

Grace Alele-Williams

Nigerian Mathematician of Many Firsts— Breaking Down Barriers and Opening Paths

Karin-Therese Howell and Nancy Ann Neudauer

Grace Awani Alele-Williams is a woman of many firsts. She is the first woman in Nigeria to receive a doctorate in any field and the first woman appointed to be the Vice-Chancellor of an African university. She is a champion of numerous women's causes, paving the way to make the road easier for women who came after her. She believes that in being the first, it was essential to demonstrate that women could succeed in these roles. So she did not cower when faced with opposition, but rather was a force to be reckoned with, exposing and overturning corruption and cultism, developing robust programs for both in-service teachers and university students, changing how school mathematics was taught in Nigeria, building up a new university both in terms of facilities and programs, and confronting restrictions on women in the workplace arising from societal norms and employer policies. She is among the very few mathematicians who have made significant contributions to mathematics education at all levels, from elementary to university. More remarkably, some of the textbooks and ideas about teacher training that Alele-Williams developed are still in use in Nigeria today. But while her impact and contributions might be well known in mathematics education circles in Nigeria, they are not as well known in other parts of Africa or the world. This article outlines the life of Grace Alele-Williams and offers insight into her ground-breaking work in education and work practices for women in Nigeria in the twentieth century.

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Figure 1. Grace Awani Alele-Williams.

Background

Born Grace Awani Alele on December 16, 1932, in Warri (now Delta State), an oil hub and former capital of the province in Nigeria, she was the last of five siblings. Her family valued education and her mother devoted much of her time to teaching all five children herself. During her primary school education, Grace's mother moved her to three different schools by the age of 10, trying to ensure that she received the best education possible. Despite suffering through many illnesses as a child, at the age of about 12, Grace gained entry into the prestigious Queens College, Lagos (then the capital of Nigeria) and lived as a boarder

for secondary school, allowed to visit her family only once a year. At 18, she began undergraduate studies as one of 10 women amongst 400 students at the University College of Ibadan (now the University of Ibadan). She studied with many students who would later work their way up to having careers as policy makers and in senior positions in education. For example Bola Ige, Chinua Achebe and Akin Mabogunje were her contemporaries.¹ She chose to study mathematics owing to her interest in the subject and the joy she experienced solving problems and working through proofs. She often discussed mathematics with her cousin, who also maintained a keen interest in the discipline and told Grace from a young age that when writing proofs, every statement had to be supported with a reason. Her cousin also had a pet monkey, which was an added attraction of these visits. At this time, University College Ibadan did not award its own degrees.² Consequently, Alele-Williams received her Honours Degree in Mathematics in 1954, as an external degree from the University of London [10].

Perhaps inspired by her mother's dedication to education, Alele-Williams began her career as a teacher at Queen's School, Ede, Osun State, not far from Ibadan. During this time, she made a long-lasting impact on her students. Working with other teachers from Britain (who taught Arts and Sciences) and Nigeria (who taught Home Economics, Religion, and Physical Education), they produced a "large cadre of girls who subsequently became leading professionals in various sectors of Nigerian society [10]." Thus, right from the very start, Alele-Williams contributed to educating young women.



Figure 2. Regions of Nigeria, with locations from Alele-Williams' life and career highlighted.

¹Bola Ige was a lawyer and prominent Nigerian politician. Chinua Achebe was a novelist and poet who is regarded as the most dominant figure in modern African literature. Akin Mabogunje was a geographer and the first African to be elected as a Foreign Associate of the United States National Academy of Sciences.

²Alele-Williams was in the second set of students of this first university in Nigeria, along with Chinua Achebe and several others who rose to prominence.

Out of Africa

Alele-Williams secured a Nigerian government grant to study at the University of Vermont, where she also worked as a graduate assistant, with the goal of becoming a secondary school teacher. The cold weather in Vermont combined with the stifling experience of segregation in the rural setting [2] prompted Alele-Williams to leave Vermont after finishing her Master's Degree in Education in 1959. Her exposure to mathematics and science education in the United States, however, inspired her to question the education system in Nigeria, and she decided to continue beyond her Master's degree. In the United States, she had witnessed active learning alongside formal lecture and a focus on understanding instead of just memorization. Universal education was also different from the system in Nigeria, where access varied widely from region to region, and had sometimes been reserved for the sons of chiefs. Most of her previous experience in Nigeria was in a system dominated by British influence. She writes about this in her PhD thesis and highlights the fact that contributions of British-trained Nigerians dominated the education system in Nigeria at the time. She believed that armed with a PhD, she would be better equipped to introduce changes. She recognized that this credential was necessary for her to lead such a charge [10]. At this point, the vast post-Sputnik support for mathematics provided her with the opportunity to attend the University of Chicago, Columbia, or Harvard, funded by a graduate fellowship. Thus as a young woman of 25, she had the educational choice of a lifetime for any student from Africa or otherwise. She chose Chicago.

