UNPOPULARITY OF DESIGN AND TECHNOLOGY EDUCATION AMONG FEMALE STUDENTS AT SECONDARY SCHOOL LEVEL IN BOTSWANA

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Abstract
This case study responds to a growing concern among educationist of the gender imbalance in subject allocation at secondary school level particularly in practical subjects such as Design and Technology, Art and Home Economic. The focus of this particular study was however in design and technology at senior secondary school level with perspective to investigate the unpopularity of D/T among the female students. The study was carried out at the two senior secondary schools in Botswana and involved teachers and students as participants. Expressly, the study set out to assess the general factors deterring the girl child from selecting D/T as a subject of their choice and to find out why girls doing Design and Technology selected it. Data was collected through interviews and questionnaire. The study found out that there are several factors contributing to the girls attitudes towards Design and Technology such as; Traditional believes, family influence, career influence, personal interest, personal experience and gender. Findings suggest that girls lack career guidance since schools do not provide the services that will encourage them to select practical subjects and this is the reason why we find enrolments dominated by boys in Design and Technology in secondary schools. Based on the findings it was recommended that schools should engage in more robust career guidance to enlighten the girls about male dominated subjects.
Keywords: D/T education, feminism, secondary education, optional subjects, guidance and counselling

Background and justification

Botswana introduced the implementation of the Revised National Policy on Education (RNPE) in 1996. One of the recommendations of RNPE was to make design and technology (D/T) a core subject at Junior Secondary School level by the year 2000. Following this effort, outstanding to financial constraints, D/T was introduced as an optional subject among a range of other subjects such as Art, Computer Studies, Physical Education and Home Economics. The table below reflects the subject groupings from the curriculum blueprint for senior secondary school programme covering core and optional subject groupings' per the two broad areas (Core group & Option group).

Table 1:Botswana General Certificate of Secondary Education: subject groupings

CORE GROUP	OPTIONAL GROUPS			
	HUMANITIES AND SOCIAL SCIENCES	SCIENCES	CREATIVE, TECHNICAL AND VOC	ENRICHMENT
English	History	Single Science	Design and Technology Agriculture	Third Language
Setswana	Geography	Double Science	Art Food and Nutrition	Physical Education
Mathematics	Social Studies	Chemistry	Computer Studies Fashion and Fabrics	Music
	Development Studies	Physics	Business Studies Home Management	Religious Education
	Literature in English	Biology		Moral Education
		Human and Social Biology (only for private candidates)		

(Curriculum blueprint: Senior secondary school programme, 1998)

As a subject D/T implicates student's application of their practical and technological skills with inventive thinking in order to design and make the products that meet the human needs. As such the purpose of D/T is aimed at improving the quality of life (Ryan, 2002) as well as solving problems as individuals and teams. The content of the subject provides students with a broad based education that equips students' with knowledge and skills that are transferable to everyday life. The programme also pays attention to the all-round development of the individual and the inculcation of attitudes and values that nurture respect for one's self and for others. Life skills education has been integrated into the programmes (Republic of BOTSWANA. 2008)

D/T as a subject has been marred by mixed attitudes and perceptions from various people. That is, some view it as a male subject while to others Design and Technology is considered a non-gender biased subject. The view that D/T is a male subject is incorrect and misleading and deserves to be challenged. Researchers experience and interaction with secondary schools in Botswana have shown that most D/T students in secondary schools in Botswana are males. This episode is a course for concern and has triggered this study. Our believe is that culture and tradition has a major impact in the attitudes of females towards the subject as the curriculum of Design and Technology has some features which are associated with our culture such as carpentry, mechanics, construction among others. For instance it has been known from traditional era that most of the jobs that involves carpentry, mechanical and construction are occupied and done by males even up to the present. Simply put, the physical elements integrated into the content of Design and Technology has brought a mentality of the subject been deemed a male subject been considered as a male subject.
Like alluded above, D/T is a more practical subject which requires a lot of physical work and less theory. Technology education refers to educating children to employ the hardware and

software of technology. It includes educating theory and practice of a range of material processes for metal, wood, plastics materials and, more recently, textile, leather and food materials. All these areas have a component of the learning theory but the greater and more important is that of gaining practical experience (Kumar, 2002, p. 125). Martin, (2003) defined it as the study of the utilization of tools, resources and systems to solve problems and to enhance control over the natural and the made environment in an endeavour to improve the human condition. These are undoubtedly enterprising definitions of D/T.

