Pre-Service Teachers' Attitudes Towards Effective Teaching And Meaningful Learning In Technology Education

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Abstract
The aim of this study was to develop an understanding of pre-service teachers' attitudes towards effective teaching and meaningful learning in Technology education. We explain how a quantitative research approach was used, involving a convenient sample of 100 students to conduct the study. Data collection was by means of an attitude survey. Our results show that in terms of cognitive competence, these students believe that they can learn Technology, while they also value the subject by using it in everyday life. Although Technology is not too difficult, it does require a great deal of discipline to learn, and most people have to learn a new way of thinking to do it. A correlation analysis of data additionally revealed that students who will use Technology when they are teachers also enjoyed taking these Technology sections of their courses.
Keywords: Pre-Service Teachers' Attitudes towards Technology

"**Attitude remains the critical factor in feeding the drive toward progress**."
(Bahr, Shaha, Farnsworth, Lewis & Benson, 2004, p. 88)

1. Introduction

The emergence of the world's current post-industrial technologically based societies over the past few decades "has made serious demands upon the education sector" (Ankiewicz, Adam, De Swardt & Gross, 2001, p. 189). This has resulted in curriculum reform in Technology, with many important changes in the ways in which subject concepts are being taught in primary and high schools. The implementation of computers and various other technologies in the classroom, as well as utilising discovery, hands-on constructivist-type activities (Mills, 2004) not only offer teachers and learners many alternatives in terms of new and innovative strategies, but are also being used in a concerted effort to improve attitudes towards effective teaching and meaningful learning in Technology education.
"Teacher attitudes have long been understood as an important factor in educational progress" (Bahr et al., 2004, p. 88):

- teacher values and attitudes, intrinsic to a specific person, influence learners' values concerning technology education (Reddy, Ankiewicz, De Swardt & Gross, 2003), and
- teachers' concepts of technology and technology education have a direct bearing on how learners in their classes perceive the subject (McGrath, 2002).

Pre-service teachers "have not yet attained the conceptual knowledge ... they need to guide their students to undertake technological practice in its broadest sense" (McGrath, 2002, p. 43). If they do not have positive attitudes toward the *usefulness* of technology, it might be because they "lack favorable attitudinal patterns related to their anticipation of the impact of teaching". For them to be able "to cope with the particular demands of teaching technology education" (Reddy, Ankiewicz & de Swardt, 2005, p. 15), there is a need for an approach which will develop teachers who will actively seek ways to *use what they learned.*

Students can then not only incorporate their newly acquired skills into *useful* learning that will not go to waste, but these could also be levered towards the development of positive attitudes.

We therefore believe that this study presents something that would appeal to the national and international Technology Education community, in that it informs "the process of developing the most effective ways of preparing teachers to deal with values in technology education" (Pavlova & Middleton, 2002, p. 103).

As Pavlova and Middleton (2002, p. 103) also hold that "the question concerning the values that technology educators hold is still an open one", similar to Mills (2004), we used this survey with the aim of providing simple descriptive statistics to answer research questions around pre-service teachers' attitudes towards, and ideas regarding, effective teaching and meaningful learning in Technology education. The study thus took place against the contextual background of pre-service teachers enrolled in various Technology courses, who were administered a Survey of Attitudes towards Technology, which also made additional data available regarding important variables previously related to attitudes.

Now that we have introduced the reader to focus-aspects regarding the background, aim and nature of this study, we will provide an overview of applicable literature related to pre-service Technology teachers' attitudes. We discuss the theoretical and conceptual framework underpinning this paper in broad outlines, before supplying a description of the research design and methodology used. A presentation and discussion of results follows, before a summary of results and the implications of these conclude the paper.

