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## Repositioning Computer Studies: Cultural Context and Gendered Subject Choices in Kenya

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### **Introduction**

If Marie Antoinette haughtily advised the French authorities in the late 18th century to let the poor eat cake when they asked for bread ... the rich nations in the early 21st century shout, 'let them have computers', when the poor of the world ask for food and respect (Nettleford 2002:25).

Education is gendered, and the developed West often influences educational systems in Africa. Therefore, the sentiments expressed by Rex Nettleford, Vice-Chancellor of the University of the West Indies, point to the various socio-economic and cultural paradigms that ameliorate the advancement of computer technology in Africa. Nettleford's argument, when assessed within current global educational debates, reflects the continued pernicious effect of computer technology and its centrality in the advancement of science and technology, which continue to be unattended to in Africa. Additionally, for all intents and purposes, gender, the workings of agency and structure in education, is often not theorised into this science and technology debate in terms of access and practical needs.

The need for enhanced Science and Technology (S&T) in Kenya led to the introduction of computer studies in Kenyan schools in 1994. This move was primarily concerned with teaching computers as an optional science-oriented subject. The content of computer studies covers both basic computer literacy and computer engineering at higher levels. Inevitably, its categorisation as a science subject, and the lack of understanding of its implementation, merely perpetuates constraints already

imposed on girls' participation by social structures. When mapped against the educational backdrop of gender-oriented biases, girls' exclusion and disparities in terms of geographical regions, school resources, available infrastructure (electricity, water, laboratories, land space) and teaching personnel, the inclusion of computer studies was not without obstacles. Therefore, it came as no surprise that the first national examinations to include computer studies took place in 1998 with only twenty-two students registered. Such hesitation in the practical implementation of computer studies raises critical questions related to the educational system, subject choices, subject clusters and gender.

This article arises out of a concern that the cultural, social and economic context in which educational policy with regard to computer studies has been developed, together with the manner in which the subject has been introduced, learned and practiced, contributes to the perpetuation of gendered disadvantage in S&T in Kenya. One interpretation may be that the teaching of computer studies has been left to those schools and geographical regions where appropriate infrastructure is available, in particular urban schools. Another interpretation might be that the subject highly augments power structures in relation to types of schools (private, public, district, provincial or national), gender and external linkages. These observations depict an educational system that is favourable towards advantaged schools and facing difficulties in promoting a truly gendered approach.

The need to examine educational policy with respect to S&T, especially computer studies, coupled with the ways in which these policies reflect gender disparities and gender role expectations in the wider society, therefore adversely affecting the participation of women and girls in computer studies in Kenya, is the focus of this chapter. Focusing on selected Kenyan secondary school learners in Forms One–Four in Western Province, the chapter seeks to articulate and discuss the relationships and challenges between gender and S&T that appear to emanate from a variety of contexts. The data collected includes educational consultant interviews with two members of the Kenya National Examinations Council (KNEC), along with both informal and structured interviews with students and staff at four selected secondary schools. Published aggregate computer studies statistical results from the 1998–2002 Kenya Certificate of Secondary Examinations (KCSE) were obtained from the KNEC.

Macro-structural features, that is, type of school, academic performance, gender and subjects offered, presented a further basis for evaluating the ways in which gender is experienced. Type of school refers to the secondary school categorisation adopted by KNEC, that is, private schools, district schools (76 districts), provincial schools (8 provinces) and the seventeen national schools. Whereas the national schools select the top students nationwide, the district and provincial schools must select 85 percent of their students from their own district or provincial catchment areas.

A questionnaire was developed to obtain preliminary knowledge of girls' computer studies expectations. Using an identified set of contextual factors that appear to ameliorate girls' entry into S&T (Kakonge 2000), the general objectives of the

computer studies subject were reflected upon as a way of problematising the concept of gender. Ultimately, a framework was developed for understanding the gendered tendencies embedded in educational policy on computer studies and the contextual factors that continue to promote the exclusion of girls in S&T in Kenya.

### Reconstructing the Science and Technology Debate

While every society has a wealth of information and a rich knowledge-base of its own, the power to own, structure, decide upon and control the technology for coding, transmitting and using information is determined by economic means, with the dividing line following economic, linguistic, ethnic and gender barriers (UNESCO 2003:68).

