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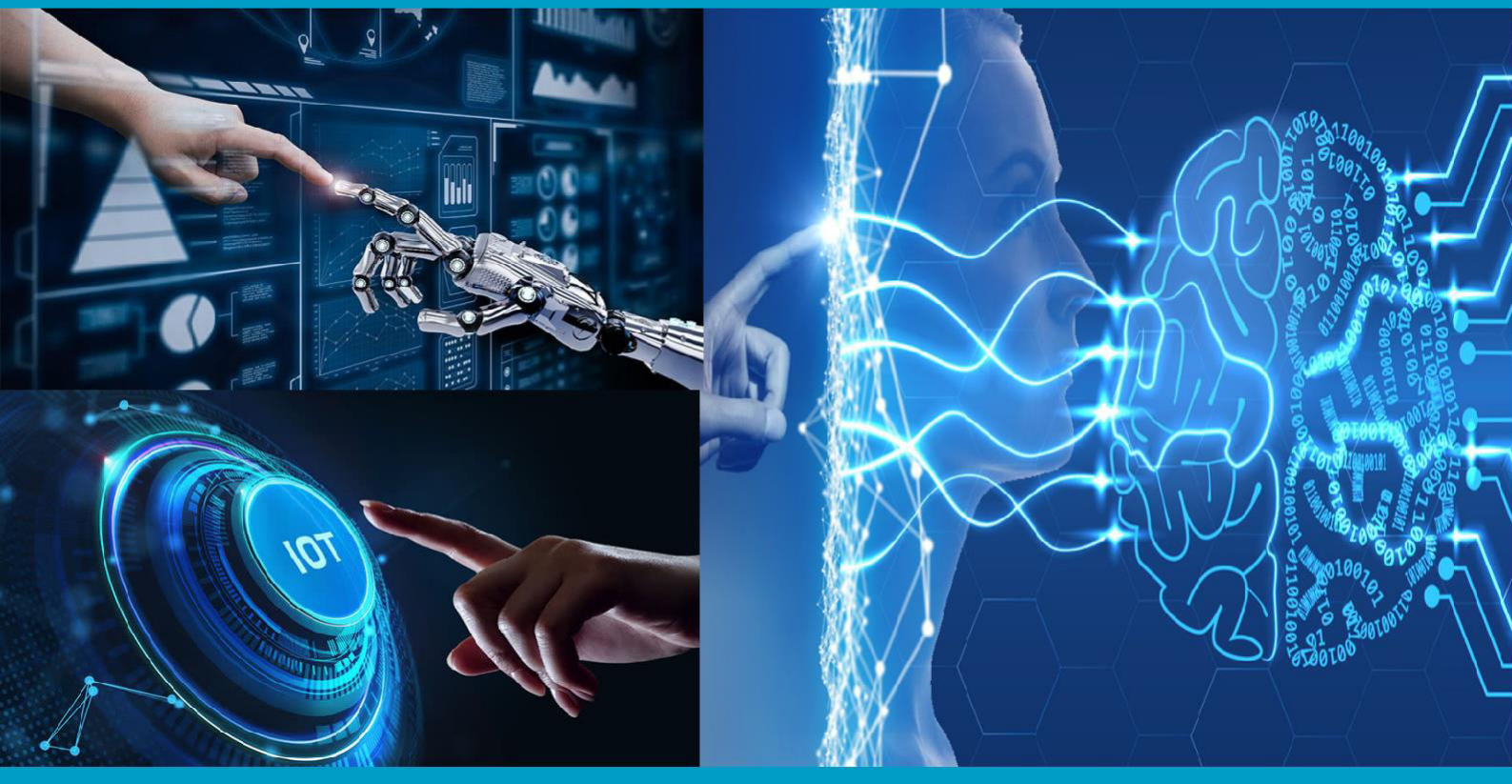

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The Correlation between Mathematics Education and Civilization: An Abridged Study

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ABSTRACT: Mathematics education has played an important role in giving impetus, impulse and space in moulding one civilization for the emergenceand growth of the study of social, cultural, political and economicaffairs with the application of the analytical aspects of Mathematics education. These varied directions of motivations have procreated diverse areas of allowance - such asthe impact of gender and class, ethno-mathematics, critical mathematics education,equity and social justice - which have found expressions in the scientific activities andprogrammes of social research. This paper is intended to provide an abridged view of the different fields of investigation viz. social, cultural, political and economics. In this paper, the study is organisedaround three themes: conducting research, sites of structural disadvantages and thepedagogic implications of critical mathematics education.