The University of Chicago gave Alele-Williams education in and access to experts in comparative education, especially through its Center for Comparative Education,³ and a distance and lens through which she could view and study the educational system in Nigeria. In her dissertation, she observed that the newly independent African states "envision education as a means of fostering economic growth, expanding social amenities and inculcating in the masses the ideals of democratic nationhood [1]." She pointed out that education had become an important instrument of social change, in contrast with the colonial period, during which educational activities were externally motivated and focused on the training of the present generation of African political leadership. Alele-Williams looked at the history

³The Center for Comparative Education (CCE) is an interdisciplinary research center within the Department of Education of the University of Chicago that was launched with the purpose of bringing social science faculty outside of the field of education and a cross-cultural flavor into the Department of Education. This was at a time when comparative education was gaining stature as an educational specialty. Its founding director, Arnold C. Anderson, chairman of Alele-William's advisory committee, wrote in 1966, "We at Chicago do believe that there are certain essentials of a sound program, and we give high priority to features that others would regard as idiosyncratic" [15].

and geography of education in Nigeria, introduced by British missionaries to spread the Christian gospel in the East and West, but kept out of the North because the prevailing Islamic administration banned proselytizing and establishing schools. Educational policy promoted the education of the chiefs' sons and members of the ruling class, resulting in an educational system throughout Nigeria that was not uniform. As she described it, the schools and universities had "created cleavage between the elite and the masses [1]."

Alele-Williams argued in her dissertation that the indigenous nationalist movement to create an independent Nigerian state (encouraged by foreign-educated Nigerians who resented aims for Nigerian development in British terms) sought to replace native authorities with local governments, establish a new social order, and expand educational and health facilities. American-trained Nigerians, she noted, helped the nationalist movement whereas the British-trained Nigerians were less attuned to the masses and had a stake in the status quo. Alele-Williams wanted to be a part of the transition to a new universal educational system.

The First Firsts

Alele-Williams completed her PhD in 1963—the first Nigerian woman awarded a doctorate—with a thesis entitled, *Dynamics of Education in the Birth of a New Nation: Case Study of Nigeria*. And Nigeria was a new nation at this time, gaining independence in late 1960, but not, as it turned out, a stable government until many decades later. Independence for Nigeria was finally achieved, and Alele-Williams began to forge the path ahead for women—for herself and for many, many women to follow. She returned to Nigeria in December of 1963 to take a postdoctoral position at the University of Ibadan and to marry Babatunde Abraham Williams. Williams had completed his Master's Degree in 1954 at the University of Illinois and in 1963 he was a Senior Lecturer in political science at the University of Ibadan, where Adele-Williams had earned her Honors Degree.

In 1965, after two years of postdoctoral work in Ibadan, Alele-Williams was appointed as a Lecturer in the Faculty of Education at the University of Lagos where her husband also secured a position. She was promoted to Senior Lecturer in 1968 and to Associate Professor of Mathematics Education in 1974, becoming the first female in Nigeria to hold this position. Even though she had been in the university just as long as her husband, and she was an Associate Professor there, she did not have the same rights as he and other men did. When her husband was laid off in 1975, they were told to vacate the campus apartment they occupied with their five children. Her petition to retain their apartment based on her position as an Associate Professor was originally denied, but then granted on

appeal, leading to a new "points system" for all employees that allowed women to be treated more equally, and also made it possible for a woman to retain accommodation.

Alele-Williams was building her own identity and independence at the same time as Nigeria was moving towards its independence. As a newly independent nation, Nigeria was establishing new systems and structures, including a new educational system, which opened the door for Alele-Williams to work toward universal education. Could it be that leaving the colonial system, and such strict adherence to the British mores, also opened the door for women, including Alele-Williams, to push traditional boundaries and limitations for women?

Contributions to the Educational System and Teacher Training

Alele-Williams believed that students should take an active role in learning mathematics and discovering concepts—ideas embraced today in the form of inquiry-based learning. These ideas are still sparse in African schools and universities across the continent, where more formal lecture is the norm. Her work emphasised the importance of student understanding, as opposed to just memorizing mathematical methods. These ideas were revolutionary in the 1960s and 70s (see [5]). In her thesis she also expressed the view that Nigeria would need scientists to drive economic activity to ensure graduates have employment opportunities.

