

GOVERNMENT POLICY ON SCIENCE EDUCATION IN UGANDA: A GLASS-CEILING FOR WOMEN'S ACCESS TO HIGHER EDUCATION

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Abstract

The paper assesses the Ugandan policy on science education and its implications for girls' access to higher education. The rationale behind this policy was to build capacity in the field of science in Uganda. Consequently, science subjects were made compulsory in schools, and 75% of the Government scholarships to public universities made science based. We demonstrate that this has created a "glass ceiling": it has put girls at a disadvantage by reinstating the former status quo, where access to higher education favoured boys. This is because Ugandan society (at home and in school) discourages girls' pursuit of the sciences. In addition, the policy was prematurely implemented with no adequate preparation for girls to take science based courses. Using content analysis, this study found that the policy was not guided by inclusion and/or equity principles to which Uganda committed as a signatory more than two decades ago, to the World Conference of Education for All (EFA) held in Jomtein, Thailand. These principles advocate removing obstacles to learning, and embracing diversity in education so that every learner is included.

Introduction

Uganda is a landlocked country in Eastern Africa with a population of approximately 34.5 million (UN Fund for Population Activities (UNFPA) as cited in Baguma, 2011) which is growing at a rate of 3.1%. The most recent population census conducted by the Uganda Bureau of Statistics (UBOS) shows that the economy of Uganda is primarily based on agriculture, with over 70% of the working population employed by the sector (UBOS, 2002). The availability of social services is limited and living conditions poor (Omagor, Atim, Okot, Kiryahika & Eron, 2001). High levels of illiteracy characterize Uganda's population with 64% of the 4.7 million illiterate Ugandans being women (UBOS, 2002, p.48).

Uganda's formal education system adopts a four tier educational model. This has seven years of primary education (ages 6-12). This is followed by four years of ordinary level secondary

education(13-16), two years of advanced level secondary education (17-19), and then the tertiary level. Each level is nationally examined and certificates are awarded.

Over the past two decades, the Government of Uganda produced several key policy documents highlighting all children's rights to education. Examples include the *The Government White Paper on Education* (1992), *Education Strategic Investment Plan* (1998), *Policy and Basic Requirements and Minimum Standards Indicators for Educational Institutions* (2001), and *Education Sector Strategic Plan* (2005). The Government also implemented Universal Primary Education (UPE), which started in January 1997. 'Under this policy, Government was to provide "free" education that is fees for up to four children maximum from each family of which two must be girls or if there is a disabled child, he/she must be given priority' Kisubi (2008, p.4). Universal Secondary Education (USE) was also implemented in 2007(Asankha & Takashi, 2011).

However, today, the gender disparities in education still remain mostly caused by high dropout and non-completion of girls especially at higher levels in education (Muhwezi, 2003). In an effort to accelerate girls' full and equal participation and retention in schools, the Ugandan government established several strategies (Omagor et al., 2001) including the affirmative action policy that gives young women an additional 1.5 points on top of their Advanced Level (this is the national university entry examination) examination results. This was implemented as an incentive to improve their access to higher education (Naziwa, 2010; Onsango, 2009; Womakuyu, 2010).

Onsango (2009) asserts that affirmative action can only have an effect on gender equity, and access to university education, if governments and universities adopt multifaceted approaches in which various strategies or packages support one another in order to close the gender gap in university education. In this paper we show that the policy on science education, is incompatible with the 1.5 policy on affirmative action, and argue that it is likely to derail the progress made so far towards accelerating women's access to higher education.

The paper briefly introduces the policy background. Following this is a description of the review methodology. A discussion of the reasons why the science policy is an obstacle to girls' access to higher education in Uganda follows. We argue that this policy, which foregrounds sciences in access to higher education in Uganda, was implemented without

preparing the stakeholders, especially girls who form a minority in the sciences. In addition, the policy is neither equitable nor inclusive and is likely to plummet the gains made so far to increase girls' chances to access higher education. The paper ends with a summary of the key issues discussed.

The Policy on Science Education

The *Government White Paper on Education* (1992) highlighted the potential role of science and technology in enhancing development (Black et al., 1998). It was argued that since obtaining independence from Britain in 1962, Uganda has largely promoted humanities subjects, producing large numbers of “white-collar” workers, such as lawyers, economists, and administrators. This explains the shortage of doctors, engineers and agricultural researchers among others (Wamboga-Mugirya, 2005). The development of a modern civilization has a lot to do with advancement of science and technology. This was the rationale behind the “strategic” government policy on science education (Tinkamanyire, 2010), which aims to bridge the gap by training more scientists.

