PAULO FREIRE'S CRITICAL PEDAGOGY AND THE ROLE OF NUMBERS IN ADULT EDUCATION

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Abstract
Paulo Freire's critical pedagogy is premised on the liberation of oppressed individuals through education with learning being an inherently political act. Adult numeracy education on the other hand holds that numbers transcend mere mathematical computation embodying tools for critical consciousness and empowerment. Since there remains a conspicuous research gap concerning how numbers specifically function within critical pedagogical practices aimed at adult learners, this study addresses this lacuna. The study seeks to unearth fundamental questions such as: How can numbers be leveraged to bringing about critical thinking and social justice among adult learners? What are the barriers and facilitators in implementing numeracy education through a Freirean perspective? The study employs the qualitative method of research by critically analyzing the nexus between the importance of numeracy in fostering critical awareness even as the traditional approaches to teaching mathematics often fail to resonate with adult learners' lived-experiences, thereby inhibiting their ability to critically engage with numerical concepts in relation to the world. The significance of this study lies in its contribution to the evolving discourse on critical pedagogy and adult education since the Freirean principles offers valuable insights for educators seeking to enhance their teaching from theory to practice. As a finding, Paulo Freire's critical pedagogy provides a robust foundation for reimagining adult numeracy education especially from its emphasis on praxis and dialogical interactions engendering positive actions.

Keywords: Pedagogy, Critical, Numeracy, Adult, Education, Oppression, Dialogic, Freedom

Introduction

Paulo Freire's critical pedagogy is a response to oppressive educational systems that perpetuated social inequities with its root in his experiences with marginalized communities in Brazil. Freire's seminal work, *Pedagogy of the Oppressed* (2000) introduced a paradigm shift, by advocating for education as a means of liberation and empowerment. His theory posits that learners must develop critical consciousness which will enable them to recognize and challenge systemic injustices. This historical backdrop is necessary for understanding how Freire's principles can be applied to various domains of education, including adult numeracy. Adult numeracy education remains a significant yet underexplored area which is characterized by diverse learner needs and varying levels of mathematical proficiency. The current state of adult numeracy education reflects both advancements and persistent challenges. For instance, (Baker & Street, 1994) notes that, while technological innovations

have facilitated new methods of teaching mathematics, many adult learners continue to face barriers relating to socioeconomic status, prior educational experiences, and cultural backgrounds. These factors underscore the need for an inclusive approach that aligns with Freirean ideals.

Traditionally, mathematics has been perceived as a neutral discipline devoid of political or social implications. However, scholars such as Skovsmose (2020) argue that mathematics education inherently involves power dynamics and social justice issues. While numerous studies have explored critical approaches to literacy and general education, few have specifically examined how Freire's principles can inform the teaching of numbers. This study aims to fill this lacuna by investigating the role of critical consciousness in numerical literacy while highlighting the necessity for a more holistic understanding of mathematical education. Traditional methods often prioritize rote learning and procedural fluency at the expense of deeper conceptual understanding and social relevance of mathematics. Gutierrez (2018:25) contends that, "Mathematics education should equip students with the tools to critically analyze and transform their realities". This position aligns with Freire's assertion that education must empower individuals to become active agents of change. Furthermore, the social justice implications of numerical literacy cannot be overstated. Numerical skills are essential for navigating everyday life, from managing personal finances to participating in democratic processes. However, disparities in mathematical proficiency increases existing social inequalities, particularly among marginalized groups.

This study will therefore examine how Paulo Freire's principles apply to teaching numbers within the context of adult education. It will investigate the mechanisms through which critical pedagogy can enhance numerical literacy and promote empowerment. To achieve this, the following research questions shall guide the inquiry such as: How do adult learners perceive the relationship between numerical literacy and social justice? What strategies can educators employ to integrate critical consciousness into numeracy instruction? What are the outcomes of implementing a Freirean approach to adult numeracy education? The attempt to answer these questions will set the study on the track of contributing new ideas and knowledge within the broad framework of the subject matter bringing about more clarity in these aspects.

