

**AN INTERNATIONAL DEVELOPMENT INTERVENTION  
IN MATHEMATICS EDUCATION IN TANZANIA:  
LOOKING BACK 25 YEARS LATER.**

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*Informed by the research of the first author for his doctoral thesis “Cooperation, Complexity and Adaptation: Higher Education capacity initiatives in international development assistance programmes in sub-Saharan Africa” (2018), this paper examines Irish Aid funded initiatives in mathematics education (at primary, post-primary and third levels) in Tanzania in the 1990s. Testimonies of key informants (both Tanzanian and Irish) involved in these initiatives, along with unpublished archival material from the period, provide the evidence base for the qualitative research. The research methodology employed was inductive analysis and purposive sampling. The second author worked on a project supporting mathematics (and mathematics education) in both the university and NGO sectors in Tanzania from 1991 to 1994. The authors argue that, in a development context, initial and continuing mathematics teacher education requires a whole-of-systems perspective, considered over an extended period of time and transcending the boundaries between levels of education.*

## **INTRODUCTION**

In 1973, around the time of Ireland’s accession to the (then) European Economic Community, the Government of Ireland initiated a programme of overseas development assistance, which later came to be known as Irish Aid (Murphy, 2012). In its early days, Irish Aid considered its comparative advantage to lie in supporting technical assistance and human capacity development projects (as distinct from large infrastructural and capital-intensive ones). The intention was to address identified skills deficits in the four chosen ‘priority’ countries of sub-Saharan Africa (Lesotho, Sudan, Tanzania and Zambia), drawing on appropriate Irish expertise and in response to requests from host Governments and institutions (Murphy, 2012, p. 68).

When it came to translating these aspirations into practice in the institutions of higher education in Ireland, a cross-institutional implementation body, Higher Education for Development Cooperation (HEDCO) was set up in 1975, with the purpose of acting as Irish Aid’s promotional and implementing arm for higher education cooperation with Africa, through the participation of the all-island university sector in Irish Aid.

In the 1990s, HEDCO designed and implemented two projects relating to mathematics and mathematics education, one in the University of Dar es Salaam (USDM), the other in Korogwe Teachers’ College (KTC). Between these two initiatives, a rich alliance was forged between Tanzania and Ireland involving expertise and building capacity in mathematics and mathematics education at primary and secondary (post-primary) levels, as well as in initial teacher education and higher education. In KTC, the project sought to contribute to upgrade the quality of mathematics teaching in Tanzania through design, piloting and adaptation of appropriate methodologies and materials for

teaching of mathematics at primary level, with particular emphasis on the girl child and the woman teacher. In UDSM, the project was designed to secure an academically self-sustaining Department of Mathematics to enable it to fulfil its University mandate for teaching and research, and to support outreach initiatives aimed at improving quality of mathematics teaching in schools and colleges.

The first author, having spent a decade of his earlier career with HEDCO, recently completed his doctoral thesis (McEvoy, 2018) examining the role of higher education capacity development as a component of international development assistance programming to Africa, provided by international finance institutions, and by OECD member states (including Ireland). The second author completed his doctorate in numerical analysis in 1984 and lectured in mathematics from 1981 until 2016, including three years in UDSM (1991-1994). Soon after arriving in Tanzania he became involved in the Mathematical Association of Tanzania (MAT/CHAHITA), developing there an interest in mathematics education which deepening on his return to Ireland. In 2016, he made the transition from mathematics to mathematics education at the DCU Institute of Education. His experience in Tanzania, along with his work in mathematics and mathematics education informs the discussion below seeing the first author's research from the perspective of mathematics education.

## **RESEARCH SCOPE AND METHODOLOGY**

The research (McEvoy, 2018) set out to examine the historical pathways which have supported aid-funded higher education capacity initiatives (AFHECIs), and their contribution to strengthening sub-Saharan Africa's higher education systems and to wider societal transformation. It examines two public policy domains (international development and higher education) each of which is demonstrably complex and multi-faceted.

The inter-disciplinary and trans-disciplinary character of the study required a heterogeneous methodology encompassing multiple sources of qualitative evidence: (i) literature review, (ii) 27 key informant 'depth interviews', (iii) case studies using archival material (including that relating to HEDCO in general and the two Mathematics education projects in particular), and (iv) practitioner reflection spanning some 30 years of professional practice in development programme management and evaluation.

The underpinning theoretical perspective was that of Complex Adaptive Systems (CAS) theory, which has been gaining currency as a theoretical prism on topical problems in public management and organisational analysis (Land, Hauck & Baser, 2009). Consistent with the inductive nature of this study, purposive sampling, a non-random technique widely used in qualitative research for the identification and selection of information-rich subjects (Patton, 2002), was used to determine the population of potential interviewees.