The policy, which took effect in 2006, made the study of science subjects, namely: Physics, Chemistry, Biology and Mathematics compulsory for ordinary level secondary school students. In addition, first year students are required to take some science subjects (Wamboga-Mugirya, 2005). Finally, the Government decreed that science students would receive 75% of the Government scholarships to public universities and tertiary institutions in Uganda (Tinkamanyire, 2010; Wamboga-Mugirya, 2005). Uganda is a signatory to Education for All (EFA) (UNESCO, 1990) which affirms the importance of education to individual, national and global development. The objectives of EFA include gender parity in primary and secondary education by the year 2005 and gender equality at all levels of education by 2015.

However, this Ugandan policy contravenes both equity and inclusion in education because it not only puts girls at a disadvantage, but also excludes students interested in the arts from fair competition with the scientists for opportunities to access higher education. Promoters of the science policy have been blamed for shattering girls' hopes for higher education. This is because girls comprise a minority in the science subjects in Uganda. According to Sussman (2007, non-paginated) ‘before the science preference policy, about 37% of government merit scholarships were awarded to women. This year (2007) that fell to 29%’. A more recent

admission list of government sponsored students to public institutions of higher learning shows a huge gap between men and women (Kagolo, 2010): out of the 2,581 students admitted on merit, only 981 are female. This is because 75% of the state scholarships are for science programs that are not popular among women in Uganda. Moreover, Sussman (2007, non-paginated), asserts that ‘for these low-income students, most of whom come from households earning less than \$1 a day, government scholarships are their only hope for attending university’. Hence this policy is likely to thwart their chances of attaining higher education.

Review Methodology

The review is based on the policy on science education in Uganda, which is found in Section 6.5 of the Government White Paper on Education (1992). The provisions of the policy have already been discussed in section 2 (above), of this paper. We situate the policy in the literature showing the complex case of low enrolment of girls in the sciences from an African, and global perspective. We use the literature to argue that the Ugandan policy on science education is a glass ceiling to women’s access to higher education in Uganda given that globally, ‘girls and women are still far from equally represented in mathematics, science, and technology (MST) education and occupations’ (Sanders, 2000, p.13).

The term “glass ceiling”, which we use in the paper, was first talked about in the employment context to refer to invisible barriers that impede the career advancement of women in North America (Hymowitz & Schellhardt, 1986). According to Baxter (2000, p.275), ‘the general-case glass ceiling hypothesis states that not only is it more difficult for women than for men to be promoted up levels of authority hierarchies within workplaces, but also that the obstacles women face relative to men become greater as they move up the hierarchy’. This situation is referred to as a “ceiling” as there is a limitation blocking upward progression and “glass” (transparent) because while the limitation is real, it is transparent and therefore not immediately obvious to the observer. Since the term was coined, “glass ceiling” has also come to describe the limited advancement of all marginalized groups in various domains of life (Bell, McLaughlin & Sequieva 2002). In this study, the term is used to describe why the policy on science education in Uganda is an obstacle (glass ceiling) for girls’ advancement to higher education, making the goal to achieve higher education even more challenging.

We highlight the two popular schools of thought that govern thinking in science achievement in relation to gender. One school of thought believes that men have better developed visual-spatial ability than females (Child & Smithers, 1971); thus, they attribute gender inequity in academic performance in science to genetics (Benbow & Stanley, 1980; Gray, 1981), and believe that women are intrinsically disadvantaged in studying science and mathematics (Fogg, 2005; Reid, 2003). Persons who subscribe to this position would most probably be reluctant to investigate why women in Africa are underrepresented in the sciences, and how this can be tackled in order to improve their achievement and participation.

However, another school of thought, draws from the substantial scholarship which gives evidence that there is an insignificant difference between male and female intellectual ability, and that the differences in their intellectual abilities are the result of social pressures and discrimination that discourage girls and women from pursuing science and mathematics (Hyde, Fennema & Lamon, 1990; Hyde, Fennema, Ryan, Frost & Hopp, 1990; Jahoda, 1979; Sanders, 2000). We subscribe to this framework and concur that women can excel in the sciences as well as men, given the opportunity and a cognitively stimulating environment for science education (Hyde, Fennema, & Lamon, 1990; Kahle & Meece, 1994; Solomon, 1997; Xie & Shauman, 2003). It is in this methodological framework that this paper addresses gender inequity in science education in Uganda, which in our view has been exacerbated for the female students, by the Ugandan policy on science education.

Why the Policy on Science Education is a Glass ceiling to Women's Access to Higher Education in Uganda

Culture

Uganda is a patriarchal society with a culture deeply rooted in gender discrimination against women who are considered inferior to men (Kaleeba & Willimore, 1991; Kimpikaho & Kwesiga, 2002; Mirembe & Davies, 2001). The ability to pursue science subjects and career roles is considered a possibility for boys and men, who are perceived as "intelligent" (Mugumya, 2004). Additionally, the society considers sciences too difficult for girls (Nakkazi, 2011). This is consistent with research even in Europe as Kimball (1998, p.450) points out that 'there remains in Eurocentric cultures a persistent belief that mathematics remains to the realm of the masculine'.