A considerable amount of research point to gender differences in educational policies and their implementation (Harding and McGregor 1995; Lukalo 1999). In Kenya, Eshiwani showed in the 1980s that the underlying determinant of women's under-representation in S&T disciplines was the inadequate preparation provided at the secondary school level (Kakonge 2000). Various studies have indicated that access to education in Africa has seen girls marginalised and generally under-represented in the fields of S&T in secondary schools and tertiary institutions (Jegade et al. 1996; Truscot 1994; Makau 1999). Reflecting on various African countries, Mariro (1999) found the scientific subject option characteristic in S&T-related subjects in secondary schools a critical catalyst in girls' further isolation from S&T careers. In addition to these findings, educational advancement in science subjects at the KCSE level in Kenya testify to social factors, such as household chores, school drop-out rates, early marriages, length of time taken to qualify for S&T careers, that are related to girls' adult family roles and continue to inhibit their progressive learning. Conversely, these factors have significant effects on performance and educational outcomes for female learners but not for male (Njenga 1999:164).

Other issues that give credence to the view that gender-related factors continue to interfere with girls' representation in S&T fields include lack of positive female role models, inadequate science facilities, socio-cultural expectations, gendered stereotypes and gender expectations by teachers, parents and the community (Erinosho 1994). To interrogate the very nature of the notions of S&T depends on the cultural and social expectations of the gendered roles for girls and the existing masculine conception of the scientific enterprise, which deters girls from pursuing S&T choices. Sands (1993:238–248) and Malcolm (1993:249–253) argue from the premise that the manner in which gender is experienced, fought over, sought after, worked at, accomplished, endeavoured and negotiated at a micro-level in girls' day-to-day lives is critical in contesting assumptions of gender and S&T.

Experiences in S&T for learners at the secondary school level are both meaningful and important, since they have significant consequences for their career outcomes. These outcomes can be explained in Harding's (1986) formulations of construction of gender as structural and symbolic. The structural is manifested by the gendered division of labour (arts subjects — female, S&T subjects — male), while the symbolic

manifests itself through the languages and images that surround S&T (Malcolm 1993; Kitetu 2003). This gender division is culturally specific, socially constructed, linked to gender ideology and interwoven into broader social processes and power relations (Stepulevage 2001). Therefore, the question of how gender influences S&T subject choices in secondary schools in Kenya calls for a critical analysis of the constraints imposed on girls' participation by social structures, hegemonic social identities and the distribution of educational privileges.

As Enos (1995) argues, the structural adjustment programmes levelled at Africa in the 1980s have subtly dictated the choices of areas to be pursued in S&T based on the benefits for the developed countries. Ultimately, the indirect consequences of these policies filter down to the 'grassroots' level and lead to the exclusion of women (Beoku-Betts 2003). The feminist theme that 'science is socially constructed and as such embodies a history and a political agenda' rings true (Olson 1994:78). The field of education has been a locus for counter-practices and counter-discourses that have perpetuated gender exclusion tendencies (Obanya 1999). Researchers often look for explanations for the gendered exclusions in education in different ways with the aim of deconstructing upheld notions and 'truths' (Makhubu 1993). A key assumption of these approaches in post-colonial educational studies in Africa is that culture is constituted by the learned behaviour passed down from generation to generation. Such power to participate effectively in any process of negotiation has historically been divided along gendered lines.

Given the rate at which many research bodies were set up for African women (e.g., ACTRW, under the auspices of the UN's Economic Commission for Africa, in 1995) or by the African Woman (e.g., AAWORD 1977; FAWE 1999), gender continues to pose theoretical, analytical and practical challenges to Africa. Third-World women's activities tend to get devalued and depoliticised when examined through the binoculars of Western feminists. As a result, hegemonic Western feminist discourses end up framing Third-World feminist issues. Citing the heterogeneous nature of women's lives in developing countries, Mohanty discusses women's lives as a source of both compliance with and resistance to the dominant relations of power. When girls are offered subject choices from a fettered position (school setting, variety of subjects available), factors such as low self-esteem and low motivation enhance the gendered discriminatory tendencies. Thus, understanding the structured realities as they exist at local and national levels is critical.

