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Full Length Research Paper

What do boys and girls think about technology?

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The purpose of this article is to give a snapshot of the variables on attitudes and concepts of learners towards technology as a learning area in schools. The research was designed from a constructivist perspective. The questionnaire was employed to gather data about the attitude of learners towards the implementation of technology education in the North West Province. Data was collected using the simple random sampling procedure involving 7634 learners in the North West Province. The questionnaires were then analyzed using the Statistical Package for Social Sciences (SPSS). The variables on learner attitudes towards technology were discovered to be crucial for the implementation of technology in schools. The data on the attitudes towards technology indicates that as learners progress from grades 7 to 9 (ages 12 to 14), their attitudes and concepts become more positive and this depends on how technology is taught in the classroom. There was significant main effect for the variable of gender on attitude, meaning that there is a significant difference between boys and girls in the positiveness of their attitudes towards technology, with boys being more positive. This is considered as an area that needs development, and emphasizes the importance of gender equity programmes in technology education.

Keywords: Boys and girls, technology, North West Province

INTRODUCTION

Background

The introduction of Technology as a learning area in schools has produced a challenging future for all those involved with every aspect of Technological education. This challenge is particularly relevant to the educators whose future responsibility will be to implement this exciting learning area as members of the school based Technology teams. Teaching Technology makes a unique contribution to the education of all learners. It prepares them to work in a rapidly changing technological world by introducing them to the design methods and skills needed to produce practical solutions to real problems (Black, 1998:2; Anonymous, 2002:2).

The successful implementation of the Technology curriculum is dependent on educators at all levels having a solidly established personal construct of Technology, equivalent to that of the curriculum. The views of educators about the nature of Technology are of great concern to curriculum support specialists at in-service level (Nkotsoe, 2004:4). In an examination of the dimensions of Technology, Custer (1995:219) argues that there is a critical need for all individuals to develop at least minimum levels of the understanding of Technology as it has a profound influence on all parts of human life in the world. Technological literacy is becoming one of the backbones for development through education on a global scale.

The current study is modeled on research synthesized from studies of Mallet (1997:4) and Holland (2004:16). These studies reflect research efforts to identify suitable approaches for the implementation of Technology as well as assessment of instructional strategies in Technology education. According to Holland (2004:16) assessing learners' cognitive ability resulting from various instructional approaches is difficult. However, measuring learners' attitudes toward Technology may reveal the teaching approaches that relate to positive attitudes toward Technology. De Klerk Wolters (1989:9) suggests that from the perspective of attitude formation, it is important to start Technology education at an early age. This means that it is appropriate to pay attention to Technology in the initial training of primary school educators and/or as part of an in-service training.

Table 1: Age category of learners

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11 - 12 years	463	6.1	6.3	6.3
	13 - 16 years	6294	82.4	85.9	92.2
	17 - 19 years	552	7.2	7.6	99.8
	20 - 22 years	18	.2	.2	100.0
	Total	7327	95.9	99.9	
Missing	Missing	307	4		
	Total	307	4.0		
Total		7634	100.0		

Learners ought to be taught a "broad concept of Technology" because there is a positive relation between having a broad concept of Technology and positive affection towards Technology (Nkotsoe, 2004:4).

Theoretical framework

Constructivism is an approach to cognitive development in which learners discover all knowledge about the world through their own activity (Berk, 2000:645). It is based on a combination of a subset of research within cognitive and social psychology. Dewey is considered to be the founder philosopher of this approach (Huitt, 2003:1). In constructivism knowledge is not a fixed object; it is constructed by an individual through his/her own experiences of that object (Hsiao, 2007:3; Doolittle and Camp, 2007:17).

Dewey stresses the importance of having the learners' knowledge grow from experience. Knowledge and ideas comes only from a situation where learners have to draw them out of experiences that have meaning and importance to them (Epstein, 2002:5). These situations have to occur in a social environment, where learners could come together to analyze materials and to create a community of learners who held their knowledge together.