Feminists argue that women's exclusion from science is typical of a patriarchal society, as it is a way of excluding women from powerful positions and powerful knowledge (Kelly, 1981; Sanders, 2000). According to Kelly (1981, p.89) 'girls in a patriarchal society will internalize beliefs, attitudes and expectations about science...which will generate negative attitudes towards ...science'. Girls in Uganda have been socialized towards the arts subjects, as there is an overall impression of science as masculine. According to Nakkazi (2011, non-paginated), 'due to our gender socialization, from birth we are socialized as caretakers and rarely exposed to things that compel us to [study] science'. Other studies corroborate the fact that gender differences in attitudes towards science have originated in the way that males and females are brought up. This stereotypical view is conveyed to children and it affects their course selection and achievement (Aldridge & Goldman, 2002; Eliot, 2009; Guzzeti & Williams, 1996; Jones, Howe & Rua, 2000; Mewborn, 1999; Sadker & Sadker, 1994); Canter (1979), Davies & Kandel (1981), Eccles (1987), Houser & Gravey (1985), and Margolis and Fisher (2002) as cited in Ochwa-Echel, 2011, p.282). Sanders (2000, p.13) asserts that when girls are socialized this way, 'we as a nation lose access to a significant portion of our talent'; this is because, fewer girls may defy societal expectations by taking on science subjects.

According to Sussman (2007, non-paginated), 'Uganda's decision to bestow more of its university scholarships on science students worries gender advocates in a country where female scientists face strong cultural bias'. Baguma (2009) states that experts believe there is a strong link between fewer girls joining university and dropout rates at lower levels of education in Uganda. Sussman (2007, non-paginated), cites education advocates such as the Forum for African Women Educationalists, who state that 'the new scholarship policy will further restrict the number of women going to university because of cultural biases against girls in science here'.

Discrimination

Discrimination is evident in the education system where girls are discriminated against even by their own parents (Deininger, 2003; Muhwezi, 2003). For example Muhwezi (2003) explains that some parents prefer to send boys to private schools and girls to the public schools, which offer free education of a lower standard. Some parents seem to place more value on educating boys rather than girls, because they seemingly think girl education a waste

of time as the benefits are reaped by the marriage partner (Brown, 1996; Ochwa-Echel, 2011).

Further, Sussman (2007, non paginated) adds that girls are allocated a bigger housework burden than boys; she reports of an interview with a school girl who said: 'Our time for studying is very limited because as girls we have a lot of housework ... It is very difficult to find the time to study things like sciences and math. That is why we are told to leave it for the boys'. Sussman asserts that housework is one of the primary reasons for girls' poor performance in Ugandan schools, and that in rural areas, where cultural biases against girls are more deeply entrenched and the housework load much greater, the science gap is even more pronounced. The science policy compounds the already profound challenges to a girl's academic success.

Seymour and Hewitt (1997 as cited in Sanders, 2000, p.25) explain that 'secondary and post-secondary teachers have often noticed that girls tend to enter their classes less experienced in the subject matter than boys'. Fisher, Margolis and Miller 1997 (as cited in Sanders, 2000, p. 25) report on the 'discrepancy between boys' and girls' hands-on experience of common science, especially electrical equipment. This could be attributed to the fact that boys are accorded more opportunities to engage with science equipment than girls; Sanders, for example, points out the frequency with which computers are placed in boys', rather than in girls' rooms (Sanders, 2000, p.25). Boys therefore seemingly have a head start in science even before they are introduced to the subjects in school (Aldridge & Goldman, 2002; Guzzeti & Williams, 1996).

On the whole, if girls are allotted more housework chores, educated in schools with poorer facilities and lower standards and provided less opportunity to engage with scientific equipment, it could diminish their chances of competing for the limited scholarships at tertiary level, 75% of which will be awarded to science subjects, which require ample study time, as well as good facilities absent in the poor schools, where the majority of girls study.

The Curriculum

Another documented form of gender stereotyping is presented in school textbooks and other curriculum materials (Ansary & Babaii, 2003; Barton & Sakwa, in press; Britton & Lumpkin,

1977; Davoodi, 1999; Kimball, 1998; Lee & Collins, 2009; Pihlaja, 2007). There is the tendency to present women in biased ways, primarily as mothers, homemakers, and care givers (Gupta & Yin, 1990; Hellinger, 1980; Rifkin, 1998; Stromquist, 2005). A content analysis of *English in Use Bk 2*, a book recommended by the Ministry of Education and Sports for teaching English to senior 2 students in Ugandan schools, revealed portrayals women in traditional stereotypical roles (Barton & Sakwa, in press). The effects of textbooks on the socialization of children has been variously documented (Coles, 1977; Hellinger, 1980; Johansson & Malmsjo, 2009; Peterson & Lach, 1990).