### **Positioning the Computer Debate**

When the teaching of S&T is presented to learners as a male domain, the social constructions of specific subjects in the classroom take on constructions of gender (Makhubu 1993). These gendered constructions have been aptly discussed by Grint and Gill (1995), Beoku-Betts (2003), Galpin (1992), and Kitetu (2003). These and other studies of the role of S&T in education have been diverse and have adopted various theoretical underpinnings. What is clear is that, as Harding (1991:50) argues, scientific and technological changes 'are inherently political, since they redistribute

costs and benefits of access to ... resources in new ways. They tend to widen any pre-existing gaps between the haves and the have-nots unless issues of just distribution are directly addressed'. Significantly, unlike other areas of educational technology change, the introduction of computers into schools was largely uncontested. A utopian wave of enthusiasm presupposed that computers were inherently and unequivocally a 'good thing' for education in Kenya and a sure prescription for industrialisation by 2020 (Coughlin and Ikaria 1988). However, this view ignores questions of the social, cultural and historical construction of information technology and 'the social meanings of science and technology [rooted in] ... the curious coincidence between masculinism and Eurocentrism' (Harding 1991:245). Ignored also is the issue of life outside the formal education system, where everyday life involves learning, creating and negotiating with technology (Omoka 1991).

The S&T debate in Kenya cannot afford to decontextualise computing from the wider social and political variables that shape the gendered contexts of human resources and the school itself (Beoku-Betts 2003). As White, Shade and Brayton (2001:50) point out, 'for women and men alike, computers exist in an uneasy societal space ... [where] fear and anxiety ... [are] connected to a lack of personal control over the impact computers have on our lives'. The feeling of lack of control for learners in Africa accentuates the dependency these learners have towards the Western world of computer innovations. In this respect, many women experience disparities in relation to computer access, ICT distribution and technology (Wakhungu 2003). White, Shade and Brayton (2001) highlight ongoing concerns about computer use in developing Nations creating access barriers, together with the corresponding need to enhance, rather than detract from, indigenous knowledge. Green and Adam (2001) show how technology has favoured masculine practices and has treated feminine practices as subterranean. For S&T in Africa, the absence of vital data about gender and technology relations enhances continued practice of unfriendly policies that deter women's participation. Grint and Gill (1995) suggest that, even in the West, technology has ignored how feminine practices utilise technology in different ways. In schools, phenomena such as the 'Pygmalion Syndrome' and other experiences influence one's decision to choose or not to choose computer studies.

### **Gender, Culture and Location: Intersections and Relations to Computer Studies**

Computer studies in the formal education system has a distinct presence, but the process of engagement with the computer is continuous and interwoven in everyday life. In reflecting on this subject, the identification of spaces for agency that inform S&T debate is crucial. Diakitie (1991:123-127) cites the example of ICT policies as a major drawback to the development of technology in Africa, noting the long history of S&T subjects being used as agents of social control, especially of the poor. What about computer studies in Kenya since its inception at the secondary school level in 1995? Since the secondary school level takes four years of learning,

the results first began to emerge only in 1998 and, as Table 1 below shows, female candidature was higher than that of male.

**Table1:** KCSE Computer Studies Performance (1998)

Candidature			Type of School			
Female	Male	Total	Pri	Dis.	Pro.	Nat
17	05	22	-	-	2	-

**Note:** Pri-Private, Dis-District, Pro-Provincial, Nat-National

**Source:** Kenya National Examinations Council

As Table 1 shows, all the candidates came from only two schools, both belonging to the 'privileged' provincial category of schools. A visit to these two pioneering schools revealed that many of the computers in use were donations from religious organisations in America. The schools had to overcome technological obstacles such as outdated hardware and software, lack of backup facilities and even a lack of technicians. Most of the 17 female candidates saw their choice of the subject as a marker of the changing times and a head start to secretarial careers. Thus, the computer donations, despite their myriad difficulties of installation and maintenance, acted as agency in relation to constructing familiarity with technological knowledge and skills in these pioneering schools.

Gladys Nasongo, a KNEC officer, argued that the higher female candidature in 1998 testified to the encroachment of women in Kenya on S&T, thus ultimately aiming at devaluing masculinist tendencies in the area. The message sent by the results in 1998, she said, was that computer studies was a feminine domain, thus appropriating a female identity tag. When this gendered identity notion infiltrated the everyday educational structural relations and cultural meaning system, computer Studies became the symbolic agent of deconstructed masculine technology. It is this feminine engagement with computer studies technology that became the 'origin story' (Haraway 1991). However, from another perspective these 'privileged' provincial schools aided in constructing young women's opportunities away from the male-dominated fields of S&T into the 'softer' ground of computer studies (Makhubu 1993).

