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Girls’ Decision Processes for Participation in Design and Technology Subjects in Zimbabwe’s Secondary Schools

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Abstract
This paper presents some preliminary findings from a multi-site case study of girls’ decision-making in regard to participation in design and technology subjects in Zimbabwe. The attitudes and perceptions of fourth form girls, their design and technology teachers, school principal and parents are explored in one secondary school. Data were collected by questionnaire, focus group and interview and analysed through identification of recurring concepts in the data. Complex and interrelated factors influencing girls’ decisions for subject participation were investigated through application of a model of achievement related choice (Eccles, 1994). This investigation supports the existence of eight factors, indicating most significantly that girls place value in subjects that provide the opportunity to fulfil their self-image or are consistent with their self-image. These findings contribute to understanding of girls’ participation in design and technology in the African context, a dimension which is largely missing from mainstream debates on the subject.

Key words: secondary design and technology, design, gender, self image, culture, self-image.

Introduction
The Zimbabwe technical curriculum made significant changes from a traditional craft-based to a student and process oriented approach in 1990 upon the introduction of design as a creative problem solving core component of four subjects, namely: metalwork, woodworking, technical graphics and building. The design approach was to foster creativity in problem solving, a team approach and value judgment with a focus on the learner learning rather than the teacher teaching. The approach to teaching and learning thus became the ‘promotion and development of curiosity, enquiry, initiative, ingenuity, resourcefulness and discrimination’ in the learner (Ministry of Education, and Culture, 1990:3). To reflect this paradigm shift, the four subjects were renamed: metal technology and design, wood technology and design, technical graphics and design and, building technology and design.

One of the general assumptions made by Government was that the introduction of design and technology subjects would signal a new turn of events that would see more girls taking these subjects than was the case before. Parliamentary Acts such as the Zimbabwe Sex Discrimination Act, (1980) and the Technical Education Act, (1986) were passed and policy pronouncements made for non-gendered curricula. Schools were compelled to accord equal treatment and equal access to both girls and boys in respect of all the benefits, facilities and services including the curriculum without favour or discrimination. Despite these national commitments and Government signature to international declarations, reality on the ground told a different story. Numbers remained in favour of boys in design and technology subjects from form one to four (age 13 to 16). Gwaunza and Nzira, (1997) raised concern that there was little empirical scrutiny of basic questions such as who takes what kind of courses in Zimbabwe and the consequences of students’ course of study on their academic achievement and future career opportunities.

Morgan (1986:7) argues that:

‘subject choice in secondary school is crucial in determining a girl’s future career and life options as under-participation in certain key subject areas excludes girls from entering a wide range of employment and training opportunities’.

Fuch, Stebut and Allmendinger (2001:186) speaking of the German situation, argue that the low representation of girls could be indicative of the ‘filtering process’ to which girls are generally subjected to in science and technology, where roots may be traced to the school and social processes at large. This paper explores the decision processes of fourth form girls concerning their participation in design and technology subjects in one of eight Zimbabwean secondary schools sampled in this study.

Over the past thirty years, extensive research and development in regard to increasing girls’ involvement in science, mathematics and engineering has moved from seeking to change girls to fit particular subjects, to changing teaching to become girl-friendly and, recently, to changing the construction of subjects to remove male laden values (Burns, 1997). Various models have been proposed to explain girls’ low and sometimes lack of participation in science, mathematics and engineering areas. One of the most researched models to explain girls’ subject and occupational choices was that developed by Eccles, Adler, Futterman, Goff, Kaczala, Meece and Midgley (1983).
This expectancy value model of achievement motivation and occupational choice holds that achievement-related choices made by the student are governed by their expectation of success in the activity, how the activity is related to their short and long-term goals, their gender role schema or self-identity and the social cost of engaging in that activity as opposed to other activities. In terms of expectation for success, Eccles et al argue that the individuals' choice, persistence and performance can be explained by their beliefs about how well they will do on the activity and the extent to which they value the activity. In terms of gender role schema, they argue that a student may prefer an activity that reinforces her or his self-image of or what it means culturally to be a ‘girl’ or ‘boy’.