2. Literature Review

Transitions in Technology Education throughout the world and the subject's adjustment to these have resulted in the implementation of a contemporary, national Technology education curriculum initiative as "a compulsory lower secondary level subject" in both South African and Australian schools still being in its infancy (Van Niekerk, Ankiewicz & De Swardt, 2010; Williams, 2002, p. 272). As most teachers therefore face a very unfamiliar learning area that they know little about (Reddy et al., 2003), this paradigm shift has made it necessary for them to be equipped with the knowledge and skills to facilitate effective teaching and meaningful learning in Technology Education classrooms (Reddy, Ankiewicz & de Swardt, 2005).

South Africa is no different from countries across the globe where the new **knowledge** and innovation intensive demands that stem from our modern day, information-based global economy requires development of a technologically literate student population that supports education for democracy. Recent technological changes also necessitate informed citizens to be able "to participate effectively in the day-to-day decisions affecting their lives" (Ankiewicz et al., 2001, p. 189).

The final draft of the Curriculum and Assessment Policy Statement (CAPS) for Technology in the Senior Phase (Department of Basic Education, 2011, p. 6) states that "Technology education was introduced into the South African curriculum in recognition of the need to produce" highly skilled, adaptive and innovative engineers, technicians and artisans. This means that school leavers are being equipped with **skills** that "provide a solid foundation for many FET subjects, as well as" (*ibid*.) allowing "them to meaningfully contribute towards their respective working ... environments" (Seemann, 2002, p. 174). Another important

influence on learners' subsequent choice of technology-based careers relates to the subject Technology giving them the opportunity during their school years to develop **attitudes**, *perceptions* and aspirations that are more positive as an essential part of their education (Department of Basic Education, 2011, p. 7).

According to Bahr et al. (2004, p. 88) Dewey "asserted that the primary purpose of teacher education should be to provide" students with exploration opportunities and experiences that lead to the development of positive **values** and **attitudes** towards technology (Department of Basic Education, 2011; Reddy et al., 2003). Students' technological self-confidence, as well as their attitudes towards the world of work, could thus facilitate a shift in emphasis in many schools not only towards gender sensitivity, but in fact, gender equality (Ankiewicz, Van Rensburg and Myburgh, 2001, p. 97; Williams, 2002).

In terms of related previous research, Potgieter (2004, p. 215-216) relays "the **attitudes** to and *perceptions* of technology education" as reported by in-service teachers themselves. These "vary from positive and informed to negative and uninformed depending on the amount of exposure to information on the purpose of the new Technology learning area." Gaotlhobogwe, Laugharne & Durance (2011, p. 65) investigated how learners' different attitudes contribute to their overall *perception* of design and technology as a subject in junior secondary schools in Botswana. Although Williams (2002, p. 273-4) is concerned that most often learners' "*perceptions* of technology were developed from a very restricted range of learning experiences", Volk, Yip and Lo (2003, p. 48) are confident that **attitudes** "can be considered both the determinants and consequences of learning experiences, ... (which) may be influenced by factors such as self-concept". Finally, the teachers in the study by Potgieter (2004, p. 206) also agreed that, in general, their learners' **attitudes** towards technology education are positive.
Results from the first Hong Kong Pupils' Attitudes Toward Technology show that in a category related to the **difficulty** of the subject "boys had significantly more positive **attitudes** toward technology". Volk, Yip and Lo (2003, p. 49) also report that whereas "boys thought technology was more for boys", encouraging girls to learn by participating in practical technology activities while working in small groups, "changing learning materials … and reducing uncomfortable situations" were some of the strategies found to enhance female students' confidence and success.