When Alele-Williams finished her doctorate and returned to Nigeria, she was able to become a participant in a new series of mathematics workshops, held in Entebbe and Mombasa. These workshops were part of the African Mathematics Programme (AMP) under the leadership of MIT professor Ted Martins, who made several visits to Africa during this time. The AMP has its roots in the SMSG (School Mathematics Study Group), an American initiative focused on the reform of mathematics education [5]. The aim of the Programme was to consider changes in education in Africa with the view that a more lasting type of aid to Africa might take the form of assistance to educational institutions and programs [4]. This philosophy of aid to Africa persists today, with the African Institute of Mathematical Sciences (AIMS) providing graduate degrees in six countries to pan-African students from over 30 countries, grounded in the belief that a robust background in mathematics can prepare Africans to solve their own challenges and problems.

From 1963 to 1975, the AMP organized annual eight-week writing workshops in Africa that produced the *Entebbe Modern Mathematics series*. These workshops included participants from many African countries, including Ethiopia, Ghana, Kenya, Liberia, Malawi, Nigeria, Sierra Leone,

Uganda, Tanzania, and Zambia. Alele-Williams captured the contributions when she wrote,

The Entebbe Mathematics Series have sometimes been dubbed American but this is to ignore the valuable contribution of the African participants, who feel keenly the African origin of the series. Moreover the whole exercise has provided an international forum for teaching and learning, unprecedented in the annals of education. Africans, working with Europeans and Americans, have produced mathematics texts good enough for use anywhere in the world. Mutual benefits have been derived by all concerned and the project has clearly contributed to international understanding [6].

With these words, Alele-Williams staked a claim for the African contribution to this series. As is often the case, the Americans and Europeans were credited with saving the Africans. The reality, however, was that the Africans were full participants, bringing their knowledge and experience to the workshops, developing and shaping the *Entebbe Modern Mathematics Series* (see [7]).

The AMP workshops produced at least 67 volumes of materials covering mathematics education, including primary school, teacher training, secondary, and sixth form levels (the secondary mathematics of the final two years, preparing university-bound students for their A-level exams). The aim was to provide support for teachers in both the methodology of teaching mathematics and in the content itself. Later, videos were made as additional resources for teachers [11].

Initially, a limited number of schools adopted these materials in order to test the educational development of the students against those using the standard curricular materials of that time. The standard curriculum mostly focused on arithmetic, while the revised modern mathematics included new topics like set theory, geometry, probability and complex numbers. As Alele-Williams noted, these latter subjects were already included in European and American instruction. In what was referred to as the *Lagos Experiment*, schools would offer one experimental class with the others taught as traditional classes. In one Lagos school, this meant 15 traditional grade one classes ran alongside one experimental class. Parents demanded their children have access to the experimental class to learn the modern mathematics with the hope that it would improve their future options. As a result, the materials were soon widely adopted.

Although the AMP had redesigned the curriculum with care and thought, some serious obstacles arose. In particular, some teachers were not adequately qualified to teach the new material, particularly in certain regions of the country. To address this issue, Alele-Williams published the

Modern Mathematics Handbook for Teachers in 1974 to help both new and in-service teachers learn the methods and the topics from the *Entebbe Modern Mathematics series*. Her awareness of the challenges facing the educational system in Nigeria were clear in a report she wrote in 1976 ([4]): "Teaching the teachers mathematics is a relatively simple task but changing their attitude and practice is harder. Several years of hard work are still necessary before we can truly claim that modern mathematics has come to stay." Alele-Williams understood that it was not only about producing new training materials but also about equipping teachers with content knowledge and confidence to teach the content. In fact, Alele-Williams is still fighting for better training for teachers, and in 2017 she sued the government for better funding to produce quality teachers so that secondary students could compete globally [16].

