and able to use right channel of communication
Knowledge and skills	Reluctant to learn new things	Eager to learn new things but very slow and less effective	Eager to learn new things very quickly and effectively

Table 1.
Industrial needs outcome (rubrics).

Students attributes	High competent	Competent	beginner
Awareness	They are fully aware of education	Aware of education but less interest	No knowledge of education
Achievements	Very ambitious and soar to high	Just want to achieve their goal	No ambition at all
Potential	Very potential and eager to learn	Capability but no eager to learn	No capability at all
Innovative and creativity	Having innovative ideas and want to implement it in best manner	Having innovative ideas but do not know to implement	No innovative ideas at all
Motivation	Motivated to do further studies	Little motivation	No motivation at all

Table 2.
Students entry rubrics.

S. No	Earlier approach	Current approach
1.	Only Training at the entry level	Training throughout the career
2.	Training in knowledge and skills	Training in attitude and behavior
3.	General Training in Marketing management etc.	In company specifies
4.	Training through case study methods	Through real problems, action learning
5.	Stress on individual	Team, company-wide
6.	In training centers	Anywhere
7.	Considered as a cost	Considered as a planned investment paying rich dividends
8.	Simple evaluation at the end of the program	Evaluation on the job by the line manager after training

Table 3.
Current trends in training.

level, and their curricula vary depending on the form of study—State Board Pattern or Central Board Pattern, for example. Additionally, there are differences in the languages used for instruction, such as Tamil and English in the Tamil Nadu region of India. Based on the state board and central board syllabuses, we can discern the variations in the student’s academic background. The requirements for passing also have different eligibility. The differences are also evident in the social backdrop. It is also unknown why they entered this higher education and study program.

At the moment of entrance, the awareness of this specific program is also highly wearisome. The student’s expectations and their capacity for situational adaptation also differ widely. The higher education curriculum they face can be challenging for students to read; therefore, being able to adjust to a given scenario is essential to cramming as much as possible into each educational block. The last one concerned accomplishments, and the students’ backgrounds play a significant role in determining their entry level when they begin their studies.

As soon as they enrolled in that specific course of study, all students, regardless of their nature, had to go through the orientation program, also known as the Bridge Course, which was a proper entry-level knowledge process supplied to the students.

Every step of the students' work-in-progress, along with the associated value additions, satisfies the requirements for the student to be able to complete the course.

They must deal with the current and modern circumstances, which have been taken into account when designing the curriculum. The extracurricular and cocurricular activities that can be adopted to motivate students can be chosen based on their interests and the actual needs that each curriculum should address. The students' personalities are altered by things like setting up industrial visits, in-plant training, industrial interactions, and internships with businesses or subject matter experts. Similar to the two rails on a railroad track, one in education and another in personality changes.

This demonstrates the students' ability to communicate, use software, and develop their personalities in order to modify their exit level to meet the demands of the workforce. As we can see in the exit block (today industries) of **Figure 1**, an exceptional exit outcome is possible with a strong input, and a poor and fair output is possible with a weak input. The block diagram's diagrammatic representation of the value addition to pupils in order to satisfy industry demands is displayed.

Data gathering shows that while most respondents favor on-the-job training, a small percentage prefer off-the-job training, which is followed by classroom training.

How did the respondents feel about attending their first training program was our next query. Many responders state that their level of satisfaction is intermediate—neither totally satisfied nor dissatisfied. They learn more theory and less practical knowledge to some extent. The respondents who had previously received training from another source expressed satisfaction.

Not many respondents concur that training programs are the sole way to precisely meet expectations. In response, the respondents expressed high satisfaction with the question “whether their doubts are clarified or not.”

Receiving the circular and information on the training sessions ahead of time made the respondents satisfied. When we inquire as to “whether or not training is necessary,” in response, they said that training is essential and satisfies their requirements.

The length of the training program is not to the respondents' satisfaction. They desire it for an extended period of time. The training program was beneficial to the responders. They naturally become involved and learn about different approaches to issue solving. They receive solid assurances.