The focus of Piaget's theory is the various reconstructions that an individual goes through in the development of logical reasoning. Vygotsky believed that children learn concepts from their everyday notions and from adult concepts. He goes on to say that learners need to be guided by adults, but he also thought that it was very important for the learner to be influenced by their peers as well as discover things on their own (Epstein, 2002:6). He terms this the zone of proximal development. These supports that learners receive from peers and adults are gradually removed as learners develop autonomous learning strategies, thus promoting their own cognitive, affective and psychomotor learning skills and knowledge.

Constructivism provided the theoretical framework for this study because learning by doing and simulations of occupations are the basis for much of the instruction in Technology education (Huitt, 2003:2). Although constructivism is not a theory of teaching, it suggests taking a radically different approach to instruction from that used in most schools. The best way to learn is not from lectures, but by letting learners construct knowledge for themselves. Learners should have a constructivist educator along with a constructivist classroom to help them discover new things for themselves. Constructivism promotes increased social interaction and discussion in the classroom, both between educators and learners and between learners.

METHODOLOGY

Research questions

1. Do older learners have significantly more positive attitudes towards technology than younger learners?
2. Do rural learners have more sophisticated ideas about technological prospects than urban learners?
3. Is there a significant difference between males and females in their attitudes towards technology?
4. Is there a significant difference between males and females ideas about technological careers?

Population and sample

A learner questionnaire was administered to the sample to obtain information regarding the attitudes and concepts of learners towards Technology. The biographical information of such learners is subsequently discussed hereunder.

Age

Learners were requested to indicate their ages on the questionnaire. As seen in Table 1 the most important category is the attitude forming capacity age (ages13-16). This category constituted 6294 respondents (84%). The first age category is of learners who started grade 1

Table 2: Location of schools from which learners were sampled

	Frequency	Percent	Valid percent
Urban	4332	56.7	56.7
Rural	3006	39.4	39.4
Missing	296	3.9	3.9
Total	7634	100	100

Table 3: Five education regions from which learners were sampled

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1518	19.9	19.9	19.9
	2	1524	20.0	20.0	39.9
	3	1515	19.8	19.8	59.7
	4	1426	18.7	18.7	78.4
	5	1651	21.6	21.6	100.0
	Total	7634	100.0	100.0	

Table 4: Grades from which learners were sampled

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	142	1.9	1.9	1.9
	2	142	1.9	1.9	3.7
	7	2217	29.0	29.1	32.9
	8	2421	31.7	31.8	64.6
	9	2702	35.4	35.4	100.1
	Total	7624	99.9	100.1	
Missing	System	10	.1		
Total		7634	100.0		

earlier. The schools were lenient regarding the admission policy and 6% of these learners were sampled. Another age category is the 17-19 and the 20-22 age categories. These categories constituted 570 respondents (7.4%). These categories of age groups might have been retained (made to repeat a grade due to unsatisfactory performance) for more than once in a phase. Three hundred and seven respondents (4%) did not indicate their age.

Location of schools

According to Table 2, about 4332 of the respondents (56.7%) constituted of learners from urban areas. These were within easier reach than rural schools, which comprised of 3006 respondents (39%). Thirteen respondents (0.2%) did not indicate if they were from rural or urban areas.

Regions

The questionnaires were administered in each of the five education regions. There was almost a balance of the returned questionnaires from each of the education regions as indicated in Table 3. There were 1518 participants in region 1 comprising 19.8% of the respondents. In region 2 there were 1524 participants making 20% of the respondents and in region 3 there were 1515 participants forming 19.8% of the respondents. In both regi ons 4 and 5 there were 1426 and 1651 participants respectively. These comprised 18.7% and 21.6% of the respondents respectively.

Grade

According to Table 4 almost four percent of the learners indicated that they are doing grades 1 and 2. The reason for this error is that the capturing instrument was not validated to take grades 7, 8 and 9 only. Ten respondents (0.1%) did not indicate the grade they were in. The study therefore comprised of 2217 (29%) grade 7 learners, 2421 (31.7%) grade 8 learners and 2702 (35.4%) grade 9 learners.