It is interesting to note that the seventeen national schools, despite all their resources, were slow in offering the computer science option, only registering candidates in 2000. A closer examination of the candidates in these schools reveals lower female candidature by 2002, 91(30 percent) female candidates to 213 (70 percent) male candidates. National secondary schools in Kenya belong to highly privileged league of schools, many relying on the goodwill of the government and well-endowed PTAs. Whereas other secondary schools in Kenya can afford to offer only nine subjects at the KCSE level, National schools offer at least eighteen subjects. This translates into smaller classes, wider subject choices, lower teacher-pupil ratios, more varied appeal to all types of learners and better learning facilities. Thus, when fewer

girls enrol for computer studies in national schools, they end up ‘self-selecting’ out of S&T careers. Paradoxically, this suggests that other institutional barriers away from school act as deterrents in the S&T choices of these girls.

Several dimensions of social change seem to have impacted on the numbers of candidates for the KCSE examinations from 1998-2002 (see Table 2). First, the proliferation of ‘computer technology strategic propaganda’ nationally and globally promoted enrolment, which registered a tremendous increase from 22 candidates in 1998 to 2,145 candidates by 2002. However, while more students enrolled for computer studies in private, provincial and national schools, the district schools category, mostly found in rural areas, experienced low enrolments for various reasons, lack of electricity, infrastructure and computer hardware/software, along with low levels of economic assistance from government and PTAs.

**Table 2:** KCSE Candidate Enrolment by School Type (1998–2002)

School Type	Years/Candidature										
	1999		2000		2001		2002		1999–2002		
	F	M	F	M	F	M	F	M	F	M	Total
Pri	15	09	72	103	106	149	237	302	430	563	993
Dis	17	07	57	07	42	69	109	94	225	177	402
Pro	19	35	153	132	325	273	690	409	1187	849	2036
Nat	-	-	32	43	55	61	91	213	178	317	495
Total	51	51	314	285	528	552	1127	1018	2020	1906	3926
(%)	50	50	52	48	49	51	53	47	51	49	
Grand Total	102		599		1080		2145		3926		

**Note:** F-Female, Pri-Private, Pro-Provincial, M-Male, Dis-District, Nat-National.

**Source:** Kenya National Examinations Council.

One headmistress from a provincial girls’ school had this to say about the resources required for effective computer studies programmes:

- The parents in my school have been very helpful in funding the computer project. We started off in 1997 with two computers, and since then have added to the present number of forty. Without the computers and a good teacher, this subject is not easy.

The headmistress’ perspective demonstrates the imbalances that exist in the facilitation of computer studies. As her comment makes clear, other factors than gender hamper the implementation of the subject. Thus, the relationship between the community’s resources and aspirations is critical for computer science. Clearly, the social outlook of the community helps shape the expectations of a school’s subject choice array. Judging from the high level of female enrolment by 2002, one can conclude that the wider Kenyan community is receptive to the need to facilitate more girls in S&T-

related domains. Commenting on the astronomical increase of students in computer studies, a KNEC official had this to say:

Many schools currently offering computer studies have received a lot of donations in terms of the hardware and software from organisations abroad. Through established connections, either church-based, NGOs or individuals, outdated computers have found their way into our schools. In other instances, through school PTAs, certain levies have been forced onto parents to enable schools to buy computers. Whereas you can control what you buy, you can never control a donated piece of equipment.

Importantly, the KNEC official draws back the S&T debate to what Omoka (1991) describes as the political dynamics and dependency of technology transfer. Increasingly, PTAs, community groups, NGOs and philanthropic organisations are bridging the economic gap and hegemonic social space that the Ministry of Education should fight in the provision of equipment to schools. The process creates new links between schools and these agencies and has implications for new thinking about agency because of the ways in which the agents utilise the power they possess to change communities. The assumed value of computer technology acts as a positive facilitator of change. However, in other schools, the belief that technology is expensive acts as a barrier. In this respect, one particularly interesting aspect of computer studies in schools is the enrolment by gender since 1998 (see Table 3).