3. Theoretical and Conceptual Framework

Ankiewicz, Van Rensburg and Myburgh (2001, p. 93) include students' **attitudes** and **values** towards Technology, their awareness of it, and their knowledge and understanding thereof when they refer to the concept *technology profile.* They further state that "attitudes have an integrated three dimensional nature" (Ankiewicz, Van Rensburg and Myburgh, 2001, p. 96-98), consisting of behavioural, cognitive and affective components. It will be **difficult** to achieve outcomes related to the behavioural component of technological capabilities, without mastering the necessary **cognitive** knowledge and skill **competencies**, and having the desire to assimilate important aspects of the **affective** components of Technology Education related to attitudes, values and awareness (Reddy et al., 2003, p. 147).
Williams (2002, p. 272) has identified the importance of requiring pre-service teachers to learn about technological content knowledge to gain higher order "understanding of the structure of technological knowledge" as an area of concern in their profession (Seemann,

2002). However, issues around the nature of technological knowledge and diverse views about the place of Technology as a subject in the school curriculum are shifting with the times (Reddy, Ankiewicz & de Swardt, 2005). The latter authors, together with Ankiewicz et al. (2001), therefore believe that constructing a technological knowledge base is crucial to creating authentic contexts and positive motivational environments for learning, which ensure students' support in tasks related to introducing, developing and promoting design prowess and thinking skills.

Seemann (2002) points to research findings supporting theoretical approaches that highlight Technology as an important factor in the real situation of students' every-day lives. However, students regularly encounter **difficulties** in bridging the gap between learning procedures taught in a school culture, which are often far removed from every-day practice and thinking (McGrath, 2002, p. 45, 48). It is therefore important that their education lead to much more than just the development of **competence** in terms of **cognitive** skills, but should also result in the realisation of meaningful, practical *application* of content knowledge and skills in Technology as a science (Reddy et al., 2003, p. 148).

4. Description of Research Design and Methodology

4.1 Design of the study

We used a quantitative research design to obtain insight into pre-service teachers' attitudes towards effective teaching and meaningful learning in Technology.

4.2 Instrument, reliability and validity

We chose to administer a version of the Survey of Attitudes Toward Statistics (SATS) that was adapted for the subject Technology. Pre-service teachers had to indicate the extent of their attitudes towards different items by selecting from four response categories on the following Likert scale: 1. Strongly disagree, 2. Disagree, 3. Agree and 4. Strongly agree. We used these, instead of the 7-point scale used by the SATS, as this forced the respondents "to either agree or disagree, with no possibility of being neutral" (Maree and Pietersen, 2007, p. 167).

Similar to Mills (2004), we believe that "the subscales on the survey represent important attitudes that" could be related to what pre-service teachers believe about effective teaching and meaningful learning in Technology education. Like the SATS, our survey contained four subscales, relating to Affect, Cognitive Competence, Value and Difficulty. Items such as 'I like Technology', 'I have trouble understanding Technology because of how I think', 'Technology is worthless' and 'Technology knowledge and applications are easy to understand' are example statements from each of these subscales respectively (see Tables 2 – 4 for all subscale items).

Mills (2004) also reports that use of the SATS in previous research empirically documented indices attesting to the **validity** and **reliability** thereof as an appropriate research instrument. We believe that the Cronbach alpha coefficients, used to measure the internal reliability of the instrument, reported for Affect, Cognitive Competence, Value and Difficulty (around 0,80 for each of these subscales) can be regarded as acceptable. A factor analysis also showed a high degree of construct validity, with each of the SATS items displaying a strong and significant factor loading on a four-factor model.

4.3 Respondents

We conducted the attitude survey with second to fourth year undergraduate students studying towards their four-year Bachelor of Education degree, as well as students doing their post-graduate certificate in education, who elected Technology as one of their subjects. All enrolled at the Potchefstroom campus of North-West University in the Faculty of Education Sciences during the first semester of 2011. We did not involve first year students, as they only take a Technology module during the second semester. Although 102 pre-service teachers submitted surveys, two of them completed less than half the items, and were therefore excluded from the results – this also resulted in a very convenient group of 100 respondents, which meant that numbers provided are in fact also percentages.