Table 5: Gender of sampled learners

	Frequency	Percent
Boy	3806	49.8%
Girl	3792	49.7%
Missing	36	0.5%
Total	7634	100%

Instrumentation

Table 6: Examples of Learner attitudes and concept of technology sub-scale items

Item	*Sub-scale*	*Statement*
11	Interest	I positively want to have a job in technology
20	Interest	For learners of my age technology is interesting
10	Gender	Girls can do technology
35	Gender	Boys know more about technology than boys
6	Consequences	Technology is very important in life
7	Consequences	Technology makes everything go better than before
31	Curriculum	I know pretty well how an electric kettle works
27	Curriculum	I would like to learn more about technology at school
36	Careers	I would like to have a career in technology later on
37	Careers	When I choose a profession I consider whether it is technological or not
17	Difficulty	Technology is too difficult for me
39	Difficulty	You must be very clever to be able to study technology

Gender

Table 5 shows that 49.8% of the respondents are boys and 49.7% are girls. This shows that all genders are well represented. Zero comma five percent of the respondents did not indicate if they were boys or girls.

The questionnaire was divided into two sections, according to the following focus:

Section A: (question1-5). The purpose of this section was to gather the biographical and demographic information about each respondent. This information included the age, location of school, region, grade and gender of the respondent.

Section B: (questions 6-83). The aim of these questions was to determine the attitudes and concepts of learners towards Technology. In this 77-item instrument, respondents were asked to indicate their perceptions on a four-point scale (1 = Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree).

An analysis on the attitude and concept of learners towards Technology was done concentrating on eight factors. These are general interest in technology; attitude toward technology; technology as an activity for boys and girls; gender; consequences of technology; technological careers; curriculum; and technology is difficult (Holland, 2004:139; de Klerk Wolters, 1989:2; Boser, Palmer and Daugherty, 1998:6; Neale, 2003:25; Becker and Maunsaiyat, 2002:4). The concept of technology items represents a single scale. The responses were on a four-point scale, i.e. 1= Strongly agree, 2 = Agree, 3 = Disagree and 4 = Strongly disagree. This scale was chosen so that the respondents may commit themselves to either agree or disagree with the statement. The researcher tried to avoid the five point scale to eliminate the error of central tendency. Table 6 shows the items from the said factors that were included in this study.

Data Collection and Analyzes

A Likert-type survey, Learners' attitudes toward Technology, was administered to assess learners' attitudes related to Technology and to assess learners' attitudes and conceptual understanding of Technology. Statistical procedures using the Statistical Programme for the Social Sciences (SPSS) were used to analyze responses to the Learners' attitudes and concepts of Technology survey. The following general procedures were used to analyze and interpret data:

1. Analyze responses using a principal component analysis to identify item grouping for the sub-scales;
2. Compute chi-square tests to identify attitudinal differences by gender and location on the sub-scales; and
3. Compute Spearman's rank correlation between the age of learners and their perceptions about technology.

RESULTS/FINDINGS

A factor analysis was conducted on the attitude instrument data in an attempt to verify the factors on the sub-scales. These factors have been labeled interest, gender, consequences, difficulty, curriculum and career. A chi-square analysis was conducted as the main analysis of the data, with factors gender (male, female), location (rural, urban), and age. The attitude scale has a

Table 7: Chi-square test on item 8 with gender as variable

Gender		Technology is only concerned with computers (V8)				Total
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Boy	Count	699	768	1177	900	3544
	% within column	54.6%	51.3%	46.2%	46.9%	48.9%
Girl	Count	581	730	1371	1018	3700
	% within column	45.4%	48.7%	53.8%	53.1%	51.1%
Total	Count	1280	1498	2548	1918	7244
	% within column	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square =30,527 p-value = 0,00 df = 3

Table 8: Chi-square test on item 10 with gender as variable

Gender		Girls can do technology (v10)				Total
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Boy	Count	1479	1243	406	428	3556
	% within VAR00010	44.0%	50.8%	59.4%	54.5%	48.9%
Girl	Count	1881	1203	278	357	3719
	% within VAR00010	56.0%	49.2%	40.6%	45.5%	51.1%
Total	Count	3360	2446	684	785	7275
	% within VAR00010	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square =75,51 p=0,000 df = 3

high measure of reliability. Cronbach's alpha was computed at 0.854. This compares favourably with the average alpha value for the PATT studies done in Australia, Belgium, Canada, Hungary, Sweden, UK and USA of 0.85 (Williams, 1996:14).

