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# Computer attitudes of primary and secondary students in South Africa

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**Abstract**

This study investigated computer attitudes of 240 students from eight primary and secondary schools in South Africa. The student population of six of the eight schools that participated in the study can be characterised as middle or upper class. Two schools were from South African townships. All eight schools used computers for educational purposes, although the availability and use of the computers differed. The research question of the study was whether differences in computer attitude could be found between boys and girls, and to what extent these differences could be explained by student, school, and environment characteristics. In contrast to most studies on gender differences and computer attitudes, no gender differences in computer attitudes were found. However, this study showed differences in computer attitudes between students from the upper/middle class schools and students from the township schools. The latter showed a less positive attitude towards computers, but more interest in computer-related careers compared with the students in the upper/middle class schools. The study found that computer access and experience, which was significantly lower in the township schools, was also related to computer attitude.


*Keywords:* Technology; Attitude; Gender; Social economic status; Primary education; Secondary education

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## 1. Introduction

South Africa is the most developed and economically stable country of the African continent. It is also one of the African countries in which the importance of Information and Communication Technology (ICT) is growing fast. One area, in which the influence of ICT in South Africa society is visible, is education. According to the *School Register of Needs Survey* there is a qualitative improvement in the provision of basic facilities at schools since their first survey in 1996 (Department of Education & Department of Communications, 2001). Amongst these improvements is the increasing availability of computers for teaching and learning, which increased from 8.7% in 1996 to 12.3% in 2000. Another survey showed that in 2000, approximately 13% of all South African schools for primary and secondary education use computers (Lundall & Howell, 2000).

The 'new media industry' of South Africa offers many new employment possibilities (Howie, 2001). These professions, however, are only accessible to those with sufficient ICT knowledge and skills. With the growing importance of ICT in South African society, the labour market for people lacking ICT knowledge and skills will become increasingly difficult. A large gap is developing between a small group of people who have access to ICT skills and a large group of people who do not.

Women especially seem to have fallen victim to the growing inequality between the 'haves' and the 'have nots'. South African women are already seriously underrepresented in the information technology field (Central Statistics, 1998). In the late 1990s, more men than women were involved in information technology in South Africa. For example, only 30% of college degrees in computer science and information technology were awarded to women (Galpin, Sanders, Turner, & Venter, 2003). The SAITIS Baseline Studies (1999) revealed that only 27% of IT employees are women.

These gender differences are not only characteristic of South Africa. In many other countries like the Netherlands – where ICT is accessible on a large scale – women are also seriously underrepresented in ICT related training and professions (Ministerie, 1998). Therefore, the low participation of women in ICT professions cannot only be explained by the lack of ICT-access and ICT knowledge and skills. Without women choosing technology-based careers, gender imbalances will sustain. It is important for females to not only grow familiar and confident with ICT, but to develop an interest in the field as well. Education could be one of the instruments to make computers and computer-related professions more attractive to women. Schools should not only prepare students by providing them with the required ICT knowledge and skills, but present ICT in such a way that it is attractive and interesting for both male and female students. It is generally assumed that sufficient knowledge and skills as well as stimulating positive attitudes towards ICT will increase the participation of women in the information technology field (Van Eck & Volman, 2001).

Because of the low representation of South African women in computer-related training and professions, it was expected that girls and boys in primary and secondary schools would have different attitudes towards computers. This assumption was supported by the large number of (mostly Western) studies on gender differences in computer attitudes, showing less positive attitudes amongst girls compared to boys (e.g. Comber, Colley, Hargreaves, & Dorn, 1997; Shashaani, 1994; Van Eck & Volman, 2001).

This study focuses on gender differences in computer attitude of primary and secondary students in South Africa. By conducting eight case studies, not only in-depth information

could be collected about the computer attitude of students, but possible factors influencing (gender differences in) computer attitude could be explored as well. The problem statement of this study is as follows:

> Which differences can be found in computer attitudes between boys and girls in primary and secondary education in South Africa and to what extent can these differences be explained by student, school and environmental characteristics?

The study has been carried out under the frame of the Second Information Technology in Education Study (SITES – Module 2, Kozma, 2003; Pelgrum & Anderson, 1999). SITES is a series of studies on computer use in education conducted under the auspices of the International Association for the Evaluation of Educational Achievement (IEA). Module 2 was an international study on innovative pedagogical practices using Information and Communication Technology and was carried out between 2000 and 2002. Twenty-six countries participated in SITES Module 2, including South Africa.