KEYWORDS: Mathematics, education, society, impact, analysis.

I. INTRODUCTION

There has been an increasing acknowledgement over the last two decades that the context inwhich learning occurs profoundly affects what is learnt and by whom. In much earlyMathematical research, knowledge was conceived as being simply aproperty of the individual consciousness. The realisation that knowledge isproduced in situations (Lave, 1988; Wenger, 1998; Lerman, 2000) requires us tomove beyond an analysis of learning which is dependent on a psychologicalrepresentation of the mind alone and to consider instead the setting – its socialrelationships, its cultural locality, the discursive frameworks available in the locale,the social and political environment which frames it – and how that setting functionsgeneratively in the construction of knowledge. In other words, Mathematical education research has taken 'a social turn' (Lerman, 2000:19). Indeed,as HeatherMendick et. al. state in their seminar papers, there is a recognition that Mathematicseducation is always already social.

However, those researchers who are most likely to be found together in a forumfocused on Mathematics education and society usually mean something more thanthis. Such researchers understand Mathematics education as being a overpoweringly political activity – political in the sense of being intimately bound up with issues ofpower, authority and the legitimisation of knowledge: such researchers who are carrying their research works in the field of finding the associations between Mathematics and civilization, is able to decide whathappens, who is recognised as having the authority to set the agenda, whose interestsare served by currently dominant conceptions of learning, whose voice 'counts',whose knowledge is deemed authentic and commanding and so on (Hardy andCotton, 2000; Klein, 2002). Education is seen as being deeply value-overloaded, a moralactivity. It follows that enquiry in Mathematics education must engage with issues ofsocial justice and that a fundamental role of Mathematics education research iscritique and transformation.

This papercovers three inter-connectedthemes.

• A number of the economic and socio-political research fields are concerned with specifically methodologicalquestions. What are the implications of an equity agenda for research methodsand methodologies? Are there specific methodological implications forcritical Mathematics education researchers?

• Some areas of research drawparticular focus on one of the systematic sites of disadvantages in Mathematics education. How do class, gender, race, ethnicity

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and global position division plays impact on Mathematics education? How are the sites of structural disadvantages conceptualised? How do they interact?

• A third focusand at the same time, the central concern of some of the findingsin the practices of socio-economic inequalities associated with teaching, learning and accrediting Mathematics in secondary as well as higher stages of education in developing Mathematics teaching-learning techniques. Whateducational practices promote or inhibit a social justice agenda? What might be the outlook of critical Mathematics pedagogy?

This overview briefly considers each theme in turn and draws on the social, cultural, political and economic affairs with an analysis to illustrate and extend them.

II. REVIEW OF RELATED LITERATURE

Organisation of Women and Mathematics Education (IOWME) has been active for more than twenty years. During this time, the attainment profile for girls in Mathematics has changed significantly in a number of countries but issues remain: young women opting out of Mathematics who identifies with Mathematics and how the ways that Mathematics classrooms permit and perpetuate unhelpful stereotypes and many more.Other research has focused on 'race' and ethnicity (Atweh et al, 2001, Ladson-Billings, 1997, Powell, 2002); or on class (Frankenstein, 1990; Povey and Boylan, 1988; Zevenbergen, 1999; Lubienski, 2002). Others have specifically identified the issues of indigenous people coming to learn Mathematics (Zevenbergen, Mousley and Sullivan 2004). Tate (1997) also draws on all these areas to identify the difficulties of multiple areas of disadvantage on the learning of mathematics. Through much of this research, these sites of structural disadvantages have been conceptualised as fundamentally interconnected (Keitel, 1998). Structural sites of disadvantage form the focus. Dave Wagner's paper points up both the difficulty and the possibilities of research in the contexts of indigenous peoples.Ofhis own work, he writes, Colonialist storylines seem inevitable in this community that experiences the fallout of colonialism daily. Though respectful research and dissemination is challenging in such an environment, it can improve intercultural understandings. Two other contributors also seek to research respectfully with the Mathematics education experiences of indigenous peoples. Robyn Zevenbergen's contribution is concerned with Indigenous students who live in remote communities in Australia. Alerted by PISA to the continuing profound inequality between different social, cultural and geographic Australian communities, she uses ethno-Mathematical ideas to explore the tensions between school Mathematics practices and the mathematical knowledge the students bring to school. Bill Atweh illustrates his theoretical argument mentioned earlier with material from a study in the Asia Pacific region concerned with the internationalisation and globalisation of mathematics education: he draws on the views of mathematics educators from around the world to report on and develop in understandingthe collaboration projects between industrialised and less industrialised. Paola Valero's contribution draws attention to the fact thatmathematics education research, in general, has been operating in a reality that is far from being the reality of most classrooms in the world. She argues that mathematics education researchers, moving between utopia and reality and seeking to contribute to creating better utopias, need to give serious consideration to the reality of the vast majority of the world's mathematicsclassrooms. A research agenda is required which generates knowledge about what it is to teach and to learn Mathematics in classrooms in situations of poverty and conflict.