The respondents were pleased with their overall perception of the training course. They expressed gratitude for the trainer's decisions being implemented. They also stress that if the aforementioned is done, they will undoubtedly become more motivated, self-assured, and responsible.

6.1 Suggestions

The students' on-the-job training takes a lot of time, and if they do not have enough time, it can interfere with their regular academic routine. In order to provide the responders with more practical information, in-plant training or an industrial visit can be arranged.

After their program, participants who have participated in numerous sessions will be highly satisfied. It is necessary to use a variety of training techniques to meet all of

their expectations. It is challenging to bring out all the features that different industries demand with the aid of one strategy.

It is advised that a schedule be created in order to prevent academic disruption. Additionally, they attend the training program without missing a beat and prepare well in advance. As a result, the academic calendar itself ought to contain it. They will have an inner drive. A training program ought to last for several days as opposed to only one or two.

Additionally, we collected data from the manufacturing, consulting, and service sectors. Industries require the following attributes.

Excellent critical thinking, self-improvement, and expertise in the service industry. The manufacturing industry requires technical expertise, effective problem-solving strategies, and strong leadership.

The consulting industry values participation, judgment, and effective communication.

With the assistance of the task that was given to them, our responses have all the qualities. Conference is one of the training techniques that will aid in the development of thinking skills and updated knowledge. The incident method will encourage personal growth.

Using the case study and role-playing methods, respondents receive suggestions and solutions for the issue. Managerial and leadership skills are developed through the use of techniques such as business games and transactional analysis. Operational skills will increase through on-the-job training methods including coaching and apprenticeship. Using the job rotation strategy will also aid in learning about a variety of tasks.

Increased decision-making authority will result from the discussion process. Their conduct and attitude will be altered or changed by sensitivity training. Additionally, it enhances interpersonal competency. Committees and special assignments will force them to participate in the work. Last but not least, a communication skills training will help them express ideas and enhance their language. In addition to all of this, they receive classroom instruction where they learn enough material to use in a professional setting.

7. Conclusion

To adapt to the upcoming, strong, and quick changes necessary to meet industrial needs, training and development are essential. In addition to being ready for practical and realistic personality development, trainees should be able to overcome any obstacles they may encounter in the future. The readers would undoubtedly benefit from this study by understanding the significance of personality development and training. It also provides explicit instructions on how to carry out the training program and what kind of training approach to take into account, depending on the respondents' abilities.

Based on surveys administered at Vetri Vinayaha College of Engineering and Technology, Trichy, the results have been assessed at a cost of Rs 10,000 per student. There are numerous aspects to training; without it, it is impossible to know everything. It inspires learning a great deal of new things in addition to raising awareness. Therefore, training is crucial for both the profitable and efficient operation of the business and for meeting all industrial needs.

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*Edited by Delfín Ortega-Sánchez
and Carlos Pérez-González*

This book offers a rigorous and thought-provoking overview of some of the central challenges facing education in today's global context. Bringing together empirical and theoretical contributions from diverse geographical settings and educational levels, the volume examines how education for democratic and inclusive citizenship, equity, and social justice can be woven into the transformation of educational communities. At the same time, it analyses the impact of digital education, information literacy, and the integration of artificial intelligence in education on teaching and learning practices, as well as the role of media culture and gender stereotypes in shaping identities. The book further incorporates innovative perspectives on educational well-being, teachers' personal resources, futures design, and strategic foresight, alongside critical analyses of higher education, university internationalization, and professional education in the changing landscape of labour markets and futures of work. Its main advantages include a comparative and interdisciplinary approach, a sustained dialogue between research, public policy, and classroom practice, and a strong focus on emerging issues such as AI in education, the sustainability of reforms, and competence-based training. Overall, this volume stands as a key reference for readers seeking to understand and critically guide education in societies marked by digitalization, uncertainty, and an increasing demand for inclusion and democratic participation.

*Katherine Meltzoff,
Education and Human Development Series Editor*

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