The principal component factor analysis on the attitude instrument was conducted forcing a six factor structure, but this accounted for only 32% of the variance. A general pattern seems to be that the factors are better defined in more developed countries producing results that clearly verified up to five or six factors and account for more than 65% of the variance (Williams, 1996:14). In this study seem to less clearly isolate factors, and explain about 30% of the variance. This implies that learners in this study do not think the same way about technology as learners in other countries. This is dependent on the typical technological experiences of learners in different countries.

The chi-square tests were also analyzed to determine the level of significance among the proportion of respondents. Only those questions that had a significant difference (Pearson chi square value being less than 0.005) have been taken into consideration (Ary, Jacobs and Razavieh, 1990:209). An analysis was conducted to check for missing data. This is represented by missing item in tables 1-5 above. A check for missing data in the attitude instrument revealed that there were 649 (8.5%) incomplete instruments out of a total of 7634. This meant that 649 learners had not responded to every item on the instrument. Further analysis would normally ignore these instruments. A random review of the raw data indicated however that for many of these instruments there were less than five items of the 43 total items incomplete. A significant chi-square difference between male and female, and between locality and age, was found on only four of the 43 items related to missing data, indicating that the effect of the missing data on these variables is not significant (Table 7).

The statistical software package (SPSS 15.0) was used to perform chi-square test for the data in Table 6. The chi-square statistic and the p-value with 3 degrees of freedom were 30,527 and 0,00 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about technology being concerned with computers is significantly dependent on the gender of the learners. It means that the majority (54, 6%) of learners who tend to strongly agree that technology is only concerned with computers are boys, whereas the majorities (53, 1%) of learners who tend to strongly disagree are girls (table 8).

The chi-square statistic and the p-value with 3 degrees of freedom were 75, 51 and 0, 00 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about girls doing technology is significantly dependent on the gender of the learners. It means that the majority (56%) of learners who tend to

Table 9: Chi-square test on item 11 with gender as variable

Gender			I positively want to have a job in technology (v11)				Total
			Strongly Agree	Agree	Disagree	Strongly Disagree	
	Boy	Count	1310	1303	517	410	3540
		% within VAR00011	53.1%	49.3%	41.4%	46.9%	48.9%
	Girl	Count	1159	1342	731	465	3697
		% within VAR00011	46.9%	50.7%	58.6%	53.1%	51.1%
	Total	Count	2469	2645	1248	875	7237
		% within VAR00011	100.0%	100.0%	100.0%	100.0%	100.0%

46,58 0,000 3

Table 10: Chi-square test on item 17 with gender as variable

		Technology is too difficult for me (v17)				Total
	Gender	Strongly Agree	Agree	Disagree	Strongly Disagree	
Boy	Count	668	663	1076	1108	3515
	% within VAR00017	49.4%	46.7%	46.9%	51.8%	48.8%
Girl	Count	685	756	1217	1033	3691
	% within VAR00017	50.6%	53.3%	53.1%	48.2%	51.2%
Total	Count	1353	1419	2293	2141	7206
	% within VAR00017	100.0%	100.0%	100.0%	100.0%	100.0%

13,32 0,004 3

Table 11: Chi-square test on item 18 with gender as variable

		A girl can have a technological profession just as well as a boy (v18)				Total
	Gender	Strongly Agree	Agree	Disagree	Strongly Disagree	
Boy	Count	1367	1220	567	391	3545
	% within VAR00018	44.7%	49.1%	57.1%	54.1%	48.8%
Girl	Count	1688	1266	426	332	3712
	% within VAR00018	55.3%	50.9%	42.9%	45.9%	51.2%
Total	Count	3055	2486	993	723	7257
	% within VAR00018	100.0%	100.0%	100.0%	100.0%	100.0%

55,6 0,000 3

strongly agree that girls can do technology are girls, whereas the majorities (54, 5%) of learners who tend to strongly disagree are boys (Table 9).