4.4 Methodology

As further detail on the data collection procedures and processes followed, we requested respondents to complete the Survey of Attitudes towards Technology (SATT) voluntarily during the last week of classes in the applicable modules. They received assurances that we would only use their responses for the purposes of this enquiry, in no way use these to assess them, and that these would have no influence whatsoever on any of their marks for these modules. Students completed the survey anonymously, without supplying any individually identifying details, such as their names or student numbers.

We administered our survey in English only, as was the case for the questionnaire used by Ankiewicz, Van Rensburg and Myburgh (2001, p. 101). Although the number of respondents in our study who indicated English as their home language (4%) was even lower than that reported by the latter authors, observations by the second author while the pre-service teachers were completing the survey indicated that they did not seem to have any significant problems with the language used.

4.5 Data Analysis

Our investigation primarily considered simple descriptive quantitative analysis and comparative statistical tests to provide quantifiable assessments of the number of pre-service teachers adopting a given attitude. However, Gaotlhobogwe, Laugharne and Durance (2011, p. 66) indicate that "attempts to use more complex quantitative analysis, which ... take into account most attitudes and potential (determinants) simultaneously, are very limited." We therefore also engaged some aspects of a correlation design to check for relationships between important variables related to students' attitudes that showed up in previous research (Mills, 2004).

We now present a discussion of results, linked to previous research where applicable and available, before concluding the paper with a summary of results and the implications thereof.

5. Discussion of Results

Table 1: Summary of pre-service teachers' biographical data		**Number (%)**
Gender	Female	78
	Male	22
Age (years)	18	1
	19	4
	20	8

	21	27
	Older than 21	59
Race	Black	2
	Coloured	1
	Indian	2
	White	92
	Other	1
Home Language	Afrikaans	93
	English	4
	Setswana	2
	isiXhosa/isiZulu	0
Module	Technology 2	17
	Technology 3	12
	Technology 4	19
	Technology 5	52

Table 1 shows that more than three-quarters of the pre-service teachers represented here were female (78%), and that respondents were predominately White (92%) with Afrikaans (93%) as home language. All participating students were older than 18 years, with specifically more than half of them older than 21 years (59%). More than half of them were also taking the Technology 5 module (54%) – for interest sake, the intersection of the latter two items represent 41% of respondents. Although students were also asked to indicate the other two learning areas they were taking, (1) this data was in many cases incomplete and (2) did not yield any meaningful results or correlations with other items in the survey. While almost three-quarters of respondents (72%) remember doing some Technology in Grade 8 and/or 9, very few (12%) had other experience with Technology before taking these courses. Tables 2-6 present the descriptive statistics by subscale for the SATT. In Table 2, items 7, 8, 16, 19, 20 and 26 measured affect, while items 9, 14, 25, 28, 29 and 32 in Table 3 comprised the cognitive competence subscale. Table 4 shows the value subscale measured by items 10, 12, 22, 23, 27, 31 and 33, and items 11, 13, 15, 17, 18, 21, 24 and 30 measured difficulty (Table 5).

Table 2: Affect

Item	Description	Strongly disagree	Disagree	Agree	Strongly agree
7	I like Technology	5	12	54	29
20	I enjoyed taking this Technology section of the course	12	14	48	26
8	I feel insecure when I have to solve Technology problems	23	48	23	6
16	I get frustrated going over Technology tests in class	20	57	16	6
19	I am under stress during Technology class	44	42	9	5
26	I am scared by Technology	52	37	7	4

An investigation of responses for items on the affect subscale (Table 2) revealed that pre-service teachers agreed with 'positive' statements regarding affect, and disagreed with 'negative' statements for this subscale. Just more than half of these pre-service teachers agreed with the statement 'I like Technology', and just less than half enjoyed taking these Technology sections of their courses. Around half of the students also respectively disagreed that they feel insecure when they have to solve Technology problems or get frustrated when going over Technology tests in class. More than half of these pre-service teachers strongly disagreed that they were scared by Technology, while only 14% of them did not disagree or strongly disagreed that they were under stress during Technology class.