During the last 25 years many studies have addressed the issue of gender differences in computer attitudes. To identify factors that may affect differences in computer attitudes between male and female students, the present study starts with a review of the most recent studies in this area. While most studies on computer attitudes are conducted in Europe and the United States, only a few studies have investigated this issue in Africa. In a study by Moore (1994), male South African Matric students were found to have a more positive computer attitude than female students. A more recent South African study focusing on students' attitude towards technology however, did not reveal gender differences in attitude towards technology (van Rensburg & Ankiewicz, 1999). Both girls and boys shared similar views about the importance of technology in society and believed that technology should be accessible to all.

To identify possible influencing factors on computer attitudes, the literature review could not be limited to these African studies. Studies from European countries and the United States were also used, provided it could be assumed that the identified influencing factors were relevant in the South African context as well.

The results from the literature review were also used to define the meaning of the concept 'computer attitude', and to develop the case study instruments.

### *1.1. Review of the literature*

#### *1.1.1. Computer attitude*

The concept 'Computer attitude' can be divided into three components: affective, cognitive, and conative (Fishbein & Ajzen, 1975). First of all, differences in computer attitudes between female and male students can be attributed to the *affective* component of attitude. Gender differences in students' comfort and confidence with computers, anxiety towards computers, and enjoyment of working with computers were found in several studies (e.g. Durndell, Glissov, & Siann, 1995; Moore, 1994; Ordidge, 1997; Shashaani, 1994). In general, most male secondary students felt more *confident* with the use of computers than female students. Female students appeared to be more *anxious* with computers and considered the computer more difficult than male students. Weil and Rosen (1995) defined technophobia as "anxiety about present or future interactions with computers or computer related technology." According to them, girls were more 'technophobic' about computers than boys. However, not all studies agreed with this. Robertson, Calder,

Fung, and O'Shea (1995) found that there was little significant difference in female and male secondary students' anxiety and comfort with computers. This result was explained by increasing exposure of both female and male students to computers and game machines. Janssen Reinen and Plomp (1997) found that female students in elementary, lower and upper secondary schools *enjoyed* using the computer less than male students did.

Several studies showed that female and male students' attitude differ at the *cognitive* component of attitude as well. Robertson et al. (1995) conclude in their study that female secondary students are less positive about computers because they had less interest in them and regarded computers as less useful than males. Shashaani (1994) also found that high school male students scored higher on interest in and utility of computers than the female students. In addition, Comber et al. (1997) found that male students had a more positive attitude towards computers and *valued* them more than female students did Janssen Reinen and Plomp (1997) found that female students (in elementary, lower and upper secondary schools) perceived more problems with the use of computer software compared to their male classmates.

An interaction between the affective component and the cognitive component was found by Shaw and Marlow (1999). They showed that students who were anxious about computers and had less self-confidence tended to have a strong negative score on the use of the computer.

Several researchers studied the *stereotyping* aspect of computer attitudes (computers are more suitable for boys than for girls, e.g. Levine & Donitsa-Schmidt, 1998; Shashaani & Khalili, 2001). Shashaani and Khalili (2001) found that female university students showed a stronger belief in equal gender ability and competence in computer use than males. Durndell and Thomson (1997) found that most high school boys as well as girls believe that computers are part of the 'male domain'.

Finally, most research showed that females and males differ in their *preferences for specific computer activities*. According to Van Eck and Volman (2001), boys use a computer for a broader variety of activities than girls. Janssen Reinen and Plomp (1997) also demonstrated that male students were engaged in a greater number of different computer activities in school compared to female students. Their study showed that female students indicated a higher engagement in word-processing in comparison with male students. In contrast, Comber et al. (1997) found no gender differences in the use of the computer for word-processing and playing games. Internet use seemed to be more attractive to girls than boys. Mumtaz (2001) found that primary school boys spent more time playing computer games whereas girls spent more time on the Internet e-mailing friends. Martin (1998) showed that girls were more enthusiastic than boys in doing tasks with the Internet.