The chi-square statistic and the p-value with 3 degrees of freedom were 46, 58 and 0, 00 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about having a job in technology is significantly dependent on the gender of the learners. It means that the majority (53, 1%) of learners who tend to strongly agree that they want to have a job in technology are boys, whereas the majorities (53, 1%) of learners who tend to strongly disagree are girls (Table 10).

The chi-square statistic and the p-value with 3 degrees of freedom were 13, 32 and 0, 004 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about technology being too difficult is significantly dependent on the gender of the learners. It means that the majority (50, 6%) of learners who tend to strongly agree that technology is too difficult are girls, whereas the majorities (51, 8%) of learners who tend to strongly disagree are boys (Table 11).

Table 12: Chi-square test on item 24 with gender as variable

Gender			Boys are able to repair things better than girls (v24)				Total
			Strongly Agree	Agree	Disagree	Strongly Disagree	
	Boy	Count	1094	935	611	592	3232
		% within VAR00024	51.2%	52.1%	44.7%	44.0%	48.6%
	Girl	Count	1043	861	756	754	3414
		% within VAR00024	48.8%	47.9%	55.3%	56.0%	51.4%
Total		Count	2137	1796	1367	1346	6646
		% within VAR00024	100.0%	100.0%	100.0%	100.0%	100.0%

34,19 0,000 3

Table 13: Chi-square test on item 35 with gender as variable

Gender			Boys know more about technology than girls (v35)				Total
			Strongly Agree	Agree	Disagree	Strongly Disagree	
	Boy	Count	985	909	801	842	3537
		% within VAR00035	51.3%	50.0%	49.1%	45.3%	48.9%
	Girl	Count	934	908	831	1017	3690
		% within VAR00035	48.7%	50.0%	50.9%	54.7%	51.1%
Total		Count	1919	1817	1632	1859	7227
		% within VAR00035	100.0%	100.0%	100.0%	100.0%	100.0%

15,15 0,002 3

Table 14: Chi-square test on item 9 with location of school as variable

Location of School			Working in technology is very creative (v9)				Total
			Strongly Agree	Agree	Disagree	Strongly Disagree	
	Urban	Count	1986	1749	303	251	4289
		% within VAR0009	59.1%	62.4%	48.6%	52.5%	59.0%
	Rural	Count	1376	1053	321	227	2977
		% within VAR0009	40.9%	37.6%	51.4%	47.5%	41.0%
Total		Count	3362	2802	624	478	7266
		% within VAR0009	100.0%	100.0%	100.0%	100.0%	100.0%

50,01 0,000 3

The chi-square statistic and the p-value with 3 degrees of freedom were 55, 6 and 0, 000 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about a girl having a technological profession just as well as a boy is significantly dependent on the gender of the learners. It means that the majority (55, 3%) of learners who tend to strongly agree that a girl can have a technological profession just as well as a boy are girls, whereas the majorities (54, 1%) of learners who tend to strongly disagree are boys (Table 12).

The chi-square statistic and the p-value with 3 degrees of freedom were 34, 19 and 0, 000 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about boys being able to repair things better than girls is significantly dependent on the gender of the learners. It means that the majority (51, 2%) of learners who tend to strongly agree boys are able to repair things better than girls are boys, whereas the majorities (56%) of learners who tend to strongly disagree are girls (Table 13).

The chi-square statistic and the p-value with 3 degrees of freedom were 15, 15 and 0, 002 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about boys knowing more about technology than girls is significantly dependent on the gender of the learners. It means that the majority (51, 3%) of learners who tend to strongly agree boys know more about technology than girls are boys, whereas the majorities (54, 7%) of learners who tend to strongly disagree are girls (Table 14).