Furthermore, in Uganda, male chauvinism has not only dominated households but has also been explicitly expressed in the curriculum (Mugumya, 2004). Mugumya (2004, p.5) asserts that ‘Our society, which prescribes “work for women” and “work for men” has further entrenched this notion in the school curriculum’. Subject choice is gendered, with girls tending towards the arts, and boys, the sciences. Muhwezi (2003, p.10) gives a list of the gendered subject choice ‘... the cultural subjects e.g. Home Economics, Clothing and Textile... are preferred by girls, and technical subjects e.g. Wood Work, Technical Drawing... preferred by boys’. Dr. Catherine Kanabahita, the Head of the Gender Department at Makerere University affirmed that since the majority of the female students do arts courses, ‘the policy on sciences is not favoring them’(Kagolo, 2010, non-paginated). Sussman (2007) extends this discussion explaining that ‘major universities have already dramatically rolled back their admissions in non-science departments’ implying that there are fewer options for girls to go to university.

In addition, the authorship of the recommended curriculum texts seems to reinforce the gendered subject preferences. For example, Muhwezi (2003, p.12) argues that ‘the authorship (of books at primary school level) was predominantly male for Mathematics and Science and equally balanced for Social Studies and English’. This imbalance seems to send a message about the gendered ability according to subject and probably reinforces the gendered subject preferences, limiting girls’ inclination towards science subjects.

Teachers’ Attitudes

A century ago educationalists like Felter (1906 as cited in Kelly, 1981) argued that girls should only be taught sciences at elementary level because the mastery of analytic concepts

would be injurious to their health. Such an argument sounds ridiculous today but is substantiated in some teachers' attitudes towards girls and sciences in Uganda today.

Burns (2004) reveals a teacher's opinion about the intelligence of boys as compared to girls: 'It seems that boys are brighter than girls, boys answer more than girls in class. This may be due to different intellectual capacities.' Muhwezi (2003, p.14) also reveals 'some traces of hidden discrimination against girls especially in subjects like mathematics' as portrayed by the following statement made by a teacher in the Kumi district in Uganda: 'Girls are not interested in mathematics at all. They are very lazy and they are often absent from school. This makes it difficult for them to follow in most of the lessons. They thus end up failing the subject and disliking it.'

Teachers in some coeducational schools have been accused of 'implicitly discouraging girls from taking on science based subjects' (Mugumya, 2004, p.5). Sussman (2007, non paginated) cites student responses to an interview about girls' ability to pursue sciences: 'Girls' minds aren't good at science'; this claim is supported by a male science teacher who states that 'girls don't have the same capacity for sciences that boys do...the girls in my classes have never performed as well as the boys. Some of it is cultural, some of it is mental and some of it is biological'.

This outlook of the teacher is not unique to Uganda alone, as the low teacher expectations of girls' achievement in sciences has been broadly documented (see Kimball, 1998, p.450-457). Such expectations are often reflected unconsciously by parents, friends, teachers, and the media. Women are educated in a social environment, which "knows" that women have a natural aversion to science; that the mastery of science tools and discourse is difficult for women and that the potential pool of capable women scientists is small. These beliefs, while not supported by research create their own reality for girls and women. Otherwise capable women believe that MST fields are inappropriate for them. These women fail to pursue mathematics, science and technology courses as far as they could (Madigan, 1997; NCES, 1997; Hill, 1995; Rayman and Brett, 1993) thus short-changing themselves and society...' (Sanders, 2000, p.17).

Kelly (1981,p.79) argues that 'if science achievement has a masculine image in any society, then boys will be motivated to achieve ...in science as part of their developing masculinity;

conversely, girls will see success in science as incompatible with their developing femininity and so avoid it'. This situation is not unique to Uganda. Female Education in Mathematics and Science in Africa (FEMSA) studies in eight African countries, namely, Burkina Faso, Kenya, Mali, Malawi, Mozambique, Senegal, Swaziland, and Zambia (O'Connor, 2000) found that teachers' attitudes have a vast impact on science achievement in girls. However the teachers were seemingly resigned to the fact that girls' low achievement in the sciences was inevitable.

Moreover research shows that teachers' perceptions of student ability affect performance (Ayodeji, 2010; Margolis & Fisher, 2002; Tiedermann, 2002; Zeldin & Pajeres, 2000). In addition, 'research has repeatedly shown that confidence is strongly correlated with achievement in mathematics, particularly for girls' (Sanders, 2000, p.19). This implies that negative teacher attitudes towards girls' achievement in the sciences could be an obstacle towards exploring these subjects.

