LEARNERS' PERCEPTIONS REGARDING THE USE OF GEOMETER'S SKETCHPAD IN SECONDARY SCHOOLS

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Abstract

A positive perception regarding an ICT-driven approach to teaching impacts learners' achievement. Two models, namely the Technology Acceptance Model (TAM) and Cognitive Absorption (CA) were used to determine learners' perceptions. A survey was conducted to determine the attitudes and behaviour of individuals regarding the use of the Geometer's Sketch Pad (GSP). The study found that 70.8% of the learners held positive perceptions about the GSP, where higher percentages represented females (43.1%) when compared to males (27.7%). Furthermore, this study found a weak association ($x^2 = 3.426$; $\rho = 0.180 > \alpha = 0.05$) between gender and perception levels and a strong association between performance in the Geometry and perception levels ($x^2 = 0.758$; $\rho = 0.685 > \alpha = 0.05$). It can, therefore, be concluded that perceptions regarding the GSP have effect on performance in Geometry. Furthermore, a very weak negative correlation between gender and performance in the post-test in Geometry ($r = -0.122$; $\rho = 0.052 > 0.05$) was found, which implies that better performance is not determined by gender. The study recommends that Mathematics teachers be encouraged to use the GSP in their classrooms.

Key words: Geometer's Sketch Pad (GSP), Technology Acceptance Model (TAM), Cognitive Absorption (CA), Geometry, Information and Communication Technology

Introduction

Mathematics plays an important role in many fields of work. However, traditionally poor performance in the subject at national examinations level has been reported globally (Ali, 2013; Karue & Amukowa, 2013; Dobbins, Gagnon, & Ulrich, 2014) with some of the contributing factors being poor teaching methods, a lack of proper instructional materials and learners' involvement (Ali, 2013; Karue & Amukowa, 2013; Haimbodi, 2012; Mateya, 2008; Naukushu, 2011). Because of its usefulness in everyday life, Geometry comprises a huge chunk of Mathematics in the school system. In fact, Geometry is regarded as "… a unifying topic to the entire Mathematics curriculum and it is a rich source of visualization for arithmetical, algebraic, and statistical concepts" (Idris, 2009, p. 94). However, the extent to which learners comprehend Geometry remains unclear. Often learners focus on the calculating process or memorise geometry formulas, and this would decrease their learning motivation (Hwang, Lin, Ochirbat, Shih & Kumara, 2015).

The Namibian Mathematics curriculum comprises many topics, including Geometry which is taught from primary to secondary grades. Themes covered under Geometry

in the senior secondary phase include geometrical terms and relationships, geometrical constructions, symmetry, angle properties and locus. However, performance in Geometry has been poor, with Idris (2009) and Myers (2009) pointing out that little regard has been given to how well the learners understand geometrical concepts and it is limited, especially among students with difficulties in Mathematics (Dobbins, Gagnon & Ulrich, 2014). The national average pass rate in Grade 12 Mathematics Namibia Senior Secondary Certificate (NSSC) Ordinary Level has been persistently below 50% (Directorate of National Examinations and Assessment (DNEA), 2012, 2013, 2014, 2015, 2016, 2017). The low pass rate is attributed to the conventional ways of teaching mathematics in Namibian schools. National Institute for Educational Development (NIED) (2010) calls for innovative ways of teaching Mathematics, including Geometry, in an effort to improve learners' performance.

Mathematics educators have long promoted the use of technology in the teaching and learning of their subject (Banyard, Underwood, Kerlin & Stiller, 2011; Hartsell, Herron, Fang & Rathod, 2010; Idris, 2009; Myers, 2009; Passey, Rogers, Machell, McHugh & Allaway, 2003). More specifically, the Geometer's Sketchpad (GSP) is not only used for creating, exploring and analysing in the field of Geometry but also in Algebra, Calculus, Pre-Calculus and Trigonometry, as well as in other areas. For a better conceptual understanding, Eu (2013) calls for a need to visualize geometrical concepts using visualization software, such as the GSP, to address instructional inadequacies. In addition, the GSP was found to have a positive effect not only on performance but also on the increasing interest in studying meaning in Geometry (Eu, 2013, Kanandjebo, 2017) and its motivational impact on learners' perceptions regarding Mathematics (Idris, 2009; Omollo, Indoshi & Ayere, 2013; Passey, et al., 2003; Slouti & Barton, 2007).