Table 15: Chi-square test on item 10 with location of school as variable

Location of School			Girls can do technology (v10)				Total
			Strongly Agree	Agree	Disagree	Strongly Disagree	
	Urban	Count	2056	1510	362	378	4306
		% within VAR00010	61.2%	61.7%	52.9%	48.2%	59.2%
	Rural	Count	1304	936	322	407	2969
		% within VAR00010	38.8%	38.3%	47.1%	51.8%	40.8%
Total		Count	3360	2446	684	785	7275
		% within VAR00010	100.0%	100.0%	100.0%	100.0%	100.0%

62,82 0,000 3

Table 16: Chi-square test on item 11 with location of school as variable

Location of School			I positively want to have a job in technology (v11)				Total
			Strongly Agree	Agree	Disagree	Strongly Disagree	
	Urban	Count	1387	1633	778	480	4278
		% within VAR00011	56.2%	61.7%	62.3%	54.9%	59.1%
	Rural	Count	1082	1012	470	395	2959
		% within VAR00011	43.8%	38.3%	37.7%	45.1%	40.9%
Total		Count	2469	2645	1248	875	7237
		% within VAR00011	100.0%	100.0%	100.0%	100.0%	100.0 %

28,3 0,000 3

Table 17: Chi-square test on item 12 with location of school as variable

Location of School			Developed countries can do much for developing countries by technology (v12)				Total
			Strongly Agree	Agree	Disagree	Strongly Disagree	
	Urban	Count	1656	1804	533	263	4256
		% within VAR00012	58.4%	62.7%	55.2%	49.4%	59.1%
	Rural	Count	1178	1071	433	269	2951
		% within VAR00012	41.6%	37.3%	44.8%	50.6%	40.9%
Total		Count	2834	2875	966	532	7207
		% within VAR00012	100.0%	100.0%	100.0%	100.0%	100.0%

43,04 0,000 3

The chi-square statistic and the p-value with 3 degrees of freedom were 50,01 and 0, 000 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about working in technology being creative is significantly dependent on the location of the school. It means that the majority (59, 1%) of learners who tend to strongly agree that working in technology is very creative are from urban schools, whereas the majorities (52, 5%) of learners who tend to strongly disagree are also from urban schools (Table 15).

The chi-square statistic and the p-value with 3 degrees of freedom were 62, 82 and 0, 000 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about girls doing technology is significantly dependent on the location of the school. It means that the majority (61, 2%) of learners who tend to strongly agree that girls can do technology are from urban schools, whereas the majorities (51, 8%) of learners who tend to strongly disagree are from rural schools (Table 16).

The chi-square statistic and the p-value with 3 degrees of freedom were 28, 3 and 0, 000 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about wanting to have a job in technology is significantly dependent on the location of the school. It means that the majority (56, 2%) of learners who tend to strongly agree that they positively want to have a job in technology are from urban schools, whereas the majorities (54, 9%) of learners who tend to strongly disagree are also from urban schools (Table 17).

Table 18: Chi-square test on item 43 with location of school as variable

Location of School		In technology there is much opportunity to invent things by yourself (v43)				Total
		Strongly Agree	Agree	Disagree	Strongly Disagree	
Rural	Count	1595	1876	531	254	4256
	% within VAR00043	60.9%	61.0%	52.4%	49.3%	58.9%
Urban	Count	1026	1197	483	261	2967
	% within VAR00043	39.1%	39.0%	47.6%	50.7%	41.1%
Total	Count	2621	3073	1014	515	7223
	% within VAR00043	100.0%	100.0%	100.0%	100.0%	100.0%

47,4 0,000 3

Table 19: Spearman's rank correlation between the age of learners and their perceptions about technology

Item (Statement)		Age Category
Technology is only concerned with computers (**V8**)	Correlation Coefficient p-value Sample Size (N)	-0,086 0,000 7244
A girl can have a technological profession just as well as a boy (**V18**)	Correlation Coefficient p-value Sample Size (N)	0,069 0,000 7257
When I choose a profession I consider if it is technological or not (**V37**)	Correlation Coefficient p-value Sample Size (N)	0,025 0,032 7205
You must be very clever to be able to study technology (**V39**)	Correlation Coefficient p-value Sample Size (N)	-0,042 0,000 7232
You can learn a lot of technology by yourself (**V42**)	Correlation Coefficient p-value Sample Size (N)	-0,034 0,004 7231

The chi-square statistic and the p-value with 3 degrees of freedom were 43, 04 and 0, 000 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about developed countries doing much for developing countries by technology is significantly dependent on the location of the school. It means that the majority (58, 4%) of learners who tend to strongly agree that developed countries can do much for developing countries by technology are from urban schools, whereas the majorities (50, 6%) of learners who tend to strongly disagree are from rural schools (Table 18).