### *1.2. Possible factors influencing computer attitudes*

Most studies found a relationship between gender and (aspects of) computer attitudes. Many of these studies also tried to find explanations for these gender differences. One of the most mentioned factors in the research literature is *computer experience.* For example, Moore (1994) found in her study involving South African students a positive correlation between computer experiences and attitude. Schumacher and Morahan-Martin (2001) researched the relationship between Internet use and computer experiences,

skills, and attitudes. Their results indicated that male university students were more experienced with computer programming and games than female students. Also, male students were more likely to own a computer than female students. Furthermore, males spend more time on the Internet than females. Competency and comfort with computers and the Internet were highly inter-correlated and both were predicted by computer and Internet experience.

According to Ordidge (1997), differences in computer attitude between male and female students appeared to be related to the *accessibility* to computers. Parental purchasing patterns and computer ownership by boys could reinforce gender differences. Several studies found that male secondary students use a computer at home more frequently than females do. Furthermore, more male than female students have access to a computer at home (Comber et al., 1997; Robertson et al., 1995). Selwyn (1998) discovered that high school students who use a computer at home have a significantly more positive attitude towards the use of computers than students who do not use a computer at home. The use of computers at home was advantageous to students in terms of their classroom ICT performance, computer proficiency, and amount of computer use in the school. More surprisingly, computer use at home also seemed to have a positive effect on the general performance of students in school (Selwyn, 1998).

Furthermore, the social environment like the *computer attitudes of parents* and *parental encouragement of students to work with a computer* can affect students' attitude towards computers (Shashaani, 1994). Shashaani (1994) found that parents' gender stereotyped views about computers can have a positive effect on the computer attitudes of their sons, but a negative effect on their daughters' attitude.

Several studies assume that the teacher's impact on students' computer attitudes is an important one (e.g. Christensen, 1998; McLlroy, Bunting, Tierney, & Gordon, 2001; Van Eck & Volman, 2001). A confident and competent approach of the instructor might have beneficial effects on students with anxiety and negative computer attitudes. As mentioned by McLlroy et al. (2001), a negative first experience is likely to be associated with anxiety attitudes and negative cognitions. Also, the presence of *female role models* in the school could have a positive effect on the computer attitudes of female students. Women working with computers confidently could serve as role models for female students (Janssen Reinen & Plomp, 1997). Lee (1997) states that when more male teachers than female teachers use computers in their education, it confirms stereotyped views about computer use among male and female students.

The effects of the *educational settings* (single-sex or co-educational classes or schools) on girls' and boys' computer attitudes is regarded as a possible influencing factor as well. Jones and Clarke (1995) for example, found that female students from single-sex settings had more experience with computers and more positive computer attitudes than female students from co-educational settings. Although the girls from single-sex settings had the same amount of access to the resources, they had more computer experience with a larger variety of computer programs, which turned out to be the strongest indicator of a positive computer attitude.

The literature review revealed several factors that could affect gender differences in computer attitudes. In this study, the influence of the type of computer use and experience, the role of parents, the influence of educational setting, and a school's social status is explored. Enjoyment, importance, anxiety and stereotyped views are considered important aspects of computer attitudes with regard to gender differences.

## 2. Design

### 2.1. Sample

Eight primary and secondary schools in the Western Cape and Gauteng provinces in South Africa took part in this study. Six of them were also selected for SITES. These six schools were located in the Western Cape Province and were selected because they were seen as more advanced and successful in using ICT in their teaching and learning than the average South African school. The students of these schools were from upper and middle social classes. Because these advanced schools are a minority in South Africa, two additional schools considered more typical of South Africa were selected. These were situated in the Gauteng Province, in a township called Duduza. The students from these schools are mainly from the lower social class. The two schools had recently obtained a number of computers and had just started to use them for teaching and learning.

Two of the eight schools in the sample were girls-only schools, one was a boys-only school, and five were co-educational schools. The age range of students varied from 10 to 16 years. Table 1 provides an overview of the schools that participated in the study.

### 2.2. Instruments

#### 2.2.1. Student questionnaire

A short version of the Computer Attitude Questionnaire (CAQ), developed by Knezek, Christensen, and Miyashita (1998), was used to assess students' computer attitudes. Three subscales from the CAQ are used in this study. They are Computer Importance, Computer Enjoyment, and Anxiety. Computer Importance is a cognitive component of attitude and it implies 'the degree of perceived usefulness of using computers for present and future work'. Computer Enjoyment is an affective component and involves 'liking or enjoying working with computers'. Computer Anxiety is an affective component and can be described as the 'fear of computers or the tendency of a person to be uneasy, apprehensive, and phobic towards the use of computers'.