Conceptual Clarifications

The Concept of Critical Pedagogy: According to Freire (1970) Critical Pedagogy is an educational approach that emphasizes the importance of critical thinking, dialogue, and social justice in the learning process. Freire maintained that traditional education deliberately maintains social inequality by supporting social constructs and reinforcing cultural traditions. Freire's concept of critical pedagogy is focus on the idea of 'conscientization' which refers to the process of becoming aware of one's social and political reality and taking action to transform it (Freire, 1970). Principles of note in critical pedagogy according to Freire (1970) include dialogue which has to do with encouraging open and critical dialogue between students (adult learner) and teachers to promote critical thinking and problem-solving. The second is conscientization which has to do with raising awareness of social and political realities and encouraging students (adult learners) to take action to transform them. Another is problem-based learning which has to do with encouraging students (adult learners) to question and challenge dominant ideologies, rather than simply accepting them. The last is empowerment where students (adult learners) are empowered

to take control of their own learning and become active participants in the educational process. Critical pedagogy is an approach to learning that says, you are not just a receiver of information; you are an intellectual, an interrogator, and a change maker. It is about inspiring critical thinking, fostering dialogue, an empowering the students to challenge the traditional way of doing and seeing the world. In a critical pedagogy classroom, students/adult learners will be motivated to ask challenging questions like why are things the way they are? Why is there something and not nothing? And how can we make the world a better place for all? In critical pedagogy, students/adult learners will learn to think critically about the world around them, and to examine information and seek out different perspectives. Critical pedagogy is about taking action to create a more just and equitable world. It is about recognizing that education is not just an individual pursuit but a collective one that can form the world we live in.

The Concept of Numbers: Numbers are mathematical objects used to count, measure, and label quantities (Katz, 2013). Numbers can be natural, whole, integers, rational, irrational, real and complex. Natural numbers refer to the set of positive integers beginning from 1and are used primarily for counting and ordering; whole numbers include natural numbers along with zero and are used in basic arithmetic operations and counting. Integers comprise both positive and negative numbers as well as zero and they are used for representing both directions on a number line; rational numbers are numbers that can be expressed as the quotient or fraction of two integers and are useful for measurements and comparisons. Irrational numbers on the other hand are numbers that cannot be expressed as a fraction of two integers and they have non-repeating and non-terminating decimal expansions. Real numbers comprise the set of both rational and irrational numbers; complex numbers involve the square root of negative numbers and are expressed in the form of a+bi, where ‘a’ and ‘b’ are real numbers and ‘i’ is the imaginary unit. Numbers have the following properties: commutativity- the order of numbers does not change the result of addition or multiplication; associativity- the order in which numbers are grouped does not change the result of addition or multiplication; distributivity- multiplication distributes over addition (Katz, 2013).

The Concept of Adult Education: The concept of adult education has undergone various interpretation by scholars across different periods. However, a landmark definition emerged from the International Conference on Adult Education held in Paris, France in 1976, and this gained widespread acceptance and has since served as a foundational reference point. Adult education is the entire body of organized educational processes, whatever the content, level, or method, whether formal or otherwise, whether they provide or replace initial education in schools or colleges, and universities as well as in apprenticeship, whereby persons regarded as adult by the society to which they belong develop their abilities, enrich their knowledge, improve their technical or professional qualifications, or turn them in a new direction and bring about changes in their attitudes or behaviour in the two-fold perspective of full personal development and participation in balanced independent, social, economic, and cultural development (UNESCO, 1976). The above definition of adult education provided in 1976 by UNESCO is all encompassing as it comprises formal, non-formal, and self-directed learning (informal learning). Nevertheless, as specialization and professionalization continue to evolve, certain aspects like apprenticeship training have become more closely linked with technical and vocational education rather than being exclusively categorized under adult education. A more recent and significant definition of adult education emerged from the

Fifth International Conference on Adult Education (CONFINTEA V), held in Hamburg, Germany, in 1997 which has since gained considerable importance and recognition. The 1997 definition of adult education has gained widespread acceptance due to its emphasis on the critical role of adult education in enhancing human well-being. Given the current global challenges, including environmental degradation, poverty, inequality, and rising insecurity, the need for adult education as a catalyst for peace, tolerance, and dialogue has become increasingly pressing. Furthermore, the growing diversity and complexity of modern societies underscores the importance of adult education in fostering intercultural and multicultural understanding thereby promoting social cohesion and global citizenship.