From a different look, Design and Technology activities are perceived to present one of the highest levels of ricks for injury but that does not mean that only specific gender should be exposed to danger. In modern day work places we observe that females perform a lot of physical work in various sectors such as construction industry, engineering and the army to mention but a few. This is symbolic of the latent potentials females have to fit into the so-called male careers. As such there is need to equally expose and orientate girls to D/T so as to accord them equal opportunity for possible advance into carriers such as engineering. Such a robust move can possibly help the girl child to take away the fear of working in harsh and physical conditions.

Research Objectives

The research was informed by the following objectives:

- To assess the general **factors** hinder girls from selecting D/T as a subject of their choice.
- To find out why girls doing Design and Technology selected it.

Problem statement

Design and Technology is a subject which is mostly practical with a ratio of 40% theory and 60% practical. It was first introduced in Botswana Secondary schools in 1990 with the intention of replacing traditional technical subjects such as metalwork, technical drawing and woodwork as a core subject (Moalosi, 2008). The main purpose of introducing it was to develop the technological problem solving abilities amongst students that aid them in everyday life, to enable students to work as a team to solve problems and to help pupils to develop a range of practical skills associated with the modern industry. However, from the time it was introduced in secondary schools up to the present time it has been discovered that it is a mostly male dominated subject in schools than other practical subjects therefore it brings a larger distress basing on the fact that many girls are not doing Design and Technology as it was expected. It implies that the girl child miss important elements aimed at improving their useful skills.

Literature Review

Gaotlhobogwe (2014) stated that in terms of support, in Botswana unlike in other countries like Swaziland D/T girls had more support from their parents, siblings and teachers as opposed to non D/T girls. He justified this by stating that any intervention to promote D/T amongst girls should target not only them but their families as well. From this expression it is quite clear that some of the girls doing D/T had the influence from their families in choosing D/T as the subject of their choice. It is commendable to realize that parents are actively engaged in their children's education. Such is a practice worth appreciation from parents as it is capable of helping youngsters by enlightening them on subject selection prior to making final decisions.

Growney (1995) stated that an observation has been made and statistical evidence indicates that although girls choose to engage with D/T and perform well, but very few of them make

this choice. This is an indication that even though D/T is associated with hard labor and resulting in very low intake of girls, girls who select D/T still do well in the subject. The gender discrimination of girls related to themselves as well as technology related subjects has been due to some ascribed factors such as; negative attitudes of parents. This statement makes an assumption that the negative attitudes from parents can be an influence to a girl's decision on the D/T subject, i.e. some parents may also dislike the subject for their own beliefs or perceptions so they may tend to pass their perceptions to their children and this may result in the child disliking the subject.

Growney (1995) states that lack of female teacher role models could also be a contributing factor to a girl's attitudes towards the subject. This is likely to be true as we see that in modern days that most of the D/T teachers are males and that is, there is very little or no female D/T teachers to inspire young girls in selecting D/T as their subject or even pursuing it in the future. Absence of support from families (Lin, 2012). According to Gaotlhobogwe (2014) technology education being a male dominated teaching force, technology education is bound to have a double-effect of gender imbalance. On the other hand it would be the young girls who just do not want to take up opportunities to pursue technology education, and on the other hand it would be due to a male-dominated teaching force which also creates an image to them that Design and Technology is a masculine field of study. When young girls grow seeing mostly male D/T teachers and less female teachers it may also suggest that it is male subject. This may also limit their quest to consider D/T as a subject of choice.

The lack of support from families could also be an influencing factor to the girls' choices, due to lack of career guidance in some schools, families could play an important role by at least trying to guide the students on the subjects that they could choose at the senior schools. Lemani (2015) stated that sometimes it is not about the girls' attitudes, as the statistics have shown that more boys enroll in secondary schools than boys, she stated that more girls begin to drop out of school by the time they reach standard 5 at the age around 14-15 therefore girls become less than boys in many subjects more especially in Design and Technology and science subjects, this also happen. She additionally stated that the economic factor is also one of the influence to the low enrollment of girls as some families in rural and peri-urban with poor or low income opt to invest in educating a boy child believing that he will be the breadwinner as such it leading to low enrolment of girls in secondary schools. Every pupil is encouraged to succeed according to their own ability; an individual achievement is greatly valued in Design and Technology. A study of D/T provides an ideal foundation of a variety BA and BSC degree programmes in the art and design principles, including architecture, engineering and interior design. It can also provide evidence of practical ability, teamwork and problem solving which are highly regarded by universities (Cameron, 2014). This argument is valid since D/T education teaches skills that are needed for survival in the modern days so if girls have access to this skills through studying Design and Technology they will be also gaining survival skills. In this way girls will also have a good representation in the technological fields.