Kanandjebo (2017) conducted a study to investigate the effectiveness of using the GSP on students' achievement and to obtain the perception of students regarding the use of the software in teaching and learning, and subsequently a framework. More specifically, the framework explored the effects of Information and Communication Technology (ICT)-driven pedagogy (teaching approach) on the performance of Grade 12 Geometry Ordinary Level learners, by utilising the Understanding by Design (UbD) teaching approach incorporated into the GSP to explain Geometrical concepts. The UbD framework was employed as a planning framework to guide the curriculum, assessment and instruction (Wiggins & McTighe, 1998). Accordingly, the UbD calls for collaborative learning, as well as the use of technology and other teaching approaches, in order to design, share and critique the learning content (McTighe & Wiggins, 2012). Additionally, the merger of the Technology Acceptance Model (TAM) and the Cognitive Absorption (CA) Theory were adopted as a conceptual framework to test learners' perceptions of the ICT-driven approach to teaching. This article was guided by the following research questions: What are the perceptions (levels) of the learners regarding the use of the UbD teaching approach by using the GSP? What is the association between perception levels, performance and the gender of learners?

Literature Review

This study was informed by the Technology Acceptance Model (TAM) and the Cognitive Absorption (CA) Theory.

Technology Acceptance Model (TAM)

The TAM places emphasis on the behaviour of an individual regarding the use of ICT. According to Park (2009), TAM is one of several, widely used models that have shown great potential in explaining and predicting individuals' beliefs about ICT. TAM postulates that a user's adoption of the new ICT tools is determined by that user's Intention to Use (ITU) them, which in turn is related to the user's beliefs about them (Chandra, Theng, O'Lwin & Foo, 2009). The TAM is built on two fundamental elements, which are: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Al-Adam, Al-Adam & Smedley, 2013). Both the PU and PEOU signify attitudes and behavioural intention to accept technology. The PEOU is the degree to which an individual believes that using a particular technology would be free of effort, while the PU is the degree to which an individual believes that using a particular technology would enhance his or her performance (Davis, 1989). Consequently, the more an individual perceives the technology as easy to use or useful, the greater the chances that a person would be willing to adopt or recommend it to be used. Dahawy and Kamel (n.d.) stress that the easier the way in which the technological tool can be used, the more it is adopted to communicate information. Individuals are more likely to have a positive attitude to the use of a new technology if they perceive it as easy to use and useful. Figure 1 shows the relationship between elements of the TAM.

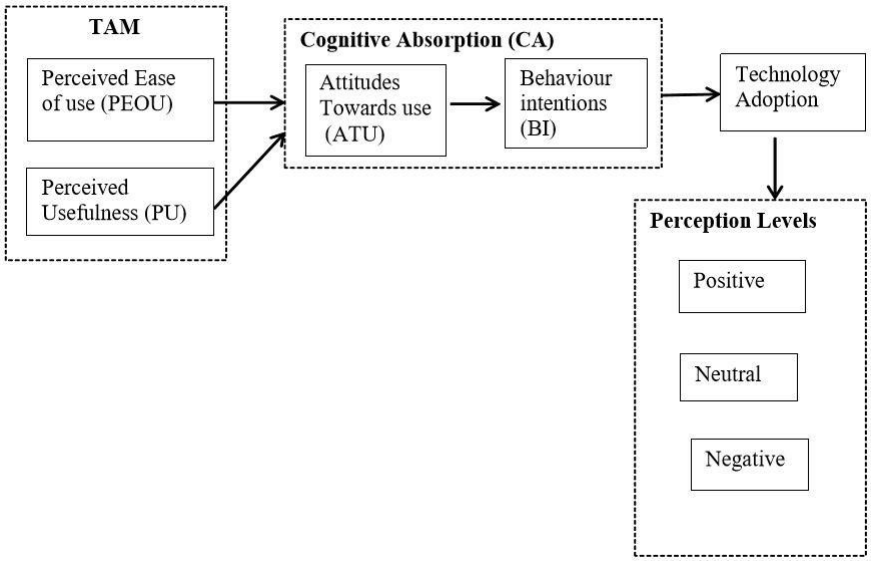

Figure 1: *Technology Acceptance Model (Adopted from Davis, Bagozzir, & Warshaw, 1989)*

Figure 1 shows that the PU and PEOU jointly predict attitudes about the use of Technology Adoption (AT). The PU also influences the user's Behavioural Intentions (BI). An individual's actual use of technology is influenced directly or indirectly by the user's Behavioural Intentions (BI), Attitude Toward Use (ATU), Perceived Usefulness and Perceived Ease of Technology Use (Davis, 1989; Park, 2009). Furthermore, a higher level of PU results in positive Attitudes toward Use (ATU) of technology, and the PEOU can directly determine Attitudes toward Use (ATU). In order to clarify and heighten further the understanding of learners' perceptions regarding the GSP and what drives their intentions to use it, the Cognitive Absorption Theory was utilised, as will be discussed below.