Literature Review

The historical development of critical pedagogy traces its roots back to the mid-twentieth century when Paulo Freire began formulating his revolutionary educational theories in response to the oppressive conditions faced by marginalized communities in Brazil. Freire's seminal work, *Pedagogy of the Oppressed* (2000), laid the groundwork for a transformative approach to education as it emphasized the role of dialogue, reflection, and action in fostering critical consciousness among learners. His concept of *conscientização* challenged traditional models of education that reinforced passive learning and social hierarchies. According to Freire (2000), true education must empower individuals to recognize and challenge systemic injustices, thereby transforming their realities. This paradigm shift was further elaborated upon by subsequent scholars who expanded on Freire's ideas. For instance, Shor (1987) emphasized the importance of problem-posing education, where learners actively engage with real-world issues rather than passively receiving information. This approach fosters a deeper understanding of societal structures and encourages learners to become agents of change. Similarly, McLaren (2009) explored the intersection of critical pedagogy with broader socio-political contexts, highlighting the need for educators to address issues of race, class, and gender in their teaching practices.

The evolution of critical pedagogy also reflects a shift in educational philosophy and practice. Giroux (2010) noted that the rise of neoliberal policies and market-driven approaches to education has posed significant challenges to the implementation of critical pedagogical principles. In this context, critical pedagogy serves as a counter-narrative, while advocating for an education system that prioritizes equity, justice, and human dignity over profit and efficiency. The application of critical pedagogy extends beyond formal educational settings to various domains of adult learning. Scholars as Brookfield (2005) have examined how critical pedagogy can be adapted to adult learning environments, emphasizing the importance of creating inclusive spaces that value diverse perspectives and lived-experiences. Paralleling the development of critical pedagogy, the field of adult numeracy education has also undergone significant transformations. Historically, adult numeracy education has been shaped by competing ideologies and pedagogical approaches. On one hand, traditional methods have focused on skill acquisition and functional literacy with the aim to equip learners with practical mathematical skills for everyday life. On the other hand, more recent approaches have sought to integrate numeracy with broader educational goals while recognizing the social and cultural dimensions of mathematical knowledge. As argued by Baker and Street (1994), numeracy is not merely a technical skill but a socially constructed practice embedded within specific cultural contexts. This perspective aligns with Freire's notion of praxis, suggesting that numerical literacy should be understood from a broader societal implication.

Furthermore, scholars as Skovsmose (2020) have explored the political dimensions of mathematics education, referencing how mathematical knowledge is replicated in power relations and social inequalities. Critical pedagogical approach within educational framework can help learners develop a critical awareness of these dynamics, enabling them to challenge and transform unjust systems. This connection between critical pedagogy and numeracy underscores the potential for creating more equitable and empowering educational experiences for adult learners. As the field of critical pedagogy continues to evolve, it is essential to examine its applicability to diverse educational contexts, including adult numeracy education which is what this study is currently doing. The social context of numerical literacy also plays a pivotal role in shaping adult learners' experiences and outcomes in numeracy education. It is important to note that numeracy is not merely a technical skill but a socially constructed practice embedded within specific cultural and historical contexts. Understanding the social dimensions of numeracy requires examining how mathematical knowledge is produced, transmitted, and utilized within different societal structures and power relations. From this perspective, numeracy education becomes an arena for addressing broader issues of equity, justice, and empowerment.

One key aspect of the social context of numerical literacy is its relationship to economic inequality. Numerical skills are increasingly recognized as essential for economic participation and mobility in the modern workforce. However, disparities in numeracy proficiency extends existing social inequalities, particularly among marginalized groups such as low-income individuals, ethnic minorities, and immigrants (OECD, 2019). These disparities reflect systemic barriers that limit access to quality numeracy education and perpetuate cycles of poverty and exclusion. For instance, financial literacy initiatives that focus on budgeting, saving, and investing can empower learners to make informed decisions and improve their economic well-being (Lusardi & Mitchell, 2014). Moreover, the social context of numerical literacy extends beyond economic domains to civic and democratic participation. Numeracy is a critical skill for engaging in public discourse, analyzing data, and making informed decisions about societal issues. In democratic societies, citizens must be able to interpret statistical information, evaluate policy proposals, and hold elected officials accountable. However, many adults lack the necessary numerical skills to doing these. This deficit undermines their capacity to participate fully in civic life and contribute to the common good. The social context of numerical literacy also encompasses the role of community and collective action in promoting numeracy education. Numeracy is not solely an individual pursuit but a shared endeavour that benefits from collective support and collaboration such as participatory action research projects that involve learners in identifying and addressing local numeracy challenges (Freire, 2000) while Ole Skovsmose (1994:57) notes that, "Mathematics can be seen as a technology of power".