Research Design

The study used the qualitative approach to collect and analyze data. This design enabled a deep interaction of students and researchers to permit an in-depth study to obtain rich information on factors that influence girls from selecting D/T as a subject of their choice among senior schools in Botswana. In terms of research methods, **a** collective, as well as an instrumental, case study of two senior secondary schools in Botswana were used to illustrate issues regarding students‟ attitudes towards D/T. A collective case study consisted of

multiple cases. According to Creswell (1998) an instrumental case study is one which focuses on a specific issue rather than on the case itself. The case is used as a vehicle to better understand the issue. Case studies have the advantage of supporting a researcher's capacity for understanding complexity in a particular context, even though there is difficulty in generalizing from a single case. Noting this difficulty, two senior secondary schools were selected, ensuring some degree of generalisation to a wider population.

Population, Sample and sampling procedure

A population according to Zikmund (2003), is the complete group of specific population elements relevant to the research project. It is always important when doing a research to have a specific group of people to conduct your research on as this could help to minimize financial constraints. The targeted population consisted of girls doing D/T and teachers of D/T at Gaborone and Naledi Senior Secondary schools. Sampling is a process of using a small number or a portion of the population to make conclusions about the population (Schindler, 2006). Two schools were selected, which are; Gaborone Senior and Naledi Senior and this selection was based on the time limit and the distance of the researchers to the two schools. Simple random sampling was used for identify students and purposive sampling for teachers for group interview and questionnaire respectively.

Data collection procedure and instruments

For this study data was collected from the primary sources and the secondary sources, the primary sources were formed by the instruments such as the in-depth interviews, group interviews and questionnaires whereas the secondary sources were formed by the published journals and textbooks. The interviews were basically meant for the girls and the questionnaires for the teachers in both schools. The in-depth group interviews were conducted on students. That is, there were two sessions of interviews all together for D/T and non D/T girls at each school. The purpose for using a group interview on girls was because this would allow the students to sit together and discuss issues surrounding their subject selection concerns and contribute to the findings. Each interview lasted for 20-25 minutes. For teachers a questionnaire was found suitable as most teachers tend to cooperate with the researchers, a set of questions were developed and all the 6 D/T teachers at the two schools were given an opportunity to share their experiences on the topic.

Validity and reliability

It is always very important to ensure validity and reliability in a research. Validity is defined as the extent to which an assessment accurately measures what it is intended to measure. Ensuring that an assessment measures what it is intended to measure is a critical component in education. The results obtained will be used to predict future achievement and current knowledge. To ensure validity, the tools of validity which are the questionnaire and the interview guide were used. During selection of students for interview a bias free sample size was selected and the appropriate instruments were used. Reliability is defined as the degree to which measures are free form error and therefore yield consistent results (Zikmund, 2003). This means that if we apply the same methods carrying out a research time and again, it should yield the same results, hence in data collection we used the same methods of data collection at Gaborone and Naledi senior schools. (Schindler, 2006) Explained that reliability is a necessary contributor to validity but is not a sufficient condition for validity.

Ethical considerations

To collect the necessary information that will aid to assess these factors, permission was requested first from the relevant authorities of both the schools which are the school heads

and the senior teachers for D/T in order to allow us to conduct the study. A schedule of appointment was made in conjunctions with school managements for data collection. The purpose for setting this appointment was to avoid interference with their planned schedules. Subsequently students were interviewed after obtaining parental informed consent. For the Questionnaire, well prepared and relevant questions were provided to the teachers and an agreement was made for collection of completed questionnaires.

Findings and Discussion

The findings of the study being reported in this paper reveal certain frustrations experienced by the girl child in Botswana, education. Study investigated factors influencing the girl child from selecting D/T as a subject of choice in the senior secondary schools of Botswana. In terms of the findings of the study, the dominance of males in the D/T teaching force, inadequate career guidance and family influence WERE the root cause of this frustration.