The whole computer attitude scale of this study consisted of 20 statements. Students were asked to read the statements and circle the degree to which they agreed or disagreed with them on a four-point scale.

In addition to the attitude scale, four statements about stereotypes of computer users developed by Shashaani (1992), were included. Besides the computer attitude scale and the Stereotyping scale, questions were asked about students' backgrounds, computer use at school and outside school, computer experience, and preferences for activities with computers and computer-related careers. The student questionnaire has been completed by 240 students (133 females; 107 males) from the eight participating schools (see also Table 2).

#### 2.2.2. Interviews

In addition to the student questionnaire, school principals, teachers, and parents were interviewed by means of group interviews (Table 2). The interviews provided information about the schools' social status, computer background, ICT policy, ICT facilities, use of ICT in the educational practise, teachers' encouragement of students to work with computers, parents' perceptions of ICT, and parents' encouragement of their children to work with computers.

Table 1
Students' background characteristics among the eight cases studied

| School | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| School type | Girls-only Secondary | Girls-only Primary | Boys-only Secondary | Co-education Middle | Co-education Primary | Co-education Secondary | Co-education Primary | Co-education Primary |
| Sample | 26 female | 34 female | – | 18 female | 14 female | 14 female | 13 female | 14 female |
| Gender division | – | – | 24 male | 24 male | 16 male | 15 male | 11 male | 17 male |
| Age | 13 | 12 | 15 | 14 | 10 | 15 | 13 | 13 |
| Grade | 8 | 7 | 9 | 9 | 5 | 10 | 7 | 7 |
| Ethnic group (majority) | White | White | White | White | White | White | African | African |
| Socio-economic status | Upper | Middle | Upper | Middle | Middle | Middle | Lower | Lower |

The socio-economic status is an estimation of the students' background, based on the interviews with the school principal and the teachers.

Table 2
Different methods of data collection and number of respondents per school

| School | | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| Student questionnaire | Female | 26 | 34 | – | 18 | 14 | 14 | 13 | 14 |
| | Male | – | – | 24 | 24 | 16 | 15 | 11 | 17 |
| | Total | 26 | 34 | 24 | 42 | 30 | 29 | 24 | 31 |
| School Principal interview | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Teachers interview | | 5 | 3 | 7 | 4 | 5 | 4 | 8 | 8 |
| Parents interview | | 3 | 3 | 2 | 1 | 3 | 4 | – | – |

### 2.3. Analysis

#### 2.3.1. Student questionnaire

To calculate the attitude scores, the values of the responses to the negative statements were reversed in order to maintain a unified direction on the scale. High values represent positive attitudes and low values represent negative attitudes. For the Stereotyping scale, high values represented a very stereotyped view about computers, whereas low values represented non-stereotyped views about computers. Factor analysis was conducted and Cronbach $\alpha$ was calculated for each of the sub scales, the total Attitude scale, and the Stereotyping scale. Cronbach $\alpha$ for the three sub-scales was 0.82 (importance), 0.76 (enjoyment), and 0.82 (lack of anxiety). The coefficient for the total scale was 0.86. The $\alpha$ for the Stereotyping scale was 0.69. These coefficients indicate an acceptable level of internal consistency for each of the (sub)scales. Student's *t*-test and bivariate Pearson product-moment correlations were calculated between the computer attitude scores and other factors measured with the student questionnaire. The differences and correlations between the two groups were regarded significant if $p < 0.01$.

#### 2.3.2. Interviews

The qualitative data obtained from the interviews with school principals, teachers, and parents were analysed by coding school and environment factors that could influence student computer attitudes. Factors such as computer experience, computer access, parental encouragement, schools' vision towards computers, type of school (single-sex or co-educational), and encouragement by teachers, resulted from the literature review. First, a within-case analysis was carried out. Next, the information from the eight cases were extracted and reorganised into a cross-case comparative format. Based upon the case data, a scheme was developed to score each of the variables (and the sub-variables): computer attitude, student characteristics, school characteristics, and environment. The scheme enabled the identification and understanding of the differences among student computer attitude scores and the different school and environment conditions. For example, to compare the extent to which students feel encouraged by teachers to work with a computer among the eight cases, this variable was scored per school as high, mixed, or low encouragement, depending on the percentages.

## 3. Results

### 3.1. Students' computer attitudes

Table 3 provides the scores for girls and boys on the computer attitude scales.