Methodology

This study employs a qualitative research approach to explore the role of numeracy in adult education within the framework of Paulo Freire's critical pedagogy. The research primarily relies on a review of existing literature, focusing on scholarly articles, books, and case studies related to Freire's pedagogical theories and the integration of numeracy in adult education programs. The research design for this study adopts a qualitative approach with critical analysis as the method. This is particularly apt for exploring the intricate experiences of adult learners in numeracy education. This method allows for an in-depth exploration of how adult learners perceive and engage with numerical literacy within the context of critical

pedagogy. By adopting the critical method, concepts can be thoroughly assessed along a logical line of thought bringing clarity and a deeper understanding of how they connect to other aspects of truth and reality within the broad framework of the issues under consideration.

Theoretical Framework

The framework draws on the work of Paulo Freire and other scholars who advocate for education as a means of liberation and empowerment. Since for Freire, education must be a practice of freedom, not a practice of domination. This point underscores the need for educators to challenge oppressive structures and promote critical consciousness among learners. Within the context of adult numeracy education, the theoretical framework emphasizes the importance of recognizing the socio-political dimensions of mathematical knowledge and its role in shaping power relations and social inequalities. Another key aspect of the theoretical framework is its focus on praxis, the integration of theory and practice aimed at transforming reality. Mathematics education has the potential to equip adult students with the tools to critically analyze and transform their realities.

The Role of Numbers in Adult Education

Numbers are not merely abstract entities but essential tools for problem-solving, decision-making, and resolving complex social and economic challenges. In adult education, integrating numerical concepts plays a critical role in bringing about cognitive development while enhancing workplace competencies, and promoting social equity. Gal (2018) underscores the importance of numeracy skills in enabling adults to engage meaningfully with their surroundings underpinning essential life skills that extend beyond basic arithmetic. For instance, financial literacy, which involves understanding budgets, interest rates, and investment strategies, relies heavily on numerical reasoning. According to a report by the Organisation for Economic Co-operation and Development (OECD, 2019), adults with strong numeracy skills are better equipped to manage personal finances and make informed healthcare decisions while participating actively in civic activities. The acquisition of numeracy skills among adults is fraught with challenges. Many adult learners encounter barriers stemming from prior educational experiences, cultural perceptions of mathematics, and socio-economic constraints. Coben (2003) notes that negative attitudes toward mathematics, often rooted in childhood experiences, can persist into adulthood, creating psychological barriers to learning. These attitudes manifest as math anxiety, which affects both motivation and performance. To address such challenges, educators must adopt pedagogical approaches that emphasize relevance, accessibility, and learner empowerment. Contextualized learning, where numerical concepts are embedded within familiar scenarios, has shown promise in reducing anxiety and enhancing engagement. A study by Evans (2014) found that when adult learners see direct connections between mathematical concepts and their daily lives, they are more likely to develop confidence in their abilities.

Numeracy contributes to workforce readiness by equipping with the analytical skills necessary for modern professions. As industries increasingly rely on data-driven decision-making, employees must possess the ability to interpret and manipulate numerical information effectively. Hoyles *et al*. (2010) avers that organizations investing in numeracy training for adult workers experienced improved productivity, reduced errors, and enhanced innovation. Moreover, enhanced numeracy skills contribute to social equity by bridging gaps between different demographic groups. Historically marginalized populations, including women, ethnic minorities, and low-income individuals, often face disparities in access to

quality education. Despite its importance, the teaching of numeracy in adult education remains under-theorized and under-resourced compared to other subjects. Gal (2018:23) argues that "adult numeracy education should focus on developing flexible thinking rather than adhering rigidly to conventional algorithms". Numeracy it must be noted does not exist in isolation but complements other forms of knowledge. Thus, the role of numbers in adult education should be viewed as part of a broader educational framework rather than a standalone objective. Research indicates that adults rely on both procedural and conceptual knowledge when engaging with numbers, suggesting that instructional methods should incorporate both types of learning. Conceptual understanding involves grasping the underlying principles of mathematical operations, while procedural knowledge focuses on executing steps correctly. Combining these approaches enhances the retention and transferability of skills. Furthermore, studies reveal that metacognitive strategies—such as self-reflection and error analysis—play a crucial role in improving numeracy outcomes among adults.