In this research factor analysis was be used to analyze data. Factor analysis was developed by Charles spearman (1904) to discover factors. The targeted population generates a lot of unspecific information which amongst it contains the required facts in it. In this research one of the objectives was to find out the factors influencing to select Design and Technology as the subject of their choice. The main purpose of the factor analysis seeks to explain correlation between the objectives of the research, that is could they be a link or no link between these objectives.

The following were the key questions of the study:

- What are the general factors that influence girls to select Design and Technology as a subject of their choice?
- Why girls doing Design and technology selected it as the subject of their choice?

Factors that hinder girls from selecting Design and Technology as a subject of their choice

Responses revealed shows that most girls are influenced by their families to select Design and Technology as the subject of their choice. That is, sometimes when one of their siblings, maybe a brother or sister once did Design and Technology, they would encourage their younger sister to select it. This motivated the girls to select D/T with full knowledge that they would get help from their relatives on the subject. Some students stated that they get influence from their parents as well. Findings therefore show that families have a major impact in students' choices of subjects. This is noted as a move in the right direction since at time students face a hard time in choosing subjects at senior secondary school level. Besides Gaotlhobogwe (2010) revealed that age, gender and school performance all affected attitudes of students towards design and technology and gave an in-depth understanding of the issue.

From a different look, a few students stated that D/T is related to their career aspirations and for this reason they selected it as a subject of their choice. Precisely, one student said ' I want to pursue a career in construction engineering and therefore I know D/T would pave a way for me'. This response suggest that D/T thus can be an added advantage to girls who desire to pursue engineering courses like Architecture and Industrial design. Technology is the use of knowledge, skills and resources to meet human needs and wants or solve practical problems across all culture, whilst being sensitive to its impact and consequences on the environment (Gumbo & Tholo, 2014). Given this argument it certainly means that all students deserve to be exposed to technology education inspire for their gender.

On the whole, majority of participants indicated that career guidance and advice regarding subject selection is not effective in secondary schools in Botswana. It emerged that not all

teachers offer career guidance to students before they choose their optional subject but a few teachers do that since some students stated that they were influenced by their teachers to do it as it will help them solve other design related problems in future. One other salient point made by students is that D/T is a subject which deals with the use of tools and machines and that it requires more physical labour. That itself for the students depicts it as a hazardous subject to them and hence tend to fear working with machines and being afraid of the more physical labour hence resulting in them not selecting it as a subject of their choice. It is therefore evident that there exist a perceived level of complexity of D/T among girls and this perception goes along with such views as feeling inadequate to perform well in a subject area that is believed to be mannish. Perhaps a change of subject name to help, from design and technology to technology education. Generally, and internationally, it is more appropriate to discuss design and technology under its precursor title, technology education, because technology education operates across boundaries and beyond different titles and curricular frameworks found around the world. Hill (2003) also justified the use of the term technology education rather than design and technology.

One girl stated that since her junior school days she has observed that a lot of boys select D/T more than girls and hence it was somehow a subject that was meant for boys only. It is well known that D/T is a male oriented subject, many people believe that its work is regarded as a male job and also seeing it being taught by males in most cases makes the matter worse. Others girls like to design and they are inspired by other successful designers so some of them would also want to be like those designers in future hence they will start early by doing design and technology in senior schools. It thus shows that there is hope for design and technology enrolment to be improved by targeting children, girls in particular, who deemed the subject to be too difficult or unimportant, and by reinforcing perceptions of design and technology as an enjoyable life-skill. We let girls know that learning technology would equip them to manage time and material resources effectively and provides them opportunities for collaborative learning and nurtures teamwork (Gumbo & Tholo, 2014) .

Why girls doing Design and technology selected it as the subject of their choice

The objective was based on the girls that have selected D/T as a subject of their choice. The response shows that most girls who have chosen D/T was because of their previous junior school experience. They stated that studying D/T at senior school level would not be something new to them as it would repetition of what they did before at the junior school so they would not need to learn more skills to tackle the subject. This goes along with the spiral curriculum approach as applied in Botswana. It implies that the girls who did D/T at lower level will apply the skills acquired and thus fit with ease at senior secondary school level. This is accurate as most of the content in both junior and senior schools are the same, about 80% of all the content that is taught at the junior school level is also taught at the senior level, the project and folio approaches for both levels are similar therefore it will be easy for them to grasp the content. It also shows that not all the females fear physical labour as some girls stated that the reason behind their choice of selecting D/T was to exposed to working with machines and tools. From findings it appears strongly that some girls view D&T as a difficult and masculine subject because of their ignorance, but once they select it such views change immediately and they start to enjoy and it at times excel.