Table 3
Students' scores on computer attitude and stereotyping scale

| | Gender | *N* | Mean (SD) |
|---|---|---|---|
| Computer importance | Female | 130 | 3.4 (0.5) |
| | Male | 104 | 3.3 (0.5) |
| Computer enjoyment | Female | 130 | 3.4 (0.4) |
| | Male | 104 | 3.3 (5) |
| Computer anxiety (lack of) | Female | 120 | 3.3 (0.5) |
| | Male | 105 | 3.2 (0.6) |
| Total computer attitude scale | Female | 117 | 3.4 (0.4) |
| | Male | 103 | 3.2 (0.4) |
| Stereotyping (competent in computer use)[a] | Female | 131 | 1.4 (0.6) |
| | Male | 102 | 2.0 (0.6) |

Judgements were made on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). Stereotyping scale: Low score, perception males and females equally competent. High score, male and female not equally competent.
[a] $p < 0.01$.

In contrast to most studies on this subject, no significant differences in computer attitude between male and female students were found. In general, both female and male students seemed to be quite positive about computers. Female and male students regard computers as important and useful for daily life. Most students indicated that it is important to learn how to use a computer, that a computer is useful, and that a computer gives one the opportunity to learn new things. Also, the students were convinced that possessing computer skills contributes to getting a good job in the future. The majority of both female and male students agreed that when computers are used more often in education, they would enjoy school more.

The results also showed that female and male students equally enjoy working with a computer. Particularly on the statement "I enjoy doing things on a computer" where both groups scored very high (females, mean = 3.6; males, mean = 3.5). Furthermore, female students were even more likely to disagree with the statement "I am tired of using a computer" than male students ($t = 3.36$, $p < 0.01$).

The majority of the students in the study agreed that females have as much ability as males when learning to use a computer, that females can do as well in computer careers, and that studying about computers is important for both genders. Female students were less stereotyped ($t = -7.22$, $p < 0.01$) and showed a stronger belief in the equality of both sexes for participating in computer activities than male students.

Despite the fact that female students did not have very stereotyped views about computers and believed that women are just as capable of learning and using computers as males, they showed very limited interest in technology-related careers. Overall, most female and male students were not interested in careers as computer programmers, software developers, technical co-ordinators at schools, helpdesk operators, or computer retailers. In the top three of their favourite professions, only 19% (9% female; 30% male) of all students wrote down a profession that could be typified as computer-related.

### *3.1.1. Type of computer use and computer experience*

In general, students' most favourite programs were playing computer games, sending and reading e-mail, and searching for information on the Internet. Students liked drawing with a computer as well. Both male and female students did not like word-processing

(although females liked it more than males, $t = 5.34$, $p < 0.01$), database programs, software programming, and drill-and-practise programs to practise maths and spelling. Girls liked communicating with email significantly more than males did ($t = 3.13$, $p < 0.01$). These results confirm the results of the Mumtaz (2001), Van Eck and Volman (2001) studies.

The study did not reveal a significant difference in computer experience between girls and boys. However, a positive correlation was found between computer experience and computer attitude. This implies that students with more computer experience are more likely to have a positive computer attitude ($r = 0.41$, $p < 0.01$). The correlation is high at the computer anxiety scale as well, which means computer experience reduces anxiety towards computers ($r = 0.45$, $p < 0.01$).

### 3.1.2. Students' computer attitude and parental encouragement

Most parents encouraged their children to work with a computer. Female students felt most encouraged by both their parents, while male students felt most encouraged by their mother (mother, $t = 3.02$, $p < 0.01$; father, $t = 2.02$, $p = 0.05$). This parental encouragement seemed to be related to parents' positive view about computers. Although some parents said they were concerned that computers will decrease the value of books, most were very enthusiastic about computer use in education. Computers were regarded especially important for a childs' future. One parent said during the interview: "my daughter is learning just basic skills, which is obviously helping her for the future." Another parent mentioned the need for ICT skills for future jobs as he said, "I think we are moving into a new convention era where a lot of computers and technology will be used or required in a job." As confirmed by another parent, "in this age they obviously need all the skills to get on in the world".

### 3.1.3. Students' computer attitude and single sex schools

The data revealed that female students in a single-sex school had a more positive attitude towards computers than females from a co-educational school setting. As shown in Table 4, this difference is significant on the sub-scales enjoyment ($t = 5.77$, $p < 0.01$) and anxiety ($t = 5.97$, $p < 0.01$), the whole attitude scale ($t = 5.84$, $p < 0.01$) and the stereotyping scale ($t = -5.19$, $p < 0.01$). During the interviews with the school principals and teachers, it became clear that in the single-sex girls' schools gender equality is regarded more important and it is emphasised more in their curriculum, compared to the other schools.