**Table 3:** KCSE Gender Enrolment Pattern 1998–2002

Year	School Type			
	Female	Male	Co-ed	Total
1998	1-50%	1-50%	0	2
1999	4-33%	4-33%	4-33%	12
2000	11-26%	15-37%	15-37%	41
2001	29-40%	27-37%	17-23%	73
2002	57-39%	52-36%	37-25%	146
Total	102-37%	99-36%	73-27%	274

**Source:** Kenya National Examinations Council

As Table 3 indicates, there are more female schools offering computer studies at KCSE level in Kenya, and this serves as an entry point for girls to increasingly tap into the field of ‘soft’ technology. Thus, the male aura of S&T education, which acts as one obstacle to girls’ attainment of computer literacy, does not have to be accepted as given. One of the main analytical points in this respect is that agents (communities, NGOs, donors) act out of the gendered social and individual transformations of their views of technology. It can be noted that, quantitatively (in terms of schools, student numbers, education offered) more girls in the 1998-2002 period were educated in district (225, or 56 percent girls/177, or 44 percent boys) and provincial (1187, or 58 percent girls/849, or 42 percent boys) schools.

Qualitatively, in terms of computer studies teachers, facilities infrastructure and financial status, the majority of these schools compare unfavourably to private schools (563 boys/430 girls), and national schools (317 boys/178 girls). This structured categorisation of schools, considering also that a substantial number of secondary schools offering computer studies are co-educational, increases the marginalisation of girls in an educational system of inequality. The influence of location is pivotal, since national and private schools enjoy political, social and economic power in an area of study structurally dominated by men. In these schools, the computer 'symbolically' becomes a male enterprise.

Adopting Hardings' (1986) multi-level theory of gender, we further took into account gender processes at the structural, symbolic and identity levels by mapping the gendered nature of the computer studies teaching force and the experiences of the head teachers of the sampled secondary schools. Gender, symbolically epitomised by the teaching force, can enhance masculine/feminine values and connotations. In 2002, of the thirty-three secondary schools in Western Province offering computer studies, there were only two female computer studies teachers in district girls' schools. The situation was similar in other provinces, clearly showing a field competitively tapped into by female students yet dominated by a male teaching force. The two female teachers, when interviewed, gave their views as follows:

**Female Teacher A:** I developed interest in this subject at the university and worked on my own. My girls appreciate what they are doing, but the majority just think about secretarial jobs. I have had to tell them that other possibilities exist. Most of the girls had never touched a computer before, so I am happy their awareness level has increased. It is these girls I use to tell others what computer studies means.

**Female Teacher B:** It has a lot to do with the school. The computers are not enough, so we regulate the number of girls taking the subject. Also, only the bright and high achievers are selected for this subject. I have to keep reading and know what is on the market for my girls. Often, I have to take them to visit other schools.

The choice of studying computers is strongly linked to user values that may have been constructed consciously or unconsciously. Choices made by students can be influenced from outside the formal school system and may find grounding in everyday life experiences. Teacher A's comments above bring out the fallacy of women's technological knowledge being conceptualised essentially as women's productive activity, and this needs to be interrogated. Teacher B identifies the school and its procedures for selecting learners (high achievers) as important to the study of computer science. Such macro-structural features intersect with the cultural models of S&T and frame the academic decision-making process for the learner. Ultimately, this helps perpetuate a male-dominated S&T community, as was affirmed by two teachers in a national boys' school:

**Male Teacher A:** Some of the students already have exposure to computers before joining secondary school. Another percentage wants to enroll for a Diploma in Computer Science after school. This subject, being an option and not necessarily key to admission into science degree programmes at the university, most of our students

prefer the physics option, because it is really the bedrock for joining science-based professions.

From this teachers' comments, one can deduce that, even before joining Form One, some boys already identify with computers. Others project their vision towards getting tangible certification of their skills. Comparatively, the physics option is not a popular science option among girls in secondary schools (KNEC: 2002). As a whole, it can be understood as part of the symbolic dimensions of that feed into gender identity. The teacher aptly points out that individual choice dictates what some students want to pursue, augmenting the view that the S&T gender gap is the outcome of internal, individual processes and academic choices. The schools and educational policies recontextualise the gender socialisation processes in terms of gender-appropriate subject matter for out-of-school S&T career success.