The study examined critically the adequacy of the conventional techniques used by bilateral and multilateral donor agencies in assessing what constitutes an effective AFHECI. A synthesis of the different sources of evidence yielded a set of eleven constitutive attributes of effective AFHECIs, some of which are discussed further in the next section, with reference to the two mathematics education projects.

## **HOW THE RESEARCH RELATES TO MATHEMATICS EDUCATION**

In the past decade significant attention has been paid to supporting capacity building in mathematics education in developing/low-income countries. This is especially evident in the initiatives supported by the International Commission on Mathematical Instruction (ICMI) and, in particular, the Capacity and Networking Project (CANP) which arose in response to the UNESCO report, *Challenges in basic mathematics education* (2012). This report emphasises the vital importance of collaboration, not just North-South cooperation, but also regional cooperation (p. 37). AFRICME 5 is a manifestation of the latter; we will return to the former below. The report also includes (UNESCO, 2012, pp. 73-75) an annex on research on teacher education in South Africa and Southern Africa, giving a synopsis of work (at that time) in recruitment and retention of mathematics teachers, in the selection of content for initial teacher education, and in ongoing professional development. These are global challenges, but are particularly acute in the Global South. To make progress with the most urgent demands facing mathematics education it is necessary to pay attention to building and sustaining communities to collaborate in research in the field. An engaging account of how an individual (ICMI President, Jill Adler) can inspire and foster such collaboration is given by Graven, Phakeng & Nyabanyaba (2016).

Another aspect of the terrain considered in the UNESCO report (pp. 29-30) is the goal of achieving synergy “among a variety of experts such as mathematicians, teachers, teacher trainers and educationists in particular.” The complexity and diversity of the relationships between practitioners of the disciplines of mathematics and mathematics education are elaborated in a collection of essays edited by Fried and Dreyfus (2014). The many and urgent questions that arise in this discourse cannot be ignored when considering mathematics education in a Global Southern context; and yet, scarce resources and demographic pressures demand cognisance of economic constraints without compromising a spirit of generosity.

It is difficult to embrace all the contexts in which AFHECIs reside, and to draw some insights from experiences of over two decades ago of mathematics and mathematics education in Tanzania. The contexts outlined in the previous two paragraphs were then only ‘in gestation’. In analyzing interviews with 27 informants, McEvoy (2018) coded 532 references in eleven categories (or attributes), five of which gave rise to the (post-pilot) conceptual framework (pp. 103-104, 189-190). Here we mention one relevant key finding from each of four of these five (with the **name of the attribute** in bold). Under **forging alliances**, it was found that “authentic partnerships need to be mutually respectful, genuinely needs-responsive and focused on institutional-level capacity,” while (under **adaptation to change**) there was a “constant balancing act demanded between operating in a fluid global environment, while also maintaining strong collegiality, consensual decision-making, inclusiveness and impartiality.” These findings underscore how fruitful collaboration can withstand the contingencies that arise in implementing AFHECIs. Moreover, under **purpose & motivation**, informants affirmed that “clarity of purpose is essential for AFHECIs to be effective.” All of this rings very true to the second author as he recalls the day-to-day activity (25 years ago) of teaching analysis, numerical analysis or algebra to prospective teachers and engineers, identifying candidates for further study in Ireland, working with teachers in the field, ensuring textbooks were brought to publication, or visiting schools. Under **knowledge & skills**, informants drew attention to the rise of donor aversion “to deploying technical assistance (once considered key to [capacity development]).”

## *Last names of the authors in the order as on the paper*

This policy shift, a trend evident in the early 1990s, was well established by 2000, but without being explicitly supported by convincing evidence.

There were other, more specific, insights arising from interviews with informants, of which we mention three (McEvoy, 2018, pp. 143-145). An independent evaluator of the KTC project remarked that a ten-year funding horizon is needed to support capacity development in the education sector. A Tanzanian lecturer with extensive experience in higher education in Ireland drew attention to the low level of awareness of quality assurance in the Tanzanian higher education sector. An Irish technical assistant (in initial teacher education) noted a reluctance to fill senior vacant posts in Tanzania by well qualified applicants from neighbouring countries.

## **CONCLUSIONS**

The landscape of mathematics education is an extensive one. Each country has its own distinctive characteristics moulded by policy, curriculum and other official and societal norms – see O'Reilly, Dooley, Oldham & Shiels (2017) for an overview of the Irish one. Yet each national and regional landscape is embedded in a global one where scholars exchange ideas and learn from the global community. Considering also the analogous landscape of mathematics, this has another character, with its own practices and societal norms. These two global landscapes interact in a fascinating topology! Adding another perspective of capacity building in a world where inequality between the Global South and North has deep historical roots; now, this space is truly complicated and needs to be seen as a whole. It seems that sustained collaborative work in building communities of practice to address the challenges in basic mathematics education is already bearing fruit. Without making any extravagant claims, it also seems that some of these essential elements of collaboration were already established a quarter of a century ago on a small scale between Tanzania and Ireland.

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