Most of the girls doing D/T like the subject and that is why they selected it Participants disagreed with the common perception that D/T it is a subject for boys since they also like it and do not find it a very challenging course. The curriculum for D/T has other topics which are also taught in other subjects like Physics so topics such as electronics are offered in both

subjects. As such, studying D/T has an advantage an advantage when it comes to solving those problems in physics as they would have studied some of the content in D/T. This subject also improves critical thinking in students so by doing it will sharpen their minds in solving other general related problems. This point is raised by Gaotlhobogwe (2010) who asserts that as an emerging technological literacy subject, technology education emphasis is on literacy, which everyone needs, and it strives to lose its roots, which makes it a distinct subject with a defined role in the school curriculum.

Out of all student participants, only one girl at Gaborone Senior School stated that she was forced to select D/T even though she was not interested in the subject. At first she had decided to select Development studies as a subject of her choice but because she had studied D/T at her previous junior school her teachers ended up forcing her to select D/T which was against her willingness. This shows irresponsibility by the teachers when they force students to select the subjects that they are not interested in because as a result the student might end up failing the subject because of her lack of interest in the subject and this end up also affecting the overall performance of girls in the D/T subject.

Teachers' responses on the factors influencing girls to select D/T as a subject of their choice

The subject of Design and Technology is clearly a male oriented but according to some teachers responses it shows that they are unaware of this which brings a question mark to their statements. This is a clear indication that some D/T teachers care less about lower numbers of girls doing D/T. From the questionnaire responses, at Gaborone Senior School, a class with many students (boys & girls) has 14 pupils with the largest number of girls doing D/T (4 girls) and a teacher states that D/T is not a male oriented subject shows that they are ignorant about the issue of many girls not doing D/T. This is an indication that the teachers are not doing enough in terms of promoting the subject. The teachers stated their views that the 2 main reasons why girls don't choose to study D/T is because of the traditional beliefs and fear of more physical labor. ;*This subject contains of some of the practical work like carpentry that in some cultures it is regarded as work that should be carried out by men only so some girls may choose to abide to their traditional beliefs even at school by not doing Design and Technology and rather choose a different subject instead 'said another student..*

D/T is a subject that indeed involves a lot of practical work hence more labor will be needed, other girls may fear doing too much practical and rather take a different subject.75% of the teachers who took part in in the study responding to the questionnaire stated that ever since they started the career of teaching the number of girl studying D/T has always been far less than that of boys due to the environment in which D/T is offered where in in some instances heavy machinery may be used and resources too are scrambled for because they are scarce. Researchers argue that in an environment where there is scramble for limited resources girls may not survive because mostly they are softer in character. Similarly, due to girls‟ stronger gender discrimination view of technology than boys, it would be expected that in such an environment, as described by the interviewees in the current study, girls would find the study of technology unsuitable for them (Gaotlhobogwe, 2010).

The teachers on the sample indicated that D/T is a subject that is open for every student and that there were no policy restrictions that inhibit girls from selecting and doing D/T. However it has been observed that girls who choose to study D/T perform better on the subject and some of the teachers have shown a concern in the low enrollment of girls in the D/T subject countrywide as this leads to misrepresentation of the girl child in the D/T related fields.

Alternately such a practice deprives the girl child of the pursuance of some careers such as engineering.

Conclusion

The Study examined the reasons behind the unpopularity of D/T among the girl child in secondary schools in Botswana. Findings show that family influence, career influence, personal interest, personal experience, gender and traditional beliefs had an influence in the attitudes of a girl child towards the subject of D/T. Along the same, the gendered nature of D&T has been viewed as a socialization problem rather than a biological determination problem (Author, 2004). The participants expressed their views in what could be the factors influencing the girl in selecting D/T as a subject of their choice. The girls lack career guidance since the schools do not provide the services that will encourage them to select practical subjects and this is the reason why there will always be more boys than girls doing Design and Technology in secondary schools. Along the same the study maintains that and laments the unfortunate situation of male dominance in the teaching force considering the fact that playing field in teacher training has been made level and open.

Recommendations

The following are some of the recommendations of the study.