The total female KCSE enrolment for computer studies from 1998 to 2002 (52 percent female/48 percent male) makes it clear that computer studies appeals to more female candidates than biology and chemistry. This can be construed to mean that higher female enrolment in computer studies is an example of the hidden gendered assumptions that organise educational practices. Gender inequalities, specifically the gendered cultural and socialisation process in the home, are the edifice upon which educational systems are built in Kenya. Schools depend on the parents, and particularly mothers, to be involved in the decision-making process of subject choices for their children. Some of these choices sustain or advance gender inequities. When the number of female schools is compared to the mixed schools (1999–2002), the following is observed:

- 1999 – 4 girls' schools, 4 mixed schools,
- 2000 – 11 girls' schools, 15 mixed schools
- 2001 – 29 girls' schools, 17 mixed schools
- 2002 – 57 girls' schools, 37 mixed schools

These figures portray the choice of Computer Studies as a 'softer option' for female students consistent with the view of gender ideologies about women's role as 'caretakers' in S&T fields. The figures invite one to interrogate this view in two related ways. First, the activity of subject a 'choice' at KCSE level is indistinguishable from the culturally perceived role of women. The classroom nuances of mixed schools, and their discriminatory practices in classroom discourse, teacher attention (Kitetu 2003) and societal expectations for women influence these choices. The implied connection between the internal world of the classroom/school and the world of external expectations is notable.

### **Essentialising Individual Aspirations**

Several learners were interviewed on the question of computer science subject choice and the general objectives of the subject. The following discussion presents and analyses some of their comments.

**Vuyanzi (private mixed school):** Everybody knows that without computer skills in today's world, one is doomed! I want to be able to use my computer skills, when I leave for further studies to England next year .... I want to study financial banking and, as you see, the computer is dictating many things .... I need this subject, that's me!

Vuyanzi does not take on board her lived experiences of gender difference, and perhaps her views can be seen within Kitetu's (2003) 'privileged femininity' perspective. Vuyanzi sees herself benefiting from the recent S&T changes in terms of opportunities available to all, not just women. She views computer studies as integral to the sense of purpose that accompanies her dreams of upward mobility. Thus, her choice of computer studies is meaningful and important to her because computer studies entails the potential to have a significant consequence on her career outcomes. By affirming 'that's me!', Vuyanzi reinforces her idea that, even in subject choice, the student is a unique individual with their own personality. Such emancipatory discourse is essential in questioning cultural gender concerns.

But what about other views? Here are some thoughts from other students:

**Boyi (provincial boys school):** I first touched a computer in this school, but the other computer science students [already] had an idea. There are even other boys who have a computer at home and refuse to choose this subject. They already know what we are learning. I cannot afford to pay for private college, so I took this subject. I hope to be a doctor, and I know I will need a computer.

Boyi's readiness to choose computer studies can be understood as an intrinsic reward, measured in terms of the computer skills he will develop, not necessarily by educational 'outcomes'. Boyi, unlike Vuyanzi, does not see the subject of computer studies as a professional pursuit but as a relational influence for future careers. Considering his view about prior exposure, the following was noted about the content offered in computer studies:

Form One – Introduction to Computers

- Computer Systems
- Operating Systems

Form Two – Application Packages

- Word Processors, Databases, Spreadsheets
- Desktop Publishing, Internet, Email
- Data Security and Control

Form Three – Data Presentation in a Computer

- Data Processing
- Elementary Programming Principles
- Systems Development

## Form Four – Introduction to Networking and Data Communication

- Applications Areas of ICT
- Impact of ICT in Society
- Career Opportunities in the Computer Field
- Project

**Source:** Ministry of Education, Science and Technology Secondary Education Syllabus, Vol. 4, September 2002.

The intention of the policy is clear. It revolves around exposure to the beginner, expressing the perceived imbalances in varying school environments, making the subject content ‘user friendly’ to girls and alienating them from the subject content. Differences may perhaps occur in the learning process. The following comments further illuminate the argument advanced in this paper:

**Waridi (provincial girls school):** When I joined this school, I was put into the computer science class. The teachers choose the top five girls in each Form One class ... I have done well so far and I hope to score... mmh... A in this year’s exams. You have to be alert in this subject. Many of the girls find it is too demanding. The rest want to be secretaries in big NGOs, but I want to be a lawyer.

Waridi advances the view that the school policy, subject demands, gender stereotypes and personal ambition determine students’ placement and success in the subject. On one level, she sees the key to doing well as being ‘alert’. Such an idealised solution resonates with the deeply held psychological needs of girls that cement the gendered cornerstones of computer studies.

The influence of the family is also quite profound in some of cases:

Sawe (district boys’ school): My parents want me to be an engineer, and my father says I cannot work without using a computer...