The chi-square statistic and the p-value with 3 degrees of freedom were 47, 4 and 0, 000 respectively. Since the p-value is less than 5% level of significance, then the perceptions of learners about much opportunity to invent things by themselves in technology is significantly dependent on the location of the school. It means that the majority (60, 9%) of learners who tend to strongly agree that in technology there is much opportunity to invent things by themselves are from urban schools, whereas the majorities (50, 7%) of learners who tend to strongly disagree are from rural schools.

Test of significance was conducted on the attitude instrument using Spearman's rank correlation. The test is concerned with the relationship between two ranked variables (X and Y). The relationship is statistically significant if the p-value is less than 5% level of significance. Table 19 below shows Spearman's rank correlation between the age of learners and their perceptions about technology. Negative r means older learners tend to strongly agree, whereas younger learners tend to strongly disagree with the given statement. Positive r means older learners tend to strongly disagree, whereas younger learners tend to strongly agree with the given statement (Table 19).

The statistical software package (SPSS 15.0) was used to perform the correlation analysis and the results are shown in Table 19. The p-value = 0,000 indicates that the correlation between the age category and statement 8 is significant at 5% level of significance. Since the correlation coefficient (r = -0,086) is negative, it means that older learners tend to strongly agree that technology is only concerned with computers, whereas younger learners tend to strongly disagree. In item 39, the p-value = 0,000 indicates that the correlation between the age category and statement 39 is significant at 5% level of significance. Since the

correlation coefficient (r = -0,042) is negative, it means that older learners tend to strongly agree that you must be very clever to study technology, whereas younger learners tend to strongly disagree. The same trend applies for item 42. The p-value = 0,004 indicates that the correlation between the age category and statement 42 is significant at 5% level of significance. Since the correlation coefficient (r = -0,034) is negative, it means that older learners tend to strongly agree that you can learn a lot of technology by yourself, whereas younger learners tend to strongly disagree.

According to table 19, item 18, the p-value = 0,000 indicates that the correlation between the age category and statement 18 is significant at 5% level of significance. Since the correlation coefficient (r = 0,069) is positive, it means that older learners tend to strongly disagree that a girl can have a technological profession just as well as a boy, whereas younger learners tend to strongly agree with the statement. The same could be said about item 37. The p-value = 0,032 indicates that the correlation between the age category and statement 37 is significant at 5% level of significance. Since the correlation coefficient (r = 0,025) is positive, it means that older learners tend to strongly disagree that when they choose a profession, they consider whether it is technological or not, whereas younger learners tend to strongly agree with the statement.

CONCLUSIONS

These conclusions are summaries of the findings and discussions, and will be organized around the research questions. Information from the quantitative analysis will be used in answering these questions.

- Do older learners have significantly more positive attitudes towards technology than younger learners?

Younger learners have significantly more positive attitudes towards technology than older learners. Studies conducted in the Netherlands, seem to indicate that learners' attitudes to technology are strongly entrenched by the time they are about 11 years (Williams, 1996:23).

There is a significant difference between urban and rural learners in their attitudes towards technology, with urban learners being more positive.

- Is there a significant difference between males and females in their attitudes towards technology?

There is a significant difference between males and females in their attitudes towards technology, with males being more positive. This gap between males and females seem to exist for all learners and remains even if they study technology.

- Is there a significant difference between males and females ideas about technological careers?

Boys seem to be interested in following technological careers than girls.

RECOMMENDATION

Recommendations and Implications for teacher education

- Technology should be taught well at an early stage in primary schools because it is the period of attitude formation;
- Technology education programmes may not be meeting the needs of female and rural learners. The profession should strive to develop curriculum materials and activities that meet the interest and needs of these learners;
- The research should be expanded to Further Education and Training (FET) Band Institutions (Year 15-18);
- FET schools should take technology subjects and learn more about technology.

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