According to Sanders (2000, p. 21) 'research shows that especially in traditionally male subjects such as mathematics, science, and technology, teachers more often call on boys, give boys longer response times, probe boys' responses with higher level questions, and reward boys' assertive behaviors...(Grossman & Grossman, 1994; Lockheed & Klein, 1985; Sadker & Sadker, 1994)'. Girls often engage in passive activities such as recording data, while boys get the opportunity to handle equipment, dissect, and engage in hands-on problem-solving (Guzzeti & Williams, 1996; Mewborn, 1999). Additionally, Forum for African Women Educationalists (FAWE, 2001) assert that teacher' classroom instructional and management practices are not always conducive to learning especially for girls in science and mathematics courses.

The policy on science education should have been implemented after preparing teachers to get rid of their biases about girls' achievement in this field, in order to improve the chances of both boys' and girls' engagement with science subjects: 'Research shows that with training in recognising and changing these biased behaviours, gender imbalances can be remedied' (Kahle and Meece, 1994, as cited in Sanders, 2000, p.21).

Performance

Studies in participation at tertiary education in Africa generally reveal that women's enrolment in most universities is below half that of men (FAWE, 2001). Women's performance is also below that of the men (Bordo, 2001; Reid, 2003).

According to Mulemwa (2004), the average failure rate in non-science subjects in the Uganda Certificate of Education (UCE) every year is between 10 to 20%. However, the failure rate for science subjects is much higher between 40% up to 60% with the majority of poor performers being girls. It has been reported that girls tend to perform better in subjects like English and Social Studies while boys perform better in Mathematics and Science. It is not surprising therefore, that boys dominate science courses and thus take up the biggest percentage of admissions. For instance, out of the 82 students admitted for Bachelor of Medicine and Surgery at Makerere University this year (in 2010), 59 were male and 23 female; out of the 18 students admitted for Bachelor of Pharmacy, only 3 were female; out of the 38 students admitted for Bachelor of Electrical Engineering, 8 were female (Kagolo, 2010).

The choice of subjects, as well as performance in them determines the future careers of students. It is not surprising therefore, that in the Ugandan society, more men are occupied in science-related professions than women (Morley et al., 2006; Ochwa-Echel, 2011). This is evidently because few women opt to take the sciences during their secondary education. Further, Kwesiga (2002) attributes girls' lack of interest in the sciences to the absence of women teachers in the science subjects. According to Sanders (2000, p.16) 'the constructed expectation that mathematics, science and technology are male domains is reinforced by the obvious predominance of men in these fields, both in numbers and positions of responsibility'. Girls therefore do not have enough role models (Nancy, 1999) to inspire them to pursue the sciences. Mulemwa (2004) argues that in Uganda, many girls dropout of school due to extremely poor performance in the science and technology subject area. This policy, which has neither favoured the arts subjects in which girls are more included nor prepared them to embrace the sciences, is an obstacle to women's access to higher education in Uganda.

On the whole, Booth and Ainscow (2002) assert that inequities in education can be caused by the structure of the education system and the opportunities it provides, from early childhood education through different pathways in secondary education all the way to adult education.

The policy on science education in Uganda, which forces students at all levels to take the sciences, is in contravention of delivering equity especially for girls, as it puts the pathway of sciences as a prerequisite to increased chances of acquiring higher education, yet girls form the minority in the sciences. In addition, Booth and Ainscow (2002) assert that equity in education can be enhanced by the classroom practices (the organization of teaching and learning in the classroom). However, school culture in Uganda does not encourage sciences for girls. The classroom practices should have been made more facilitative of girls' involvement and enrolment into the sciences, for example through teacher training to promote positive attitudes towards girls and science education. Field, Kuczera and Pont (2007) also propose that the human and financial resources available in schools should enhance equity. However, this policy seems to have been made prematurely and is only favourable for a minority of private secondary schools that have facilities such as laboratories and trained science teachers. According to Mulemwa (2004), Government cannot provide adequate resources for all government-aided schools to teach sciences. Consequently, some schools do not offer all the basic science subjects and many students opt out of science as soon as possible. This may deprive students from acquiring practical skills and diminishes and/or destroys their interest in the sciences. Most of such schools are where parents would rather take the girls rather than the boys, and, according to the editor of the New Vision (2009), the rural girl cannot compete for the coveted 75% scheme when textbooks are a luxury, and there is no laboratory in her school. This policy therefore reduces girls' chances to access higher education. Miles and Singhal (2009) argue that becoming inclusive '...in relation to both EFA agenda and inclusive education...requires a principled approach to education...' which should be reflected even in policy. However, this policy, which makes sciences compulsory even for those who are not inclined there, not only increases their chances of failure, but decreases their participation in the curricula. It does not address diversity, and seems to stipulate that those interested in the arts are in the "wrong" field. Tinkamanyire (2010) claims that career teachers talk about the importance of identifying and building one's talents. On the other hand, the policy sends a message that if you are talented in arts, then your talent is "wrong" and the Government cannot support it. It is not possible for all children to be talented in sciences. In addition, the policy is not pro-poor, as the schools capable of offering science subjects are mostly private and urban schools, which can afford the facilities necessary for science education. This means that many students, especially the girls who usually end up in poor schools, are disadvantaged.