Table 4
Computer attitude and stereotyping of female students in single-sex and co-educational school settings

| | Single-sex girls' schools Female ($n = 60$) | Co-educational schools Female ($n = 73$) |
|---|---|---|
| | Mean (SD) | Mean (SD) |
| Computer importance | 3.4 (0.4) | 3.3 (0.6) |
| Computer enjoyment[a] | 3.6 (0.3) | 3.2 (0.5) |
| Computer anxiety (lack of)[a] | 3.6 (0.4) | 3.1 (0.5) |
| Total computer attitude scale[a] | 3.5 (0.3) | 3.2 (0.4) |
| Stereotyping[a] | 1.2 (0.3) | 1.7 (0.7) |

Judgements were made on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree).

[a] Differences between the two groups are significant ($p < 0.01$).

The boy's school in the sample did not show a more positive computer attitude in comparison with the attitude of other male students in the sample.

*3.1.4. Students' computer attitude, experience and access related to the schools' social status*

Although no significant gender differences were found in students' computer attitude among the students in our sample, those from the upper and middle class schools had a more positive computer attitude and less stereotypical views about women in computing than the students from the township schools (see Table 5).

Both female and male students from the two township schools have a lower mean attitude score and are more stereotyped than students from the wealthier schools ($t = -7.01$, $p < 0.01$).

When one takes into account the mean computer-student ratio for South African schools (1:42), the six upper and middle class schools can be seen as well resourced to use ICT in education (Pelgrum & Anderson, 1999). They had at least one computer available for 25 students or less. In addition, most of these schools had facilities such as a computer lab, a media centre, a local network, and a connection to the Internet and e-mail. In contrast, the two township schools lacked most of these computer facilities; these schools had access to only five basic computers (computer-student ratio, school G: 1:166, school H: 1:148), which were used for incidental activities only. At one of the township schools, the students got the opportunity to use a computer at school only once a month and did not have access to a computer at school after school hours. The upper and middle class schools also differed with the township schools in their ICT policy. The majority of the school principals in the six upper and middle class schools regarded the use of ICT in their schools as an important issue. In comparison with the township schools, these schools have a more comprehensive perspective of ICT in their institutions. They mention the importance of ICT in their education and regard ICT as a tool to enhance learning and emphasise the integration of computers in the teaching and learning practices. Therefore, these schools increasingly integrated ICT into their educational practices. As one principal stated: ''computers should be effectively used in every facet of the school''. Some teachers stated that ''students should learn ICT skills as part of something else'', and ''ICT [should] simply [be] used effectively for projects''. In contrast, the focus of the ICT policy of the two township schools was mostly to make their learners computer literate. To learn about computers was seen as important because it enables students to increase their career

Table 5
Differences in computer attitude between students from advantaged and less advantaged schools

| Attitude scale | Advantaged schools ($n = 185$) | Less advantaged schools ($n = 55$) |
|---|---|---|
| | Mean (SD) | Mean (SD) |
| Computer importance | 3.3 (0.4) | 3.3 (0.7) |
| Computer enjoyment[a] | 3.4 (0.4) | 3.1(0.5) |
| Computer anxiety (lack of)[a] | 3.4 (0.5) | 2.9 (0.5) |
| Total computer attitude scale[a] | 3.4 (0.4) | 3.1 (0.4) |
| Stereotyping[a] | 1.5 (0.6) | 2.2 (0.6) |

Judgements were made on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree).

[a] Differences between the groups are significant ($p < 0.01$).

opportunities. Yet, ICT was considered a separate subject and not as a tool to enhance learning.

Another difference, which could be related with the schools' social status was the computer experience of the students. The students from upper and middle class schools were exposed to computers for a couple of years and gained a lot of computer experience because of this. In contrast, students from the township schools were exposed to computers for the first time only a couple of months before. Besides, most students from the more upper and middle class schools had access to a computer at home or could use one at their friend's place. Most students from the township schools did not have access to a home computer.