III. ACCOMPANYING RESEARCH

As well as Mathematics education concerns itself, conducting mathematics educationalresearch is also a political and moral activity involving issuesof values, power,authority and legitimacy. Researchers interested in Mathematics education andsociety are likely to suggest that the aim of inquiry for social justice is ‘the critiqueand transformation of the social, political, cultural, economic, ethnic and genderstructures that constrain and exploit humankind (Guba and Lincoln, 1998: 211,original emphasis). Such a posture may have implications at a methodological leveland a number of the contributors to this study make such methodologicalconsiderations a focus. Research methods and methodologies are not neutral with respect to social justice, what are needed for approaches that explicitly acknowledge the politics ofmethodology and its impact on research (Vithal, 2003). Power differentials aboundin the relationships between the researcher and the researched, with consequentquestions about the status - an acknowledgement of the 'limits of knowing' (Walshaw2002, p.346) - and ownership of the tales that are told (Povey and Angier, 2006). Inher contribution to this seminar, Tansy Hardy suggests an understanding of researchas discursively and culturally constituted and explores the implications for how dataare read and how and which stories

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are told as a result, focusing on thediscursive practices the researchers do. Dave Wagner is also concerned with storylinesbutin contrast his paper draws on positioning theory and favours an approachwhere interpretation 'considers only the interactions of the immediate participants ina conversation' since 'discourse systems are solely experienced locally through themedium of individuals in interactions'. He raises concerns about authority structuresand about how communities are represented, illustrating the ideas by reporting onwork with Canadian Indigenous communities. He identifies colonial storylines andtheir connection with transmission metaphors for knowledge acquisition; and hecontrasts these with more respectful ones which show distributed agency. Others who have become frustrated with Mathematics education research which doesnot deal with social justice issues in a practical way which have argued that there is a strongneed to bring teachers into the research process and focus on issues of equity as theyrelate to classroom practice (Rousseau & Tate, 2003). The concern here is to avoidconducting research on, rather than with teachers (Setati 2000). In her contribution, MerrilynGoos examines how teachers and researchers can worktogether in ways which allow genuinecollaboration to be brought into being ratherthan in ways which simply serve the academic researchers' agenda. She draws onthree methodologically distinct, research projects to generate questions about therole of Mathematics education research with respect to critique and transformation ofthe researcher and the researched. The paper contributed by Tony Cotton is alsoconcerned to critique and transform this accepted set of relationships:

Research in mathematics education is surely conducted for the benefit of teachersand the children they work with. Yet so often the voices of these keybeneficiaries are marginalised within research to play the roles of clippedcommentators allowed in only so long as they offer sound bites that sit neatly inthe researcher's preferred story.He suggests an alternative and more democratic purpose for Mathematics educationresearch, that of opening up spaces for marginalised or 'silenced' groups to be heard.He describes using new, more collaborative methods to enable researchers, teachersand pupils to 'speak to' both the academy and to those who form policy, methodswhich privilege experience over theory as a basis for understanding, allowing us tothink how our world may be changed. A warning is given in the contribution from Bill Atweh about the complexity ofachieving change in education. He argues that in spite of the long history ofresearch and practice, social justice remains under theorised in Mathematicseducation. He notes that as Mathematics acts as a gate-keeper for entry tomany aspects of society, programmes have been developed to meet the needs ofstudents who are deemed not to be engaging or not to be achieving as a result offactors of social background. He demonstrates some tensions between differentpossible understandings of social justice and associated practices; basing hisargument on the writings of Nancy Fraser, he points up that suchunderstandings andpractices may achieve the opposite of what was intended.