Research design
The question addressed in this paper is, ‘what are the reasons for girls’ choice or rejection of design and technology subjects perceived by fourth form girls and significant others?’ Responses draw on the experiences of fourth form girls, their teachers and parents and uses Eccles et al (1983) model to explore their views and perceptions.

Fieldwork for this study was carried out in two provinces of Zimbabwe, Harare and Masvingo, involving eight schools in a multi-site case study. Two schools were purposively selected from each of four types of schools, namely: private elite, Government group A (urban high socio-economic), Government group B (urban low socio-economic), and rural council schools. This paper reports one component case study involving an urban Government group B secondary school located in Masvingo. Mari secondary school (a pseudonym) offered metal technology and design, wood technology and design and technical graphics and design among the design and technology subjects the present study focused. It was also the only Government secondary school where three girls were represented in technical graphics and design. Other Government group B and rural schools sampled had no girls taking any of the four design and technology subjects.

Mari secondary school is an old government secondary school with a student population of 1140 at the time of the fieldwork during the first six months of 2003. The school is situated in the high-density suburbs of Masvingo town some 292 km south of the capital city Harare and caters for children of mainly low income, self-employed, industrial and service industry communities. The communities’ strong cultural values were thought to have impacted significantly on girls’ perceptions and attitudes concerning the four subjects. The makeup of the student population was largely mono-cultural with the Shona people dominating.

Data collection included a student questionnaire completed by 38 fourth form girls selected randomly from the 118 girls in the school’s fourth form. Subsequently, focus group interviews were held with eight fourth form girls randomly selected from those who answered the questionnaire and were not taking design and technology subjects, all three fourth form girls taking technical graphics, five design and technology teachers and the family of one girl not taking design and technology who was randomly selected from those in the relevant focus group. An in-depth interview was also held with the head of the school. Anonymity of participants is preserved and pseudonyms are used. The fourth form was selected because in this year, students sit the Zimbabwe Schools Examination Council ordinary level examinations, generally considered as the school-leaving certificate. Students will have made significant decisions in regard to further study or employment. The average age of the students was 16.5 years. Initial analysis of data was done employing the constant comparative method that allows recurring concepts and similarities in the data to emerge and be refined (Silverman, 1993). The ultimate goal was to make general statements about relationships among topics by discovering the patterns and meaning in the data.

Results and discussion
Reasons for fourth form girls’ choice of or lack of choice of design and technology subjects
Questionnaire, focus group and in-depth interview responses were analysed individually and the analyses investigated collectively through the framework of Eccles et al’s (1983) model. Eight interrelated categories were identified and are reported below.

Assimilated Gender Role Schema
Respondents in the study indicated that Zimbabwean Shona culture was largely responsible for girls assimilated mindsets that saw design and technology subjects as masculine. Through differential cultural socialisation, Zimbabwean girls and boys acquired different behavioural and social traits. It was pointed out that Shona culture was structured around marriage and parenting with girls and boys being taught what it meant to be a ‘woman’ or a ‘man’ as they grew up. Their grooming from childhood was reflective of the different positions and roles they would fill in adulthood. Learning was by observation, imitation and practice and deviant behaviour was severely reprimanded by parents and other community members. Gender roles were seen as built within the language system of culture to the extent that even the very first words that the child uttered were gendered, for an example ‘Baba’ Dad and ‘Mai’ Mom. As one mother put it:
'I think it takes place when the child begins to understand language as a command medium, when the child begins to understand that he is a boy or she is a girl. A girl in our culture is taught to sit down properly. Mothers say, 'you must sit down properly like a girl, a girl sits like this (demonstrating) and a boy like that (pointing to the father sitting)'. So, the girl realizes that she is different and must follow what women do.'

The father reiterated that cultural messages through the language medium differentiated and shaped girls' and boys' way of seeing the world. For example, being told that boys ought to speak like men and not women, boys were being told in no uncertain terms that they should be brave, bold and speak with confidence and not be 'weak like women'.