International frameworks, such as the Sustainable Development Goals (SDGs), emphasize the need for universal access to quality education, including numeracy. Countries implementing successful numeracy programs often share common characteristics, such as strong institutional support, teacher training, and community involvement. The integration of numbers into adult education is further complicated by the diverse backgrounds and motivations of learners. Adults returning to education after extended absences may face unique challenges, such as balancing work, family responsibilities, and academic pursuits. Numeracy serves as a gateway to opportunities, yet disparities in access to quality education perpetuate cycles of disadvantages. The evolving nature of work and society further underscores the importance of numeracy in adult education. Automation, artificial intelligence, and globalization are reshaping the labour market, creating new demands for quantitative literacy. The role of numbers in adult education therefore, must be considered within the broader context of lifelong learning. Numeracy is not a static skill but a dynamic capability that evolves. As individuals encounter new challenges and opportunities throughout their lives, their need for numerical competence grows. Lifelong learning frameworks, such as those proposed by the OECD (2019), emphasize the importance of ongoing education and training to support personal and professional development. The role of numbers in adult education is profound and multifaceted and influences individual capabilities, organizational effectiveness, and societal progress.

Analyzing Freire's Critical Pedagogy and Numeracy in Adult Education

Paulo Freire’s critical pedagogy has profoundly influenced educational theory and practice, leading to an understanding of the relationship between education, power, and social transformation. While Freire’s work primarily addresses literacy, its principles can be extended to numeracy education, particularly in contexts where adults engage with numbers as tools for empowerment and liberation. Freire’s critical pedagogy basically emphasizes that education is not a neutral process but rather a means of either maintaining or challenging existing power structures. In *Pedagogy of the Oppressed* (1970), Freire critiques the "banking model" of education, where knowledge is deposited into passive students by authoritative teachers. Instead, he advocates for a dialogical approach, where both teacher and learner actively participate in constructing meaning through critical reflection and action. For Freire, education becomes a tool for emancipation when it enables individuals to critically analyze their reality, identify oppressive systems, and take steps

toward liberation. Although Freire's original focus was on literacy, his emphasis on critical consciousness and problem-posing education aligns very well with the challenges and opportunities of numeracy education. Numeracy, like literacy, involves more than acquiring technical skills as it encompasses the ability to interpret, question, and act upon quantitative information in meaningful ways. In adult education, numeracy often serves as a gateway to economic stability, civic participation, and personal empowerment. However, traditional approaches to teaching numeracy frequently mirror the banking model criticized by Freire. These methods prioritize rote memorization of procedures over conceptual understanding, reducing mathematics to a set of abstract rules disconnected from real-world applications.

Such an approach can alienate adult learners, particularly those who have experienced trauma or failure in previous educational settings. By contrast, applying Freirean principles to numeracy education shifts the focus from mechanical computation to critical engagement with numerical concepts, bringing deeper learning and greater relevance. One of the core tenets of Freire's critical pedagogy is the importance of context. For Freire, learning must begin with the lived-experiences of learners, drawing on their unique histories, cultures, and environments. This principle aligns closely with contemporary research on contextualized learning in numeracy education. According to Gal (2000), numeracy is inherently situated as it cannot be fully understood or applied outside of specific cultural, social, and practical contexts. When adult learners encounter mathematical concepts embedded within familiar scenarios, they are better able to make sense of them and see their value. For example, a program that teaches budgeting skills using examples drawn from participants' own financial situations allows learners to connect abstract numerical principles to tangible aspects of their lives. This connection not only enhances comprehension but also empowers learners to use their newfound skills to address real-world problems. Moreover, Freire's emphasis on dialogue underscores the importance of collaborative learning in numeracy education. Dialogue, in Freirean terms, is not merely conversation but a process of mutual exploration and co-construction of knowledge.

In a numeracy classroom informed by critical pedagogy, teachers function as facilitators rather than authorities, encouraging learners to share their perspectives, ask questions, and challenge assumptions. This fosters a sense of community and collective responsibility, countering the isolation many adult learners feel in traditional educational settings. Another key aspect of Freire's critical pedagogy is its focus on praxis which is the cycle of reflection and action. For Freire, true learning occurs when individuals critically reflect on their experiences and then act upon their insights to transform their realities. Applied to numeracy education, this concept encourages learners to move beyond passive consumption of information to active engagement with numerical data. Take for instance the situation where adult learners analyze local unemployment statistics; this could prompt discussions about systemic inequities and inspire collective efforts to advocate for policy changes. Similarly, a course on environmental sustainability might task learners with calculating carbon footprints and proposing solutions to reduce emissions in their communities. Through such activities, numeracy becomes a vehicle for critical consciousness and social activism, aligning with Freire's vision of education as a force for liberation. Mathematics, after all, is often perceived as objective and universal, free from the biases inherent in language and literature. Gutstein (2006:15) argues that, "mathematics is not neutral; it carries values, assumptions, and power relations".