Kavuzi (district girls’ school): I think what my mother says about this subject is true; it is important that I know this subject and get my marks right. I can only use a computer here in school, since at home we don’t have one.

Ronika (provincial mixed school): The subject is good, and my teacher says so. But in class he always prefers boys answering the questions, and the boys never give us enough time on the computers, and we always have to fight for ourselves. But I will succeed!

Manyasi (district mixed school): *Wasichana* [girls] can only be good at typing and don’t do very well in this subject. I know I will be a computer engineer, so I work hard.

Gender stereotypes can be clearly seen from the students’ remarks. And as Ronika and Manyasi demonstrate, these stereotypes can be incorporated in the students’ lives over time. Computer studies is seen rewarding by most of the students in career terms. The students’ views structure any interpretation, especially in relation

to the issue of agency, specifically parental influence and teachers' views. Cognitive accomplishment is important, but Ronika describes significant agents such as the teacher and male students that enhance gender differences and stereotyping picked up in the classroom. Many of these stereotypes are reinforced by students' previous computer knowledge. More than 80 percent of the boys in Forms One to Four who enrolled for computer studies had previously used computers compared to only 15 percent of the female students. These stereotypes are often cemented at home, where the boys are more likely to be encouraged to take an interest in computers (80 percent) than the girls (15 percent). Many girls reported that their brothers were allowed to leave the home and even given financial assistance for internet browsing, thus often isolating the girls from the world outside the class that uses computer technology. However, this view was not typical of the whole group, since some schools were in rural areas where electricity points were only found at schools and hospitals, thus limiting computer access outside school for both boys and girls.

Under these circumstances, differences in computer use may be detected either in or out of the classroom. Ronika and Kavuzi want to be successful and refuse to regard the subject as structurally masculine. Ronika seems aware that the boys see girls as unfit for computer science, but this only makes her resolve to work harder. In identifying teacher-gendered tendencies and masculinity in the classroom, she attempts to resist notions of gendering in the computer studies class. Nonetheless, such gendered notions exacerbate rather than alleviate gender disparities. In co-educational schools, more is involved than competition among learners, and the situation resonates with deeply held psychological needs concerning dependency, particularly given the patrifocal emphasis in most families. Manyasi's comment that 'girls can only be good at typing' reveals profound assumptions about gender, personal development, learning and teaching.

During the research the question, 'why have you opted for computer studies?', elicited a common general answer: 'because computer studies is necessary for success'. When probed further about what 'success' means, the learners said they needed careers based on computer science (70 percent male, 40 percent female) or careers where it would be an added advantage (50 percent male, 80 percent female). The latter explanation illustrates the same gendered assumptions about the link between subject choice, schools, families and individuals, forming a conceptual basis of understanding.

Running through the teacher's interviews were the gendered differences that arose out of cultural and situational contexts. Where the schools' computer studies project was supported by the community and PTAs were vibrant, these two agents had a positive social construction on computer studies. As was emphasised by one teacher, the expectations of the parents were that their children should not be left out of the computer world:

**Teacher (provincial girls school):** Our parents are very supportive, but we must also consider the financial implications of building a computer room, the machines, etc. Some parents may want this subject, but remember it is an added financial

burden. With cost-sharing everywhere, we have to limit the subject to the very best students.

Such parental support for girls' educational programmes posits an ongoing tension between macro-structural pressures that increase the desirability of education for girls and micro-structural pressures that constrain girls' education in order to preserve a patrifocal cultural model of family. Computer studies acts as a discriminatory investment that does not benefit all; some communities cannot simply afford the added burden of computer studies. Not surprisingly, most students in 2002 came from the economically empowered provincial schools (51 percent), private schools (25 percent) and national schools (15 percent), while only 9 percent were from district schools.

### Conclusion

Access to and experience with S&T plays a vital role in the career choice process. In the area of computer studies, gender assumptions and inequalities provide the structure for the ways we think about and value the teaching of computer studies. Whether our perception of the S&T gender gap is real or imagined, the research shows that girls are more interested in computers and other technology for their social function. The masculine view is more focused on the machine itself. In discussions and research findings, the influence of computer technology on culture and gender is often overlooked. A computer is not simply an instrument or tool but a component incorporated into a system (political, social, cultural, economic), and it is these systems that pose obstacles to gender and S&T. In a developing society such as that of Kenya, issues of gender and S&T development are pivotal in shaping the technological debate and informing feminist discourse.

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