Respondents perceived that cultural socialisation and resultant gender stereotypes affected girls' decisions of subject choices at school. One male metalwork teacher explained that:

Yes, cultural roles affect decisions about subject choice at school. A child who grew up learning how to weave baskets may have a profound liking for fashion and fabrics. A boy taught blacksmithing at an early age will most likely be attracted to do metalwork as this offers continuity to what the child already knows.

Fourth form girls not taking design and technology subjects were agreed that they espoused a masculine ethos and values. Responses indicated that some girls had internalised what was called their roles to the extent of believing that because they are girls, they may not be as able to tackle design and technology subjects in the same manner as boys. As one fourth form girl put it:

'We girls do not do any of the boys' technical subjects. I just think that that they are subjects for men and I won’t be able to lift the heavy equipment and materials found there' (Tsitsi).

One girl disagreed with this arguing that girls were not given the opportunity to act outside 'traditional subject areas' perceiving that Zimbabwean women received insufficient information to make informed decisions. Systemic factors incorporating ingrained cultural stereotypic views about gender differences and therefore separate engagement, were seen as directly excluding girls from participating in design and technology subjects. In many cases, girls did not have a choice but were simply channeled into subject areas by teachers. As one girl put it:

'When we came here as form ones, we were given a list of subjects we were going to take and teachers would say boys, your subjects are metalwork and woodwork and, girls you do food and nutrition and fashion and fabrics' (Dora).

Even the school principal believed in separate roles for men and women. His comments meant that he fed into the system his beliefs of separate engagement for girls and boys.

'...if we are talking about manual labour, I have reservations about that. I wouldn’t like my wife to be wielding a pick and shovel because I think it would be demeaning for her. I am quite sure that she could do it if she had to but my own personal view is that I would rather she didn’t do that. Well, to me manual labour for a woman is unladylike.'

**Cost of engaging in an activity**

According to Eccles (1994), cost may be conceptualised in terms of factors inclusive of benefits of engaging in one activity over another, the weighted effect of anxiety in respect of taking the activity, fear of failure and success and lost time while engaging in the wrong activity. One girl’s desire to venture into former ‘male areas’ on the one hand and to identify with cultural social scripts of womanhood, on the other, presented difficulty in balancing the two:

'The problem is we haven’t been given the chance to explore our talents. Nobody has told us, not even teachers to say, 'no girls, there is a market for these subjects'. Not only that but, and though women want to do various careers, they still want to keep their femininity. Now, how do you keep that intact? How do you still be a mother, be a wife, keep the traditions and still follow a career in a male field like architecture and go to work everyday?' (Cheryl)

Women’s internal conflict, according to Josefowicz, Barber and Eccles (1993), is typically resolved by ranking parenting and childcare ahead of professional endeavours. Girls perceived a lot of pressure for subject enrolment coming from significant others like parents. They indicated that they often fought between choosing their own subjects at school and following the culturally laden advice some parents provided. In a society where the education of girls is not as valued as that of boys, girls are left with no choice but to comply or risk their education. Fourth form girls also counted the cost of taking a completely new subject and struggling through it against taking a familiar subject in which they had some background knowledge. Many of the girls perceived that fashion and fabrics and food and nutrition were easier subjects because they were more familiar to them than with design and technology. They also weighed the cost of taking a subject like metalwork, and risk being the only girl in a group of boys, against taking fashion and fabrics with friends of the same gender.
**Domain specific subject efficacy**

Fourth form girls’ responses indicated that they chose subjects in which they were confident that their present skills helped them fit with the subject culture. Several of the girls chose fashion and fabrics and food and nutrition because they felt that they were not complete strangers to the areas. Respondents in this study perceived that because of differential socialisation, boys possessed more technology related knowledge than girls and tended to achieve better in these subjects. As one fourth form girl recounts:

‘engineering drawing is too much into the mechanics of things, the bolts and nuts. Most of the things I started knowing them only when I came to ordinary level (form four). For those people especially boys who have done metalwork before, they find it so much easier to do technical graphics because they know how to draw these features and they know how the engine looks like. I am just told that this is an engine and it’s just a couple of lines, curves, some straight and I have to figure out what this all means’ (Clara).