Table 3: Cognitive Competence

Item	Description	Strongly disagree	Disagree	Agree	Strongly agree
28	I can learn Technology	0	5	42	53
29	I understand Technology	2	10	51	37
9	I have trouble understanding Technology because of how I think	33	45	20	2
14	I have no idea of what's going on in Technology	53	36	7	3
25	I make a lot of errors in Technology	19	54	23	4
32	I find it difficult to understand Technology concepts	17	68	11	4

In describing their sentiments related to the cognitive competence scale (Table 3), more than half of these pre-service teachers strongly agreed that they can learn Technology (53%) and agreed that they understand Technology (51%). About that same number of them disagreed that they make a lot of errors in Technology (54%) and just less than half disagree that they have trouble understanding Technology because of the way they think (45%). Whereas more than half of these students strongly disagreed that they have no idea what is going on in Technology (53%), the highest number of students for a single indicator (68% - more than two-thirds of them) disagreed that they find it difficult to understand Technology concepts.

As displayed in Table 4, around two-thirds of these pre-service teachers agreed with the statements that Technology knowledge and applications are easy to understand (66%) and that most people quickly learn the subject (63%). However, around half of them disagreed that Technology is a complicated subject (57%), that it involves too much information and application (55%) and that Technology is highly technical (50%). The only two instances where the majority of respondents agreed with relatively 'negative' statements occurred on the difficulty subscale: 'Most people have to learn a new way of thinking to do Technology' (58%) and 'Learning Technology requires a great deal of discipline' (50%).

Table 4: Difficulty

Item	Description	Strongly disagree	Disagree	Agree	Strongly agree
10	Technology knowledge and applications are easy to understand	4	11	66	19
22	Technology is a subject quickly learned by most people	9	15	63	13
12	Technology is a complicated subject	25	57	17	1
23	Learning Technology requires a great deal of discipline	5	34	50	10
27	Technology involves too much information and application	24	55	16	5
31	Technology is highly technical	4	50	35	10
33	Most people have to learn a new way of thinking to do Technology	2	31	58	9

Table 5: Value

Item	Description	Strongly disagree	Disagree	Agree	Strongly agree
13	Technology should be a required part of my professional training as a teacher	13	21	53	13
18	I use Technology in my everyday life	8	12	37	42
11	Technology is worthless	60	32	5	3
15	Technology is not useful to the typical teacher	26	47	21	6
17	Technological thinking is not applicable in my life outside my studies	41	40	14	5
21	Technology applications are rarely presented in everyday life	29	42	22	6
24	I will have no application for Technology as a teacher	40	39	13	8
30	Technology is irrelevant in my life	42	32	17	9

Finally, Table 5 shows that just more than half of pre-service teachers agreed that Technology should be required as a part of their professional training as teachers (53%), whilst only a fifth of them (20%) did not disagree or strongly disagreed that they use Technology in their everyday lives. Just less than half respectively disagreed that Technology is not useful to the typical teacher (47%) and that everyday life rarely presents Technology applications (42%). Almost two-thirds of pre-service teachers strongly disagreed that Technology is worthless (60%), and just less than half that Technology is irrelevant in their lives (42%). However, below a fifth of them agreed or strongly agreed that, respectively,

technological thinking is not applicable in their lives outside their studies (19%) and that they will have no application for Technology as teachers (18%).
Considering that more than three-quarters of the respondents to this survey were female, it is interesting to note (see Table 6) that more than half of these pre-service teachers hold the perception that males are better at Technology skills. These results could indicate that further attention may need to be devoted to investigating female students' attitudes towards Technology in general, and their own abilities in the subject in particular.

Table 6: In general, how do you compare females' and males' skills in Technology?	**Number (%)**
Females are better at Technology	1
Males are better at Technology	57
Both sexes find the subject difficult	15
Both sexes find the subject easy	26

Most pre-service teachers indicate that they will use Technology every day, while less than one-tenth specify that they will never use it (see Table 7).