Consequently, integrating Freire's ideas into numeracy education requires rethinking the role of error and uncertainty. Traditional approaches to mathematics often stigmatize

mistakes, viewing them as failures rather than opportunities for growth. In contrast, Freirean pedagogy embraces error as an integral part of the learning process, recognizing that genuine understanding emerges through experimentation and reflection. This perspective is particularly important in adult numeracy education, where fear of making mistakes can increase math anxiety and hinder progress. Framing errors as stepping stones rather than obstacles, can aid in creating a more supportive and empowering learning environment. The application of Freire's critical pedagogy to numeracy education also raises important questions about assessment and evaluation. Standardized tests, which dominate much of the current reality in mathematics, often fail to capture the full range of skills and competencies developed through critical numeracy instruction. For example, a portfolio that documents a learner's journey from initial struggles with percentages to successful application of those concepts in managing household budgets provides a richer picture of progress than a single test score ever could. Such approaches align with Freire's belief that assessment should serve as a tool for reflection and improvement rather than judgment and ranking. Again, the intersection of Freire's critical pedagogy with numeracy education brings about the need for culturally responsive teaching practices. Just as literacy instruction must account for the diverse linguistic and cultural backgrounds of learners, so too must numeracy education recognize and value the varied experiences and identities of adult learners. Culturally relevant pedagogy, as advocated by Ladson-Billings (1995), emphasizes the importance of connecting curriculum content to learners' cultural references and lived realities. In the context of numeracy, this might involve incorporating indigenous counting systems, exploring the mathematics of traditional crafts, or analyzing statistical data related to social justice issues affecting specific communities. In so doing, educators can enhance relevance, promote inclusivity, and foster equitable outcomes in numeracy.

Conclusion

Paulo Freire's critical pedagogy brings about valuable insights by emphasizing context, dialogue, praxis, and cultural responsiveness, Freirean principles provide a pathway for developing numeracy programs that empower learners to critically engage with numerical information and act upon their insights to effect social change. While challenges remain such as overcoming entrenched perceptions of mathematics as neutral or objective, the potential benefits of integrating critical pedagogy into numeracy education are significant and far reaching. Through a sustained commitment to these principles, educators can help adult learners harness the power of numbers not just as tools for survival but as instruments of liberation and transformation. By engaging with these principles, learners develop not only numerical proficiency but also a critical awareness of the structural factors shaping their lives just as "problem-posing education allows learners to see mathematics as a tool for social change rather than just a set of abstract rules" (Frankenstein, 1989:45). Nasir and Cobb (2007:123) also makes the point that "creating inclusive classroom cultures is essential for fostering equity in mathematics education". For Skovsmose (1994:57), "Mathematics education is never politically neutral; it always serves particular interests and reproduces certain power dynamics". Understanding these power relationships is crucial for addressing the inequities and injustices that pervade mathematical learning environments.

Furthermore, Valero (2004:89) opines that, "the language of mathematics operates as a gatekeeper, determining who has access to mathematical knowledge and who is excluded". Hence, "Recognizing and valuing multiple mathematical identities is essential for fostering equity and inclusion in mathematics education" (Martin, 2009:102). In line with

Freire's position, "numeracy education should empower learners to critically analyze and challenge unjust systems" (Skovsmose, 2020:15). Paulo Freire's critical pedagogy offers a transformative approach to adult education, emphasizing dialogue, critical thinking, and the development of learners' awareness of their social realities. With regards to numeracy, this pedagogical framework goes beyond rote learning of numbers and mathematical procedures as it fosters an understanding of how numeracy can be used as a tool for social empowerment and critical engagement. Integrating numeracy within the context of Freire's pedagogy, adult learners can be encouraged not just to learn numbers but to reflect critically on the societal systems in which these numbers operate. The role of numeracy, therefore, extends beyond basic skills acquisition and becomes a means of understanding and challenging oppressive structures in society.