Cognitive Absorption (CA) Theory

The Cognitive Absorption (CA) Theory is associated with the TAM, in that it is a deep involvement in an activity with the use of ICT. Raafat and Bahli (2005) note that the CA represents a form of intrinsic motivation which involves three streams, namely: 1) trait of absorption (state of deep attention), 2) theory of flow (concentration and attitudes) and 3) concept of engagement (intrinsic interest and curiosity). The trait of absorption describes an individuals' state of deep attention, when he or she is totally absorbed in the event being experienced. This enhances intrinsic interest, curiosity and attention, without necessarily feeling that one of these is in control. When the elements (streams) of CA are positive, learners are likely to have a positive perception of technology, and this will lead to better performance in schools (Raafat & Bahli, 2005). Furthermore, the Theory of Flow (Csikszentmihalyi, 1990) is employed in explaining learners' perceptions when they are engaged in an activity that is appropriately challenging their skills level. This often results in immersion and concentrated focus on a task which, in turn, produces deep learning and high levels of personal satisfaction. When that happens, an individual is likely to have positive perceptions of ICT. In this state of being, learners are motivated by the inherent enjoyment of the challenges provided by the activity and are, subsequently, more productive and happier. A higher level of flow is capable of conferring value to the online experience, which will positively influence attitudes toward ICT use (Finneran & Zhang, 2005). This experience could also be true for other ICT tools, such as the GSP.

TAM Based Studies

TAM has been used by plenty of scholars to predict learners' perceptions regarding the adoption and acceptance of technology (Al-Adam, et al., 2013; Martínez-Torres, Toral, Barrero, Gallardo, Arias & Torres, 2008) at African universities (Ondiek, 2010; Venter, Van Rensburg & Davis, 2012). Using regression analysis, Al-Adam, et al. (2013) found that the PEOU had a significant effect on PU and Attitudes toward Use (ATU). They also found that the PU had a significant effect on Intentions to Use (ITU); hence they concluded that TAM can be employed as a useful, theoretical base to predict and understand individuals' intentions to use e-learning. The PEOU and PU both influence an individual's perceptions (Al-Adam, et al., 2013).

In another study, Venter, Van Rensburg and Davis (2012) used the TAM in a survey study to examine drivers of the Learning Management System (LMS) in a South African

open and distance learning institution. It was found that high levels of Perceived Usefulness (PU) and Perceived Ease Of Use (PEOU) contributed to positive usage behaviour (Spearman's rho, r = 0.720 0.4И1 > 0.4) at p = 0.001. Venter, et al. (2012) also found a slight statistically significant difference between the adoption of technology and attitudes towards the use of technology, implying a high percentage of positive responses on PEOU and PU results in positive behaviour usage. Similarly, Martínez-Torres, et al. (2008) concluded that the TAM was useful in predicting student intention to use e-learning, and PEOU did not posit a significant influence on, or intention towards, the usage of the e-learning tool. The studies by Al-Adam, et al. (2013), Venter, Van Rensburg and Davis (2012) and Martínez-Torres, et al. (2008) as discussed above, attest that the TAM is a useful theoretical base to explain and predict learners' perceptions of technology. In this paper the TAM was employed in order to determine learners' perception levels of the ICT-driven approach to teaching. Furthermore, Venter, et al. (2012), obtained positive values PU (r=0.720) and PEOU (r=0.491) at p=0.001 that explained the increased behaviour intentions regarding the use of an ICT-driven approach to teaching. The obtained values were used to benchmark ATU and BI to towards Technology Adoption.

Perceptions on Technology Use and Gender

Barkatsas, Kasimatis and Gialamas (2009) found boys to have more positive attitudes (Absolute value, (V) = -5.13) regarding the use of technology in Mathematics than girls have. It was also found that at a = 0.05 high achievement in Mathematics was associated with a strong, positive attitude to learning Mathematics by means of technology (V = 3.68); additionally, a low level of achievement was associated with a negative attitude to learning Mathematics by means of technology (V :s 1.И6).
Similarly, Ondiek (2010) found a significant relationship between learners' gender and attitude towards Mathematics. The study found that 93.7% of the boys had a positive attitude towards Mathematics when compared with the 59.5% of girls. This indicates that there is a tendency for girls to be negatively inclined towards Mathematics and a likelihood of lower performance by girls in Mathematics in comparison to boys (Ondiek, 2010). However, other studies indicated contradicting findings.