Table 7: When you are a teacher, how much will you use Technology?	**Number (%)**
Never	8
Sometimes	24
Weekly	29
Every day	39

Exactly half of participants (Table 8) indicated that they are 'fairly' confident that they can master Technology material, while only 14% are less than confident. Equally, almost two-thirds of respondents believe that they are 'fairly' good at Technology.

Table 8: Confidence in ability	**Not at all**	**Not very**	**Fairly**	**Very sure / good**
How confident are you that you can master Technology material?	6	8	50	34
How good at Technology are you?	3	10	63	20

In Table 9, more than half (57%) of the respondents report that they used to do very well in Technology in high school by scoring above 70% - is this as optimistic as more than half (59%) of them expecting to receive a mark of more than 70% for these Technology modules? Although follow-up in terms of only those students who participated in this study is not possible, due to them taking part anonymously, it would be interesting to investigate the average marks for these modules once the first semester examinations have been completed.

Table 9: Marks for Technology	0-39%	40%+	50%+	60%+	70%+	80%+
How well did you do in Technology in high school?	4	2	11	22	30	27
What mark do you expect to receive for this Technology module?	0	1	15	24	40	19

In a further analysis of data, we investigated the correlation of all items in the survey used, with items 34 to 40. Table 10 presents a matrix of all those items that produced correlation

coefficients of 0.40 or larger, or -0.40 and smaller (these represent arbitrary chosen cut-off values).

Item 35: When you are a teacher, how much will you use Technology?

Pre-service teachers who indicate that they will use Technology when they are teachers, also agree that they enjoyed taking these Technology sections of their courses (r = 0.51), that Technology should be a required part of their professional training as teachers (r = 0.50), that they like Technology (r = 0.46) and that they use the subject in their everyday lives (r = 0.44). They are also confident that they can master Technology material (r = 0.45).

Table 10: Correlation matrix		**Item numbers**			
Item	**Description**	**35**	**36**	**38**	**39**
5	You are registered for the module…	-0.43			
7	I like Technology	0.46	0.42		
13	Technology should be a required part of my professional training as a teacher	0.50			
14	I have no idea of what's going on in Technology	-0.44			
15	Technology is not useful to the typical teacher	-0.40			
17	Technological thinking is not applicable in my life outside my studies	-0.49	-0.47	-0.42	
18	I use Technology in my everyday life	0.44			
20	I enjoyed taking this Technology section of the course	0.51			
24	I will have no application for Technology as a teacher	-0.46	-0.40		
30	Technology is irrelevant in my life	-0.40	-0.43		
36	How confident are you that you can master Technology material?	0.45		0.40	
37	What mark do you expect to receive for this Technology module?				0.51

On the other hand, these students disagree that:

- Technology is not useful to the typical teacher (r = -0.40),
- Technology is irrelevant in their lives (r = -0.40),
- they have no idea of what's going on in Technology (r = -0.44),
- they will have no application for Technology as teachers (r = -0.46) and
- Technological thinking is not applicable in their lives outside their studies (r = -0.49).

An examination of the negative correlation (r = -0.43) that this item shows with the module students are registered for, provided one of the most interesting results in this study - it seems to indicate that generally the Technology 5 students envisage to almost never use Technology when they are teachers, while the Technology 2 students are most positive about using Technology when they are teachers.

Item 36: How confident are you that you can master Technology material?

Pre-service teachers who felt confident about mastering Technology material also agreed that they like Technology (r = 0.42). They disagreed that they will have no application for Technology as teachers (r = -0.40), that Technology is irrelevant in their lives (r = -0.43) and that technological thinking is not applicable in their lives outside their studies (r = -0.47).

Item 38: How good at Technology are you?
Pre-service teachers who saw themselves as being good at Technology are also confident that they can master Technology material (r = 0.40), and disagreed that technological thinking is not applicable in their lives outside their studies (r = -0.42).