The gap between desired change and the results of attempts to achieve it is also takenas a starting point in the paper from Candia Morgan, this time in the context ofteacher development and pedagogical change. She argues that currently, evaluationexplanations of the gap tend to focus on the characteristics of the individual teachersinvolved; and there is an associated tendency to frame such explanationsin terms that suggest teacher deficit, often related to their pedagogic subject knowledge ormismatch between their beliefs and reform principles.The paper argues for the value of a Critical Discourse Analytic approach which takesinto account 'the social and cultural contexts in which innovation takes place',contexts which structure the sense-making of both teachers and students. Theapproach involves detailed attention to and analysis of texts produced by the fullvariety of participants in the educational system, texts which are likely to producemultiple competing discourses with a view in understanding better the positionsavailable to teachers and students and the impact of these on their identities and onhow they engage with pedagogic innovation, transformation and change.

It has long been recognised that neither education systems in general nor Mathematics education in particular is neutral in terms of learners' positioning withrespect to class, gender, race, ethnicity and global position. With respect to each ofthese (and other) positioning, some learners are systemically, structurallydisadvantaged. For some of these sites, there is a considerable body of related Mathematics education research. One key area ofstructural disadvantage which has been a focus of considerable research attentionover the last few decades is that of gender (Barnes, 2000; Becker, 1996; Burton,1999; Fennema, 1996; Forgasz et al, 2000; Grevholm and Hanna, 1995; Leder et al,1999; Mendick, 2006). The internationaleffects of class and home upon the lived experiences of pupils is the focus of thecontribution from Vanessa Roper and Peter Gates. They use Bourdieu's conceptof cultural capital to frame their analysis of two case studies of pupils near thebeginning of their secondary schooling, exploring the factors which influencesuccess at school. They examine the influence of home and family including socio-economic status and linguistic backgroundon Mathematics attainment; they alsoconsider the effects of schooling itself. The pupils resulting Mathematical learningtrajectories are examined and the claim is made that what the pupils achieve in thefuture willin all likelihood, be shaped by their social background.In their contribution, Heather

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Mendick et.al. argue that issues of gender, class andethnicity are all deeply implicated in the construction of what is takes to be a Mathematician.

IV. THE PEDAGOGICAL IMPLICATIONSOF CRITICAL MATHEMATICS EDUCATION

If young people are to learn to think mathematically(Alroand Skovsmose, 2002)to develop as persons and to acquire those democraticcompetencies needed to live as citizens – critical consciousness, sustained and sustainable action and co-operation (Moreira, 2002) – there are implications for Mathematics classrooms. They will need to be placed where learners set upproductive relationships with the process of coming to know. Mathematics is experienced as being only a body of already established abstractknowledge, always known and belonging to experts, a discipline which is 'withoutfuzziness or debateable results ... no experiment, no interpretation of evidence, nocomparison of criticisms' (Rodd, 2002:2). Learning Mathematics becomes only aprocess of acquiring received knowledge of already existing rules and procedure anddoing Mathematics becomes performance. Rather tasks are needed which can beapproached in a variety of waysand for which awide range of tools can be offeredas appropriatewhich provide useful opportunities for learners to see themselves asactive, as choosing, deciding, producing arguments for and against, assessingvalidity and generating questions and ideas. Such practices profoundly affect thenature of the resulting knowledge. How we know, and how we come to know, areinseparable from what we know.Ole Skovmose isinterested in the notions of critique and of critical mathematics education andspecifically, in their relationship to both uncertainty and possibility. He argues that Mathematics operates as part of a world-wide distributed technical rationality, ineveryday practices, in professional contexts and in technological enterprises in acomplex web of social and political framings. It operates in a globalised economywith the accompanying locations of disadvantages and is implicated in the processes ofinclusion and exclusion. knowledge. Europe there is amovement to recognise and accredit suchexperiential mathematicalcompetences for the very many people who have not followed regular compulsoryschooling but the frameworks being devised forsuch accreditation seem only to beable to take schooling and academic learning as their reference point.