Recommendations

Based on the analysis of this study, Adult education programs should incorporate Paulo Freire's principles of critical pedagogy into their numeracy curricula. This can be achieved by designing numeracy lessons that focus on the context and application of numbers in real-life situations, encouraging learners to question and reflect on the socio-political dimensions of the mathematical concepts they learn. Educators in adult learning programs should be properly trained on the integration of critical pedagogy with numeracy education. Teachers should be equipped with the skills to foster a dialogic and participatory classroom environment where adult learners can critically engage with numeracy content. Furthermore, numeracy programs should emphasize practical and contextual applications of numbers that are relevant to the everyday lives of adult learners. By relating numerical concepts to the lived-experiences of learners, educators can make learning more meaningful and empower students to use numeracy as a tool for social change. This will go a long way in bridging concepts such as realism and idealism with everyday reality that needs explication for social action and change.

References

Baker, D., & Street, B. (1994). "Literacy and numeracy: The social construction of literacy practices". *International Journal of Educational Development*, 14(1), pp: 57–68.

Brookfield, S. D. (2005). *The power of critical theory: Liberating adult learning and teaching.* New York: Jossey-Bass.

Coben, D. (2003). Adults Learning Mathematics: What We Know, What We Don't Know, and What We Should Do About It. London: NRDC.

Evans, J. (2014). Adults' mathematical thinking and emotions: A study of numerate practices. *International Journal of Lifelong Education*, 33 (6), pp: 577-593.

Frankenstein, M. (1989). *Relearning mathematics: A different third R—radical math(s)*. London: Free Association Books.

Freire P. (1970). *Pedagogy of the Oppressed:* London: Continuum.

Freire, P. (1985). *The politics of education: Culture, power, and liberation.* London: Greenwood Publishing Group.

Freire, P. (2000). Pedagogy of the oppressed (30th Anniversary ed.). London: Continuum.

Gal, I. (2000). :Adult numeracy education: Research, development, and practice:. *Journal of Adolescent & Adult Literacy*, 44 (4), pp: 346-351.

Gal, I. (2018). Numeracy: "The new literacy for a data-drenched society". *Journal of Educational Change*, 19 (2), pp: 15-36.

Giroux, H. A. (2010). "The crisis of public values in the age of the new media". *Fast Capitalism*, 6(1), pp: 3–24.

Gutiérrez, R. (2018). Political conocimiento for teaching mathematics: Why teachers need it and how to develop it. In S. E. Kastberg, A. M. Tyminski, A. E. Lischka, & W. B. Sanchez (Eds.), *Building support for scholarly practices in mathematics methods*. New York: Information Age Publishers.

Gutstein, E. (2006). *Reading and Writing the World with Mathematics: Toward a Pedagogy for Social Justice*. New York: Routledge.

Hoyles, C., Noss, R., Kent, P., & Bakker, A. (2010). "Improving mathematics at work: The need for techno-mathematical literacies". *Journal of Mathematics Teacher Education*, 13 (3), pp: 227-248.

Katz, V. J. (013). *History of Mathematics: An introduction*. London: Pearson Publication

Ladson-Billings, G. (1995). "But that's just good teaching! The case for culturally relevant pedagogy". *Theory into Practice*, 34(3), pp: 159–165.

Lusardi, A., & Mitchell, O. S. (2014). "The economic importance of financial literacy: Theory and evidence". *Journal of Economic Literature*, 52(1), pp: 5–44.

Martin, D. B. (2009). "Researching race in mathematics education". *Teachers College Record*, 111(2), pp: 295–338.

McLaren, P. (2009). *Life in schools: An introduction to critical pedagogy in the foundations of education.* London: Pearson.

Nasir, N. S., & Cobb, P. (2007). *Improving access to mathematics: Diversity and equity in the classroom*. London: Teachers College Press.

OECD. (2019). *OECD Skills Outlook 2019: Thriving in a digital world*. London: OECD Publishers.

Shor, I. (1987). *Critical teaching and everyday life*. Chicago: University Press.

Skovsmose, O. (1994). *Toward a philosophy of critical mathematics education*. London: Kluwer Academic Publishers.

Skovsmose, O. (2020). *Critique as uncertainty*. London: Information Age Publishers.

UNESCO (1976). International Conference on Adult Education. Paris: UNESCO.

Valero, P. (2004). "Postmodernism as an attitude of critique to dominant mathematics education research". In M. Walshaw (Ed.), *Mathematics education within the postmodern*. London: Information Age Publishers.