In another study Mubeen, Saeed and Arif (2013) found that at oc= 0.05 there was a statistically significant correlation (r = 0.32 p = 0.1И46) between the attitude scores and Mathematics performance of girls, whereas the correlation for boys was not statistically significant (r = 0.13 p = 0.1И46). This implies that female learners performed better when compared to male learners. Mubeen, et al. (2013) also found no statistically significant relationship between the attitude towards Mathematics and academic performance and no significant relationship between gender and academic performance. According to Mubeen, et al. (2013), this was because, in principle, both gender produced exactly the same scientific knowledge, provided that adequate rigour was undertaken in the scientific inquiry.

Methodology

A quantitative approach, following a survey, was used to find answers regarding learners' views on the use of the GSP. Accordingly, a closed and structured qualitative questionnaire with a rating scale was used to obtain data on demographic and to allow comparisons within the treatment sample (Rivano Eckerdal & Hagström, 2017). Two Grade 12 Mathematics, NSSC Ordinary Level classes were randomly selected to form a cluster at a school that had a computer laboratory and the Geometer's Sketchpad (GSP) software. A cluster at this school consisted of a total of 88 learners, where each class comprised 44 learners. It should be noted that due to the lack of the Namibia National Standard Grade Descriptors, Regional Level Grade Descriptors were used to determine the assessment categories (pass and fail).

A questionnaire on the demographic and perceptions of learners about the ICT-driven approach to teaching was administered to learners. The questionnaire consisted of four sub-sections, namely: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitude Toward Use (ATU) and Behavioural Intention (BI) as shown in Figure 1. All constructs were measured on a five-point Likert-type scale, from 1= *undecided* to 4 = *strongly agree*. The reliability of the version of the TAM constructs was tested by using the Cronbach alpha. A Cronbach alpha of 0.7 and above ($\alpha \geq 0.7$) was accepted in this study in line with Gay's (1987, p. 234) recommended threshold. The results from the pilot study yielded an alpha level of above 0.7 (0.791; 0.772; 0.701 and 0.733) on all the TAM constructs.

TAM constructs were analysed to establish learners' technology acceptance before determining their perception levels. Data were analysed by means of the Statistical Package for Social Sciences (SPSS) software (Version 23). Numerical scores were assigned to five response options given to each item on the attitude scale in the questionnaire. For positively stated items, the score values were assigned as follows: *Strongly Agree* (SA) = 5, *Agree* (A) = 4, *Undecided* (UD) = 3, *Disagree* (D) = 2 and *Strongly Disagree* (SD) =1. However, for the negatively stated items, the scoring was reversed (Gay, et al., 2009). The total number of learners having the same opinions on the same item was calculated as a percentage of the total sample. The responses that indicated *strongly agree (5)* and *agree (4)* were added to denote that learners had agreed on the particular statement, and the responses that indicated dis*agree (3)* and *strongly disagree (2)* were added to denote that learners had disagreed on the particular statement. Perception levels were categorized as positive, neutral and negative.

A mean score of 3.5 and above was interpreted to denote a positive attitude, between 2.5 and 3.5 as neutral and below 2.5 as negative (Omollo, et al., 2013). A Chi-square was used to determine the association between males and females and their perception levels, as well as between learners' performance versus their perceptions. In addition, the mean score of the learners' responses was used to perform cross tabulation between gender versus perception levels and learners' performance versus their perceptions in order to determine whether those who had passed had a negative or positive perception of the ICT-driven approach to teaching (UbD and GSP tools) and whether they were male or female. Finally, bi-variance

cross-tabulation was carried out in order to establish the link between gender, perception and performance on the post-test.

Results and Discussion

The analysis of the Four TAM constructs, Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitudes toward Use (ATU) and Behaviour Intentions (BI), yielded the following results:

Regarding the PEOU, 88.8% of learners believed that the ICT-driven approach to teaching was learner-friendly. The majority (91.7%) expressed the view that their interaction with the GSP was clear and understandable. The majority (91.7%) also stated that learning to use the GSP would be easy for them. The highest percentage of learners (93%) indicated that it would be easy to become skilful at using the GSP, while 90.3% felt that the process of teaching and learning by means of the ICT-driven approach to teaching was clear, understandable and straightforward. In addition, half (58.3%) of the learners disagreed that GSP was difficult to use. The highest percentage (94.4%) agreed that the ICT-driven approach to teaching assisted them in a better understanding of Geometry topics. An equal percentage of 94.4% of learners expressed that the ICT-driven approach to teaching made them feel comfortable when learning Geometry and the ICT-driven approach to teaching had helped them improve their performance in Geometry. Furthermore, 80.5% of learners indicated that the ICT-driven approach to teaching helped them to visualize, while 93.1% indicated that the ICT-driven approach to teaching would make it easier for them to do their homework and study for tests and examinations. Ninety percent (90%) indicated that the ICT-driven approach to teaching should be made part of every subject in schools. It was clear from these analyses that learners perceived the ICT-driven approach to teaching as useful.