Conclusion

In conclusion, girls generally face more obstacles to acquire education in Uganda than boys (Naziwa, 2010). In addition, the number of girls decreases with higher levels of education (Muhwezi, 2003). Therefore, the 1.5 point scheme was introduced in 1990 as an incentive to increase the number of female undergraduate entrants into public universities (Onsango, 2009). The scheme had increased girls' enrolment from 29% of all students admitted in 1990/1991 to 48% in 2004/2005.

However, the percentage decreased from 42 % (2008/2009) to 38 % in 2010 (Kagolo, 2010) since the introduction of the policy on science education. On the other hand, despite the fact that male students continue to dominate access to higher education (62%), they were supported in the academic year 2010/2011 when the admissions board decided to include 23 boys for Bachelor of Law after about 80% of the vacancies had been awarded to girls. Yet the same board did not do the same for science courses where girls are few (Kagolo, 2010). Hence gender inequity is seemingly perpetuated and reduces young women's access to education.

Finally, although without doubt the development of Ugandan society hinges on a necessary growth in human capital and expertise in science and technology, one can still place question marks on the over-privileging of the sciences and neglecting the role of the humanities in providing a more complete education for future citizens. On the whole, the policy on science education is neither fair nor inclusive as it discriminates against students inclined towards the arts subjects, and creates a glass ceiling to women's access to higher education in Uganda.

References

- Aldridge , J., & Goldman, R. (2002). Gender equity and education. In S. Dragin (Ed.), *Current issues and trends in education* (pp. 163-170). Boston: Allyn and Bacon.
- Ansary, H., & Babaii, E. (2003). Subliminal sexism in current ESL/EFL textbooks. *Asian EFL journal* 5. Retrieved from <http://www.asian-efl-journal.com/march03.sub1.php>.
- Asankha, P., & Takashi, Y. (2011). Impacts of universal secondary education policy on secondary school enrollments in Uganda. *Journal of Accounting, Finance and Economics*, 1(1), 16-30.

- Ayodeji, I. (2010). Gender-stereotypes belief and practices in the classroom: The Nigerian post-primary school teachers. *Global Journal of Human social Science*, 10 (4), 29-38.
- Baguma, A. (2009, Tuesday 19th May). Girl enrolment up but far from achieving gender equity. *New Vision*.
- Baguma, R. (2011, 30th October). Uganda's population now at 34.5 million. *New Vision*.
- Barton, A., & Sakwa, N. L. (in press). The Representation of gender in English textbooks in Uganda. *Pedagogy, Culture and Society*.
- Baxter, J. (2000). The glass ceiling hypothesis: A comparative study of the United States, Sweden, and Australia. *Gender & Society*, 14, 275-294.
- Bell, M. P., McLaughlin, M. E., & Sequieva, J. M. (2002). Discrimination, harassment, and the glass ceiling. *Journal of Business Ethics*, 37, 65-76.
- Benbow, C. P., & Stanley, J. C. (1980). Sex differences in mathematical ability: Fact or artifact? *Science* 210, 1262-1264.
- Black, T. R., Atwaru-Okello, D., Kiwanuka, J., Serwadda, D., Birabi, O., Malinga, F., Alstair, R. A. (1998). Science education in Uganda: Progress and possibilities. *International Journal of Science Education*, 20, 239-252.
- Booth, T., & Ainscow, M. (2002). *The index for inclusion*. Bristol: Centre for Studies on Inclusive Education.
- Bordo, S. (2001). Selections from the flight to objectivity. In M. Lederman & I. Bartsch (Eds.), *The gender and science reader* (pp. 82-97). London and New York: Routledge.
- Britton, G. E., & Lumpkin, M. C. (1977). For sale: subliminal bias in textbooks. *The reading teacher*, 31, 40-45.
- Brown, M. (1996). Barriers to women managers' advancement in education in Uganda. *The international journal of educational management*, 10 (6), 18-23.
- Burns, K. (2004). Talking with teachers: Kim Burns talks with Harriet Odouch in Uganda. *Beyond access: Gender, education and development*, 48, 110-114.
- Child, D., & Smithers, A. (1971). Some cognitive and affective factors in subject choice. *Research in education*, 5 (1), 37-39.
- Coles, G. S. (1977). Dick and Jane grow up: Ideology in adult basic readers. *Urban education*, 12 (1), 37-53.
- Davoodi, M. (1999). *Language and culture in Iranian high school English textbooks*. Shiraz University. Iran.
- Deininger, K. (2003). Does cost of schooling affect enrolment by the poor? Universal Primary Education in Uganda. *Economics of education review*, 22, 291-305.