Item 39: How well did you do in Technology in high school?
The mark that students expect to receive for the Technology modules they were enrolled for at the time that they completed this survey displayed one of the two largest correlation coefficients (r = 0.51) with their indications of how well they did in Technology in high school.

Previous research, such as a study by Gaotlhobogwe, Laugharne and Durance (2011, p. 65), consistently indicated that students' gender and ages affected their attitudes. However, our study did not yield any correlations at the significance levels mentioned on the previous page, for any of the items considered, with item 34 (a comparison between females' and males' skills in Technology). Likewise, for item 40, where respondents could indicate any experience they had with Technology before taking these courses, we found no significant correlations for any items in this regard.

6. Conclusion

We conclude that the overall results in this study have the implication that efforts over the past few years to improve attitudes towards effective teaching and meaningful learning in Technology at primary and high school level is almost certainly impacting pre-service teacher attitudes (Mills, 2004): the students taking these Technology courses generally have more positive attitudes than negative, which is in agreement with what Potgieter (2004) found for teachers. On the **value** subscale, respondents in this study strongly agreed that they use the subject in everyday life, while with regard to **cognitive competence** they also strongly agree that they could learn Technology.
Since the CAPS introduce Science and Technology as early as the intermediate level in primary schools, pre-service teachers are less likely to not <u>like</u> the subject, or find it **difficult** to <u>understand</u> Technology concepts: These students agreed that they <u>like</u> Technology (**affect**), that most people learn the subject quickly, that it should be a required part of their professional training as teachers, and that the subject itself, as well as Technology knowledge and *applications*, are easy to <u>understand</u>.

Additionally, they disagreed that:
- they find it **difficult** to <u>understand</u> Technology concepts,
- feel insecure when they have to solve Technology problems,
- get frustrated going over Technology tests in class,
- have trouble understanding Technology because of how they think,
- make a lot of errors in the subject,
- the subject is complicated, highly technical or not useful to the typical teacher,
- involves too much information and *application*, and
- everyday life rarely present Technology *applications*.

These pre-service teachers strongly disagreed that they will have no *application* for Technology as teachers, and that technological thinking is not *applicable* in their lives

outside their studies. This is in agreement with teachers in the study by Potgieter (2004, p. 206), the majority of whom strongly agreed that they would "be able to *apply* the Technology course content ... to a very large extent" in the situations that they were in at that stage. The students also strongly disagreed that they are under stress during Technology class or scared by the subject, have no idea what is going on in Technology, and that the subject is worthless, or irrelevant in their lives.
Results for only two statements (both which appear on the **difficulty** subscale) could imply less than positive attitudes, where these pre-service teachers agreed that learning Technology requires a great deal of discipline and that most people have to learn a new way of thinking to do Technology.

In this study, the item related to how much these pre-service teachers think they will use Technology when they are teachers showed relatively large correlation coefficients for the most number of items, including that students enjoyed taking these Technology sections of their courses. This result has the implication that reinforcing students' perceptions of the subject as an enjoyable life-skill could have a positive influence on the attitudes of those students who believe that the subject is too **difficult**, or unimportant (Gaotlhobogwe, Laugharne & Durance, 2011, p. 65).
In line with previous research, this study confirmed that pre-service teachers' confidence related to Technology education continues to be one of the important variables that influence their attitudes. However, other variables that previously showed links, such as gender and previous experience with Technology, in this study failed to show significant correlations with other attitude items.
Although, as was the case for Reddy et al. (2003, p. 154), we judge the findings of this study to be convincing, the generalisability of these to other pre-service teacher populations could be debated. However, lessons learnt could be of value to the national and international Technology Education community, as Gaotlhobogwe, Laugharne & Durance (2011, p. 65) believe that an understanding of attitudes are central to providing effective, evidence-based information, options and support for planning policy development.

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