Despite the extensive work that went into creating the new curriculum, the teaching of this "modern mathematics" in the schools was short lived. In a 2004 interview, Alele-Williams commented on her role in the project: "I tried to review the teaching of mathematics in schools, to make sure that the teachers understood the new concept which was already in use in Europe and America. I think we made an appreciable progress. But one of the saddest days of my life was the day the federal commissioner announced in 1978 that modern mathematics was abolished in schools." [9] The reform was also criticised as unsuitable for the populace. This was likely because some teachers were not adequately trained and parents did not understand the modern mathematics and were not equipped to help their children, especially once it made its way out of the initial *Lagos Experiment* schools where it was tested and into the village schools. The introduction of modern mathematics throughout Nigeria may have followed a similar path as the introduction of "new math" in the United States, where teachers, who were not prepared to teach it, found it challenging, and parents were baffled. The quote of Alele-Williams from the previous paragraph perhaps extends beyond Nigeria, "Teaching the teachers mathematics is a relatively simple task but changing their attitude and practice is harder." Consequently, modern mathematics was abolished in Nigeria. A task force was established to investigate how to redesign the curriculum. The changes were implemented beginning in 1981.

In 1974, Alele-Williams was appointed Director of the Institute of Education of the University of Lagos, where she served until 1985. In this role, she introduced many non-degree courses and certificate programs. In particular, these programs helped older women working as elementary school teachers to improve their training, opportunities that were not available to them earlier (see [12], for example). Alele-Williams's educational ideas were not limited to K-12 students or to university students who were pre-service teachers. She aimed to improve the lives of in-service

women teachers too. From 1979 to 1985, she also served as the chair of the Lagos State Curriculum Review Committee and Lagos State Examinations Board.

Late Career and Widespread Recognition

As Professor of Mathematics Education at the University of Lagos, where she remained until 1985, Alele-Williams received many honors and awards, including becoming a Fellow of the Mathematical Association of Nigeria and a Fellow of the Nigerian Academy of Education, and receiving the Merit Award for Bendel State. These awards recognized her contributions to the education system in Nigeria.

The year 1985 brought another first to Alele-Williams. In this year, she was appointed as the Vice-Chancellor of the University of Benin in Benin, Nigeria, and she became the first woman to hold this position at an African University. At the time, Nigeria was still an extremely patriarchal society, with few accustomed to a woman serving in a leadership role. She was not deterred, however, revealing financial irregularities and calling attention to neglected student facilities functioning without water and to unfinished campus buildings. She resolved these problems, setting the university back on track. It was not an easy time to occupy this office—not only did some colleagues try to undermine her, but Nigeria was also at the height of militaristic rule and the tertiary education system was struggling and fraught with secret cults⁴ associated with inciting violence and creating havoc on campuses, including trying to suppress student protest movements demanding democracy. Alele-Williams was a skilled administrator and her courage and ingenuity are credited with limiting the cultism in her university which sent “ripples of change across institutions of higher learning all over the country [6].” These ripples of change were in the form of quelling, at least for a time, cultism at universities across the country. She was also demonstrating that a woman could be an effective (and tough) high-level university administrator.

One of Alele-Williams’s former students, speaking of her time as Vice-Chancellor on the occasion of her 80th birthday, said,

Professor Alele-Williams did it with grace, guts and grit. As the first woman to be appointed the Vice-Chancellor of a Nigerian university, the cynicism before her takeover in Benin was ear-splitting! From calmly and firmly defusing sponsored “alutas,” rumour-mongering, scary shadow-boxing, sabotage and all, her time at the University of Benin from 1985 to 1991 qualifies as a Golden Age. Mama Grace

⁴These cults were secret fraternities within higher education established in 1952 by idealistic students—including Nobel laureate Wole Soyinka—to rebel against middle-class elitism. In the 1960s and 1970s several breakaway groups formed rivalries. They are now banned in Nigeria.

Alele-Williams opened her doors to everyone, treated students with respect, listened to what they had to say, encouraged academic freedom, victimized no one on account of holding contrary views and made the University of Benin a true place of learning. And she did all this at the height of military rule [14].

During her time as Vice-Chancellor, she aimed to advance other women and used the criticism of colleagues (and the publicity it brought) to further her initiatives. For example, she introduced modern computer facilities, degree courses in computer science, and diplomas in the Faculties of Science and Medicine. Her contributions echo her early life, building her own identity at a time when Nigeria was finding its way to independence and sharing this process with others. Alele-Williams was once again building something—this time an institution—against the backdrop of an unsettled situation.

I saw it as an opportunity to show that women too could rise up to the occasion. Also, I knew what the weight of the expectations of the women was. They were eager to see how things would go and I was not going to let them down [6].