- Editor, T. (2009, Tuesday 19th May). Help Rural Girls Access Higher Education. *New Vision*.
- Eliot, L. (2009). *Pink brain, blue brain: How small differences grow into troublesome gaps – and what we can do about it*. Boston: Houghton Mifflin Harcourt.
- Field, S., Kuczera, M., & B., P. (2007). *No more failures. Ten steps to equity in education*. Paris: OECD.
- Fogg, P. (2005, 4 March). Women and science: The debate goes on. *The Chronicle of Higher Education*, pp. A1, A8.
- Gray, J. A. (Ed.). (1981). *A biological basis for the sex differences in achievement in science?* Manchester, UK: Manchester University.
- Gupta, A. F., & Yin, A. L. S. (1990). Gender representation in English language textbooks used in Singapore schools. *Language and Education*, 4, 29-50.
- Guzzeti, B. J., & Williams, W. O. (1996). Changing the pattern of gendered discussion: Lessons from science classrooms. *Journal of adolescent and adult literacy*, 40, 38-47).
- Hellinger, M. (1980). For men must work and women must weep: Sexism in English language textbooks used in German school. *Women's studies international quarterly* 3, 267-275.
- Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematical performance: A meta-analysis. *Psychological bulletin*, 107, 139-155.
- Hyde, J. S., Fennema, E., Ryan, M., Frost, L., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and affect: A meta-analysis. *Psychology of women quarterly*, 14 (3), 299-324.
- Hymowitz, C., & Schellhardt, T. D. (1986). Why women can't seem to break the invisible barrier that blocks them from the top jobs. *The wall street journal: A special report: The corporate woman*, CCVII (57), D1, D4-5.
- Jahoda, G. (1979). On the nature of difficulties in spatial-perceptual tasks: Ethnic and sex differences. *British journal of psychology*, 70, 351-363.
- Johansson, S., & Malmsjo, K. B. (2009). *Gender bias in EFL textbook dialogues*. Retrieved from <http://www.essays.se/essay/21eeb5e190/>.
- Jones, M. G., Howe, A., & Rua, M. J. (2000). Gender differences in students' experiences, interests and attitudes towards science and scientists. *Science Education*, 84, 180-192.
- Kagolo, F. (2010, Monday 10th May). Boys Top University Scholarships. *New Vision*.

- Kahle, J. B., & Meece, J. (1994). Research on gender issues in the classroom. In D. L. Gable (Ed.). *Handbook of Research on Science Teaching and Learning* (pp. 542-557). New York: Macmillan.
- Kaleeba, H., S. R., & Willimore, B. (1991). *We miss you all: AIDS in the family*. Harare: Harare Women and AIDS Support Network.
- Kelly, A. (Ed.). (1981). *The Missing Half: Girls and Science*. Manchester: Manchester University Press.
- Kimball, M. M. (1998). Gender and Math: What Makes a Difference? In D. L. Anselmim & A. L. Law (Eds.). *Questions of gender* (pp. 446-460). Boston: McGraw-Hill.
- Kimpikaho, M., & Kwesiga, J. C. (2002). *Contributions of women's organisations to girls' education in Uganda*. Kampala: Fountain Publishers.
- Kisubi, A. (2008). Critique and analysis of Universal Primary Education (UPE) in Uganda in general and suggestions for improvement in particular local areas. Paper presented at the the Houston Texas Busoga Twegaite annual international convention, U.S.A.
- Kwesiga, J. (2002). *Women's access to higher education in Uganda: Uganda's experience*. Kampala: Fountain Publishers Ltd.
- Lee, J., F. , & Collins, P. (2009). Australian english language textbooks: The gender issues. *Gender and education*, 21, 353-370.
- Margolis, J., & Fisher, A. (2002). *Unlocking the clubhouse: women in computing*. Cambridge: MIT Press.
- Mewborn, D. M. (1999). Creating a gender equitable school environment. *International journal of education* (2), 103-115.
- Miles, S., & Singal, N. (2009). The education for all and inclusive education debate: conflict, contradiction or opportunity? *International journal of inclusive education*, 1-15.
- Mirembe, R., & Davies, L. (2001). Is schooling a risk? Gender, power relations and school culture in Uganda. *Gender and education*, 13, 401-416.
- Morley, L., Gunawardena, C., Kwesiga, J., Lihamba, A., Odejide, A., Shackelton, L., & Sorhaindo, A. (2006). *Gender equity in commonwealth higher education: An examination of sustainable interventions in selected commonwealth universities*. London: Department for International Development.
- Mugumya, L. (2004, January, 2004). How gender segregation at school undermines equal opportunities: A male view point. *Equals*, 5-6.
- Muhwezi, K. M. (2003). *Gender sensitive educational policy and practice: Uganda case study*. Paris: International Bureau of Education, UNESCO.