The data of this study confirmed earlier studies regarding the positive relationship between computer experience and computer attitude. Therefore, it could be expected that students from the township schools would have a less positive attitude than students from the upper and middle class schools. Students from the township schools indeed had a significantly less positive attitude towards computers. The lower social status of the schools' students, the schools' low accessibility to computer facilities, and the limited computer experience of the students might have contributed to a lower positive attitude. However, the computer attitude amongst township students is still quite positive. Furthermore, the students from the two township schools showed a greater interest in computer-related careers than their peers from the middle and upper class schools. It seems that a computer-related career is especially attractive for lower class students who have limited access to computers and limited experience in computer use. Perhaps for these students a computer career is seen as a possible opportunity to enhance their social status.

## 4. Discussion

The South African study of Moore (1994) and a large number of European and American studies reported a more positive attitude towards computers from boys compared to girls. This study, which included 240 students from eight South African schools, did not reveal gender differences in computer attitude. The results showed that both boys and girls enjoy working with a computer, are not anxious towards the computer, and see the computer as a useful tool for daily life. This result is found for students in the 'advanced' schools, as well as for students in the township schools.

With the data collected in this study, it was not possible to explain why studies in western countries often show gender differences in attitudes and why this study did not. Cultural, social, or economical differences between countries could be part of the explanation. However, the explanation could also be related to the design of this study. The sample of this study is limited, and most of the schools participating in this study (selected within the context of the research project SITES) were not representative of South-Africa. This problem was only partly solved by the selection of two additional town-ship schools. Another explanation could be related to the instruments used for measuring computer attitude. In general, studies on gender differences in computer attitude can be characterised by a large variety in instruments used to measure computer attitude. On the basis of a secondary analysis on the results of several studies, Kay (1993) concluded that different attitude instruments lead to different results with regard to the presence or lack of gender differences. Therefore, this study used an attitude

instrument that was developed and used in various other studies. Furthermore, the instrument took different aspects of attitudes into account and analysed them separately, including stereotyped views of computers.

In contrast to computer attitudes, the gender differences in favourite computer activities in this study are similar to the results of other studies. Hanor (1998), for example, found that females in primary school do not like computers as much as males, but appreciate the communication possibilities. Of all computer activities presented, both boys and girls in this study favoured playing games, sending and reading e-mail, and searching information on the Internet. Girls, in particular, liked to use e-mail more than boys.

Van Eck and Volman (2001) stated that because these ICT-applications for communication are just as or even more attractive to girls, they provide new opportunities for a more gender-egalitarian education, in general.

The study found a positive correlation between computer attitude and computer experience. Again, this result corresponds with findings from other studies. Moore (1994) found a relationship between computer experience and attitude amongst South African Matric students. She adds that earlier involvement with computers can attribute to a more positive attitude. In the present study, both boys and girls are encouraged by their parents to learn computer skills.

Finally, this study revealed that girls in single-sex schools had a more positive attitude towards computers compared to girls in co-educational schools. Jones and Clarke (1995) found the same results in their study. Young and Fraser (1992), in Jones and Clarke (1995) attributed this difference to a higher social economic status, since single-sex schools are mostly private and well-resourced schools. Another explanation for this outcome could be that girls in single-sex schools or classrooms feel more at ease and are more confident about their achievements in computer use than girls in mixed groups, especially if the teacher is female too. This could lead to a more positive computer attitude in single-sex groups compared to mixed groups. Dutch case studies have shown that girls in mixed groups are often 'overruled' by boys during computer tasks (Bamossy & Jansen, 1993; Volman, 1997). Compared to girls, boys are louder, demand more attention from the teacher, are more eager to operate the computer, and are less likely to attribute failure to themselves.

This research did not reveal gender differences in computer attitude, but showed differences in attitude towards computers between schools with students from a different social status. The computer attitude of the students from the two township schools was lower – but still positive – than the computer attitude of students from the other schools. These students also had less access to computers at home and at school and, therefore, less computer experience. As mentioned by Ordidge (1997), access might have a direct influence on actual use of computers and students' computer attitude.

Nevertheless, the results did not show a negative attitude of students from the township schools towards computers. What is more, students in these schools showed a relatively high interest in computer-related careers. The fact that ICT provide new opportunities in the labour market is probably more important to those students than to students from the high and middle class schools. From this perspective, it is important that schools with many students from lower classes get the opportunity to have an education in which ICT plays a role. As one of the teachers from the township schools said in the interview, "if some of our students can become computer literate, they can become skilled workers".

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