Alele-Williams wanted to use her positions to give women confidence to pursue their interests. Many years later she admitted that her excitement about serving as Vice-Chancellor had more to do with opening up the field for women than anything else. This highlights one aspect of her legacy, the imprint she made on individual lives. She also had a more collective impact. She served as a member of the African Union Commission on Women in Mathematics in Africa and as the Vice-President of the Third World Organisation for Women in Science. She was the recipient of the very prestigious Officer of the Order of the Niger (OON) in 1987 that honors Nigerians who have rendered service to the benefit of the nation.

Her focus on developing and improving education in Africa reached beyond the University of Lagos and the University of Benin, and even beyond Nigeria. She served on a global level in many capacities during this time, including as a member of the governing council at the United Nations Educational, Scientific, and Cultural Organization, and as a consultant to UNESCO and the Institute of Educational Planning.⁵ She was also Vice-President of the World Organization for Early Childhood Education and later became President of the Nigerian branch. In these positions she advocated for the alleviation of poverty in communities, the education of girls, and gender equality.

⁵This is an arm of UNESCO that aims to support educational policy, planning and management through various programs.

Following her time as Vice-Chancellor, Alele-Williams served on the board of directors of Chevron-Texaco, Nigeria and HIP, an Asset Management Company in Lagos. In November 1994, she was invited to give the Distinguished Annual Lecture at the National Institute for Policy and Strategic studies in Kuru, a conglomerate of small semi-developed villages, hamlets, and households on the Jos Plateau in north-central Nigeria. During this address, she spoke passionately about the role of tertiary education in bringing about cohesion and development in Nigeria [13]. On that occasion, she explained her approach to mathematics that focused on problem solving. Her visionary ideas at the time remain remarkably relevant today. There is no denying that graduates with a strong background in mathematics, skilled in problem-solving and creative thinking, are needed for Nigeria's economic development.

On 28 February 2014, Alele-Williams walked with the aid of crutches to receive the Centenary Award in Nigeria, awarded by the President, Goodluck Jonathan. The Centenary awards honored a hundred Nigerians on the occasion of 100 years as an amalgamated nation. It was widely reported in the media that she received deafening applause as she made her way to the podium, reflecting how admired she was by the broader community.

In addition to the Centenary Award, Alele-Williams received two honorary degrees in recognition of her contributions, one by the University of Benin in 2017 and the other by the University of Ibadan in 2018. These awards testify to the national recognition of the importance of her contribution to the education system in Nigeria.

In Conclusion

Grace Awani Alele-Williams achieved many of her "firsts" for Nigerian women, and sometimes for African women, as Nigeria was becoming a new nation. In this broader time of transition for the country as a whole, she contributed to the transformation of education at all levels, to the building of a university, and to the breaking down of boundaries for women.

Alele-Williams's contributions to the primary and secondary mathematics education system in Nigeria include working toward a system of universal education, bringing what was referred to as "modern mathematics" to Nigeria, and writing a handbook for mathematics teachers (see, for example, [2,3]). Many of the educational programs she introduced are still in use today in several African countries.

Alele-Williams not only had an impressive career and broke down boundaries for women in Nigeria, but she also did this while raising five children with Babatunde, and later devoting time to her nine grandchildren. She is known for mentoring women and giving advice on navigating careers while balancing family responsibilities.

Although Alele-Williams holds the beacon of many firsts for women in Nigeria, including being the first

woman awarded a doctorate in any field, the first to hold the position of Associate Professor, and then the first to be Vice Chancellor, being the first was not her goal. Rather, her "firsts" formed part of a much larger and broader aim she had for Nigeria, where more women would occupy senior positions. This is revealed in the following excerpt from a 2004 talk she gave on Gender Dignity at Lagos State University.

As long as we are celebrating a woman vice chancellor because she is the first or a woman chief judge because she is the first, then we have not arrived. We look forward to the time when we will have many women in such positions and we will be celebrating so many of them.

Grace Alele-Williams is regarded by many as the mother of Nigerian academia. Her contributions extend across decades of mathematics education. She was not only skilled in mathematics education, but also in administration and in deftly tackling corruption. Throughout her career, she faced many challenges, but always maintained a balance of kindness, availability, and fierce courage. Grace seems like an apt name.

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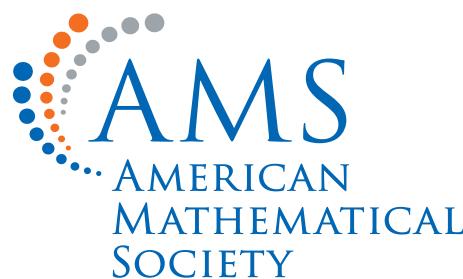
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