1. Career guidance should be taken more serious in schools. As such schools should provide career guidance. Some career paths like engineering require students to have gone through the basics of D/T so by addressing this to them would encourage them to study D/T at the senior level.
2. The enrollment of girls in Design and Technology should be on equitable ratio with boys so as to balance the gender in subject allocation.
3. D/T teaches skills that are needed for survival in the modern days so more space should be reserved for girls to allow them to also acquire the survival skills needed.
4. The teachers should work with the parents hand in hand to encourage the girl child to study Design and technology at the senior school.
5. The number of female teacher-trainees at training institutions should be increased in Design and technology to act as female role models to the girls, this can encourage girls to select D/T. The more females take up technology related jobs and increase female role models the more the subject will be perceived as important, and then the attitudes will be influenced positively (Gaotlhobogwe, 2010).

References

Cameron, M. J. (2014). *Queeenswood*. Retrieved from http://www.queenswood.org/Design-and-Technology: http://www.queenswood.org/Design-and-Technology

Curriculum blueprint: Senior secondary school programme. (1998, November 16). *Curriculum blueprint: Senior secondary school programme*, p. 9.

Drabble, E. (2013, November 10). *the gurdian*. Retrieved from the gurdian: https://www.theguardian.com/teacher-network/teacher-blog/2013/nov/10/teaching-design-technology-teacher-devoted

education, B. M. (1998, November). Curriculum blueprint: Senior secondary school programme. *Curriculum blueprint: Senior secondary school programme*.

education, B. M. (1998, November 16). Curriculum blueprint: Senior secondary school programme . *Curriculum blueprint: Senior secondary school programme* , p. 9.

education, M. o. (1998, November 16). Curriculum blueprint: Senior secondary school programme. *Curriculum blueprint: Senior secondary school programme*, p. 9.

education., B. M. (1998). Curriculum blueprint: Senior secondary school programme . *Curriculum blueprint: Senior secondary school programme* .

F. C. Indoshi, M. O. (2010). Factors that determine students' and teachers'.

Gaotlhobogwe, M. (2010). *ATTITUDES TO AND PERCEPTIONS OF DESIGN AND TECHNOLOGY STUDENTS TOWARDS THE SUBJECT: A CASE OF FIVE JUNIOR SECONDARY SCHOOLS IN BOTSWANA* . UNIVERSITY OF WALES INSTITUTE, CARDIFF SCHOOL OF EDUCATION .

Gaotlhobogwe, M. (2014).

Gaotlhobogwe, M. (2014). *A Comparative Analysis of Patterns of Girls' Attitudes towards Design and Technology: Botswana and Swaziland.* University Of Botswana.

Gaotlhobogwe, M. (2014). *A Comparative Analysis of Patterns of Girls' Attitudes towards Design and Technology: Botswana and Swaziland*.

Gaotlhobogwe, M. (2014). A Comparative Analysis of Patterns of Girls' Attitudes towards Design and Technology: Botswana and Swaziland.

GOV.UK. (2013, September 11). Retrieved from GOV.UK: https://www.gov.uk/government/publications/national-curriculum-in-england-design-and-technology-programmes-of-study/national-curriculum-in-england-design-and-technology-programmes-of-study

Growney. (1995). Gender inequality in technology... moving forward.

Hazard Identification and Risk Management. (2005). Australia.

Lemani, E. (2015). *Gender issues in the secondary schools.* Malawi: Evelyn Lemani.

Lemani, E. (n.d.). *Gender issues in Secondary schools in Malawi.* Malawi: Lemani, Evelyn.

Lin, W.-h. &.-Y. (2012). australian journal of technology education.

Moalosi, R. (2008). *Challenges facing teachers in the teaching of design and technology education in Botswana's primary schools.* Univercity Of Botswana .

Mould, I. (1989). *Google Books*. Retrieved from Google Books: https://books.google.co.bw/books?id=JUnJpBuUBEoC&pg=PA1&lpg=PA1&dq=The+purpose+of+design+and+technology&source=bl&ots=dH22b45Wkp&sig=wBcHWaeOOvV1qqNpEQf_c4juEUU&hl=en&sa=X&ved=0ahUKEwjY747u87jWAhUHJsAKHZ_LBhUQ6AEIQTAE#v=onepage&q=The%20purpose%20of%20desi

USCLibraries. (2017, october). Retrieved from USCLibraries: http://libguides.usc.edu/writingguide/researchdesigns

V.Ryan. (2002). *www.technologystudent.com*. Retrieved from www.technologystudent.com: http://www.technologystudent.com/index.htm