As well as setting up productive relationships with coming to know, and as part alsoof that agenda, social justice demands that teachers and learners set up productiverelationships between and amongst themselves. Relational equity is the theme of JoBoaler's contribution to the seminar. She uses this term to describe equitablerelations in classrooms, relations that include students treating each other withrespect and responsibility. Her report is based on a four-year study in Californianhigh schools. In one of the study schools, a low-income, ethnically diverse, urbanhigh school, the pupils learned to respect others in the class who were differentlypositioned with respect to cultural background, social class, gender and attainmentlevel. In addition, their behaviour overall improved and they achieved better resultswith differences in attainment between groups either reduced or eliminatedaltogether. The classroom approach was multi-dimensional, nurturing social andintellectual commitment, communication, responsibility and respect.

V.CONCLUSION

In the welfare of impartiality, there is a continuing and pressing need for research whichadvances our understanding of the issues related to Mathematics education andsociety. This paper throws light on the field of Mathematics education and socio-economic status of a civilization. Thereby providing an enriched perspective on the possibilities for effective actions fortransformative change.

REFERENCES

1. Atweh, Bill,"Understanding and practicing social justice in Mathematics education"
2. Boaler, Jo,"Promoting 'relational equity' through a Mathematical approach focusedupon social justice".
3. Cotton, Tony,"Relationships to Mathematics, relationships in learning Mathematics.
4. Goos, Merrilyn,"Critique and transformation in researcher-teacher relationships in Mathematics education".
5. Hardy, Tansy,"Subjectivity as a tool to explore relationships to learning andteaching Mathematics".
6. Knijnik, Gelsa "Regimes of truthon adult peasant mathematics education: Anethno-mathematics study".
7. Matos, João Filipe & Santos, "Madalena Recognizing and validating mathematicalcompetences in adults: political and ethical dimensions".
8. Mendick, Heather, Marie-Pierre Moreau & Debbie Epstein,"Embodying Mathematics.
9. Morgan, Candia,"Researching innovation in curriculum and pedagogy from acritical perspective".

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| Volume 10, Issue 3, March 2023 |

| DOI: 10.15680/IJMRSETM.2023.1003018 |

10. Roper, Vanessa & Gates, Peter,"The subtle but pervasive influence of class inlearning at school, the case of Mathematics".
11.Alro, H. &Skovsmose, O. (2002),"Dialogue and learning in Mathematics education: Intention, Reflection, Critique. Dordrecht Kluwer.
12. Atweh, B., Forgasz, H. &Nebres, B. (Eds.) (2001),"Socio-cultural research onMathematics education: an international perspective".
13. J. Boaler (Ed.),"Multiple perspectives on Mathematics teaching and learning".
14. Boaler, J. (1997) Experiencing school Mathematics: teaching styles, sex and setting". Buckingham: Open University Press.
15. Fennema, E. (1996),"Scholarship, gender and Mathematics". 16. Forgasz, H. J., Leder, G. C. & Vale, C. (2000),"Gender and Mathematics: changingperspectives".
17. Mathematical literacy curriculum,"Journal of Negro Education", 59 (3) 336-347.
18. Gorogrio, N. &Planas, N. (2005),"Social representations as mediators of Mathematicslearning in multi-ethnic classrooms". European journal ofpsychology of education,.
19. Hardy, T. & Cotton, T. (2000),"Problematising culture and discourse for Mathematicseducation research: tools for research. Proceedings of the 2nd InternationalMathematics education and society conference, Montechorro, Portugal..
20. Klein, M. (2002),"Teaching Mathematics in/for new times: a poststructuralist analysisof the productive quality of the pedagogic process. Educational studies inMathematics, pp.63-78.
21.Leder, G. C., Brew, C. & Rowley, G. (1999),"Gender differences in Mathematicsachievement-here today and gone tomorrow?
22. Powell, A. (2002),"Ethno-Mathematics and the challenges of racism in Mathematicseducation. Proceedings of the 3rd International Mathematics Education andSociety Conference, Denmark.

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