- Mulemwa, N. J. (2004). *Report on organizing the ROSE survey in Uganda*. Kampala: Education Service Commission (ESC).
- Nakkazi, E. (2011). Uphill struggle for women computer scientist. Science and innovation policy: *Gender*. Retrieved from <http://www.scidev.net/en/science-and-innovation-policy/gender/news/uphill-struggle-for-uganda-s-women-computer-scientists.html>.
- Nancy, J. L. (1999). *Why are there so few women in science*. Retrieved from <http://www.nature.com/debates/women.htm>.
- Naziwa, I. (2010, 11th March). The long road to womanhood. *The New Vision*.
- O'Connor, J. P. (2000). *Teachers are the problem in SMT, not girls! Female education in mathematics and science in Africa (FEMSA)*. Retrieved from http://library.unesco-icba.org/English/secondary_Science_Series/index_pages/science_articles_by_topic.html.
- Ochwa-Echel, J. (2011). Exploring the gender gap in computer science education in Uganda. *International journal of gender, science and technology*, 3(2), 273-292.
- Omagor, M., Atim, M., Okot, D., Kiryahika, K., & Eron, L. (2001). *Including the excluded: Meeting diversity in education: Example from Uganda*. Paris: UNESCO.
- Onsango, J. (2009). Affirmative action, gender equity and university admissions - Kenya, Uganda and Tanzania. *London review of education*, 7, 71-81.
- Peterson, S. B., & Lach, M. A. (1990). Gender stereotypes in children's books: Their prevalence and influence on cognitive and affective development. *Gender and education*, 2, 185-197.
- Pihlaja, S. (2007). Would you like to dance with me, Miwa? Gender roles and the EFL text. *The linguist list*, 16, 2 -11.
- Reid, N. (2003). Gender and physics. *International journal of science education*, 25 (4), 509-536.
- Rifkin, B. (1998). Gender representation in foreign language textbooks: Case study of textbooks of Russia. *The modern language journal* 82, 217-236.
- Sadker, M., & Sadker, D. (1994). *Failing at fairness: How America's schools cheat girls*. New York: Macmillan.
- Sanders, J. (2000). *Fairness at the source: Assessing gender equity in teacher education for colleges and universities*. Washington Research Inst.
- Solomon, J. (1997). Girls' science education: Choice, solidarity and culture. *International journal of science education*, 19(4), 407-417.

- Statistics, U. B. o. (2002). The 2002 Uganda population and housing census. Retrieved from <http://www.ubos.org/?st=pagerelations2&id=17&p=related%20pages%20:Population> on 15th November 2011.
- Stromquist, N. P. (2005). Comparative and international education: A journey toward equality and equity. *Harvard educational review*, 75(1), 89-111.
- Sussman, A. S. (2007). Ugandan science scholarships tilt against women. *We News: Covering Women's Issues-Changing Women's lives*. Retrieved from <http://womensenews.org/story/education/070723/ugandan-science-scholarships-tilt-against-women>.
- The Forum for African Women Educationalists (FAWE). (2001). *Girls' education and poverty eradication: FAWE's response*. Paper presented at the third United Nations conference on the Least Developed Countries, Brussels, Belgium.
- Tiedermann, J. (2002). Teachers' gender stereotypes as determinants of teacher perceptions in elementary school mathematics. *Educational studies in mathematics*, 50 (1), 49-62.
- Tinkamanyire, D. (2010, 13th April). New science policy unfair. *New Vision*.
- Uganda, R. o. (1992). *The government white paper on education*. Kampala: Ministry of Education and Sports.
- Uganda, R. o. (1998). *Education strategic investment plan*. Kampala: Ministry of Education and Sports.
- Uganda, R. o. (2001). *Basic requirements and minimum standards indicators for educational institutions*. Kampala: Ministry of Education and Sports.
- Uganda, R. o. (2005). *Education sector strategic plan*. Kampala: Ministry of Education and Sports.
- UNESCO. (1990). *World declaration of education for all*. Paris: UNESCO.
- Wamboga-Mugirya, P. (2005, 22nd February). Science education gets double boost in Uganda. *New Vision*.
- Womakuyu, F. (2010, Tuesday 30th March). A feat born out of diligence: Makerere university honours female professors. *New Vision*.
- Xie, Y., & Shauman, K. A. (2003). *Women in science: Career process and outcomes*. Cambridge: Harvard University Press.
- Zeldin, A., & Pajeres, F. (2000). Against the odds: Self efficacy beliefs of women in mathematical, scientific and technological careers. *American educational research journal*, 37(1), 215-246.

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