Ainley and Daly (1997) argue that improving students’ level of prior subject achievement enhances their participation levels as their self-confidence and esteem is also raised. In turn, students tended to select those activities in which they felt most confident, as was the case with this study.

A tendency was noticed where girls undervalued their capabilities to the extent of believing that boys were born with better capabilities. One girl argued that, ‘girls are not good at drawing’, hence they could not take technical graphics. However, a woodwork explained that ‘many may not have the confidence to take the subjects but, once they have enrolled, the fear disappears and they begin to enjoy themselves and do well in the subjects’. The fourth form girls suggested that because their culture put men above women in everything, they sometimes did not perform at their highest level. They felt that society expected boys to lead, so they tended to pull back to allow cultural expectations to take precedence.

**Future value of the subject**

Fourth form girls focused their attention on occupational interests and how design and technology subjects fitted their long-range goals. It appeared that most of the girls made decisions about future careers in a job market which they saw giving first preference to students who had passed academic subjects such as English language, mathematics, science, geography and history. None of the girls ascribed any future career benefit in taking design and technology subjects. One girl revealed that:

‘I have seen that the world is changing and people especially students wish to work in offices when they grow up. I do not think that if I take technology subjects, they will land me an office job’ (Tracy).

Watson, McEwen and Dawson (1994) argue that students often looked at perceived usefulness of studies to intended career. Where a correlation was not found, this tended to decrease interest and sometimes resulted in withdrawal from the subject. Many girls in the present study perceived that design and technology subjects were not pre-requisites to the careers they wanted to pursue, rather perceiving fashion and fabrics and food and nutrition as technical subjects which may be beneficial if they did not do well in academic subjects, were unable to enter university and were to engage in self employment. In a country where unemployment is close to 80% of the population, these girls saw this as critical.

**Interest in the subject**

Interest in the subject is perceived as a form of intrinsic motivation. Three girls taking design and technology subjects in this study saw the main motivating factor for participation as interest in the subject. They pointed out that their personal ability and the future value of the subject played crucial role in keeping the interest alive.

Many girls who had taken design and technology subjects in previous years said they dropped them because the subjects did not generate any interest in them. One girl said, ‘I just do not like the subjects. I found them not interesting and helpful’ (Tecla). Others pointed out that they did not like the subjects mainly because they knew nothing about what was involved there. According to Eccles (1994), interest is often associated with the perception one attached to the subject, one’s earlier achievement and social background. When a girl considered the subjects as alien to her socialization, as was the case with most of these fourth form girls, her interest diminished. For many girls who had a successful stint with any subject, Eccles argues that they were likely to pursue a related activity in the future.

**Availability of accurate information**

The girls reported a paucity of accurate information, both at home and school, that would allow them to make informed decisions about engaging in design and technology subjects. They perceived the careers that parents recommended were mainly those of people their parents saw and admired in their immediate communities. As one girl put it:

‘Because our parents do not know the jobs awaiting us, they say you should stop doing this subject because we have not seen any girl doing it. Parents...’
refuse us permission to do some of the subjects because they don’t know how these subjects will benefit us’ (Gertrude).

Teachers in schools were seen as providing little or no information to guide students in the choice of subjects and careers. One girl said that, ‘I don’t have any idea about these subjects. We were not told that girls can do these subjects (Stembeni). In terms of encouraging girls into design and technology subjects, the principal of Mari secondary school acknowledged that his school could do more. As he explains:

‘I certainly think that the school could do more to sensitize girls to take these subjects. Well, I must say that there is no direct intervention to encourage girls to take particular subjects. What happens is that there are no barriers either. Yes, we do not actively encourage, neither do we stop them (girls) to cross over and do these technology subjects.’

The Ministry of Education, Sport and Culture were also blamed for policy pronouncements without backup support and clarity on what students would benefit from taking the new design and technology subjects. Many girls believed that the subjects were for the less able students, stigmatisation which left them believing it was better to take academic subjects.

**Classroom control and learning styles**

Girls in this study saw boys as unhelpful and uncooperative in class. One girl not taking design and technology subjects felt that boys were afraid of losing that societal tag that they were better than girls, hence their refusal to work cooperatively with girls. As she put it:

‘Boys are not prepared to help you in the subject. Sometimes you want to seek information but the response that you get just puts you off. Sometimes they give you wrong answers deliberately because they think that if they give you the right information you will beat them. They are afraid that their friends will laugh at them saying they have been beaten by a girl’ (Tina).

A girl taking technical graphics complained that learning with boys was too competitive and lacked that collaboration she perceived made her learn more. Such arguments support international literature suggesting that girls and boys may favour different approaches to the same educational task (Woolnough, 1994).

Male technology teachers were blamed for concentrating too much on boys in class at the expense of girls who intimated that sometimes they felt unable to pursue questions with male teachers because they would not be listened to. Girls said they tended to let issues ride for fear of being ridiculed by both the male teacher and boys in the class, for example, when they wanted points clarified. One girl complained that:

‘Once the teacher has explained something and if the majority of the students who are boys signaled that they had understood the lesson, a girl would not dare continue to ask any more questions because the teacher and the boys would say you are drawing us back, In the end you just keep quiet’ (Kiri).

**Effects of role models and media.**

The absence of visible women role models in science, engineering and technology in Zimbabwe was perceived as a major factor in girls’ lack of participation in these areas. Role models in the family were identified as particularly influential in girls’ decisions about subjects and careers. One metalwork teacher pointed out that:

‘You find that in our family if there is a lady motor mechanic, you also find younger sisters wanting to follow in the trade. But without such women role models in the family and society, things will remain the same, each group with its own perceived roles.

This supported a study by Hill, Petus and Hedin (1990) which suggested that contact with role models like scientists, doctors, and engineers of their own gender greatly enhanced science related career decisions for girls. The importance of the media especially television was highlighted by one girl who said:

‘I think television could play a big part by showing women engineers at work so that parents and girls see these role models speaking out about their courage’ (Rita).

**Conclusion**

Eight related factors contributed to girls’ decisions about participation in design and technology subjects at fourth form level in Zimbabwe. These were:

- assimilated gender role schema;
- cost of engaging in an activity;
- future value of the subject;
- domain specific subject efficacy;
- interest in the subject;
- availability of accurate information;
- classroom control and learning styles; and
- effects of role models and media.

In particular, results show that engagement in a subject is consistent with one’s self-image. While some fourth form girls had wished to take the former
'male subjects', they chose not to do so for fear of acting outside the confines of cultural expectation and their own perceived gender identity. As Eccles (1994:597) put it, 'individuals place more value on those tasks that either provide the opportunity to fulfil their self-image or are consistent with their self-image'. Further, girls did not enjoy a learning environment where they were unable to work collaboratively with their male peers and they felt discouraged from asking questions. Together with unfamiliarity of materials and equipment, this classroom atmosphere provided a sense of alienation and is seen as a major factor preventing girls from taking design and technology subjects. Nicholls and Sutton (2001) argue that the key to student entry and retention in a subject area is a sense of belonging as opposed to alienation. They suggest that for any student to feel comfortable, they must ‘fit with institutional culture, ‘fit’ with academic staff and ‘fit’ with academic environment.

These findings suggest that to encourage girls into the current design and technology subjects, and thus provide them with opportunities to create their creative problem-solving abilities, there is a need to include contexts consistent with girls' self-image, for example jewellery in metalwork and domestic design in building. More ready access to learning in technological problem-solving, however, would be provided if a design component were introduced into the technical subjects in which girls have enrolment namely, food and nutrition and fabrics, thus expanding the range of design and technology subjects. Such development would go some way toward recognizing the technological nature of many traditionally female activities and to restoring women's technological heritage.

Acknowledgements: Thanks are extended for the support provided through a New Zealand Government Overseas Development Agency doctoral scholarship.

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