Regarding the ATU, all the learners (100%) felt that it was a good idea to use the ICT-driven approach to teaching and learning while 92.7% felt that when the ICT-driven approach to teaching was to be fully introduced it would improve teaching-learning Geometry. Meanwhile, 94.5% of the learners indicated that it would improve performance in Geometry. It was also evident, that as far as all ATU statements were concerned, a maximum of 3.6% learners were undecided as to whether the ICT-driven approach to teaching '*… would improve learners' performance in Geometry when introduced'.* It can be deduced that most of the learners were sure that the ICT-driven approach to teaching would improve their performance in Geometry.

On BI, learners (81.8%) expressed that they would tell and show others about the ICT-driven approach to teaching. Meanwhile, 69.1% of learners would prefer the full use of the ICT-driven approach to teaching over traditional modes of teaching. Above 80% (81.4%) of learners preferred teaching and learning through a combination of the ICT-driven approach to teaching and traditional modes of teaching. However, 64.8% of learners agree that '… *schools should teach only using the ICT-driven approach to teaching*'. This shows that learners vouch for the ICT- driven approach to teaching to be adopted in schools.

TAM constructs analyses showed a strong correlation between 'PEOU and ATU' (r=0.517) and 'PU and ATU' (r=0.451) and consequently influenced ATU and BI positively. Thus, the positive behaviour intentions led to improved adoption of the ICT-driven approach. The findings of this study are similar to those of Venter, et al. (2012) in that PU and PEOU contributed to positive attitudes toward BI and subsequently enhanced ATU. This study's findings also support Al-Adam, et al. (2013), in that the PEOU and PU both seem to have an influence on an individual's BI towards the use of technology. Furthermore, TAM was also used to explain and predict learners' perception levels of the ICT driven approach.

Learners' Perception Levels

This sub-section presents an analysis of the learners' perception levels of the ICT-driven approach to the teaching of Geometry to Grade 12 learners. The outcomes are presented in Table 1.

Table 1: Crosstab of gender versus perception level

Gender of Learners		Perception levels of learners			
		Positive (mean score 2: 3.5)	*Negative (mean score <2.5)*	*Neutral (2.5:s mean score <3.5)*	
Female	Count	31	1	7	39
	Perception levels learners % by gender of learners	79.5% of	2.6%	17.9%	100.0%
	% within perception levels	60.8%	25.0%	41.2%	54.2%
	% of Total	43.1%	1.4%	9.7%	54.2%
Male	Count	20	3	10	33
	evels of earners% by gender of learners	60.6%	9.1%	30.3%	100%
	% within perception levels	39.2%	75.0%	58.8%	45.8%
	% of Total	43.1%	4.2%	13.9%	45.8%
Total	Count	51	4	17	72
	% by gender of learners	70.8%	5.6%	23.6%	100%
	% within perception levels	100%	100%	100%	100%
	% of Total	70.8%	5.6%	23.6%	100%

Table 1 indicates that 79.5% of the females had a mean score of 3.5, which was categorised as a positive perception level. Less than 3% (2.6%) of the females had a negative perception level (mean score less than 2.5), while 17.9% of the females were neutral (mean score less than 3.5 and less than or equal to 2.5). Furthermore, Table 1 shows that at least 60% (60.6%) of the male respondents had a positive perception level. Only 9.1% and 30.3% of male learners had a negative and neutral perception level respectively. Three times more males (4.2%) than females (1.4%) had a negative perception level and 4.2% more males (13.9%) than females (9.7%) had neutral perceptions regarding the ICT-driven approach to teaching. The findings of this study coincide with the research findings of Wasike, Michael and Joseph (2013), who found more female learners to have had a positive perception and who performed well in Mathematics. This was because more females perceived an ICT-driven approach as useful. Although the focus of the study by Wasike, et al. (2013) was not on a specific branch of Mathematics and did involve ICT, this study is similar to theirs since it partly looked at perceptions and performance in Mathematics. However, this study's findings do not support those of Barkatsas, et al. (2009) and Omollo, et al. (2013) who found more males to have positive perceptions when compared to females. This result could be attributed to a higher number of male learners in the study.

On an overall scale, this study found that a total of 70.8% of learners, both male and female, (see Table 1) had positive perception levels of the ICT-driven approach to teaching, with 5.6% of learners indicating a negative perception level and 23.6% a neutral one. The findings of this study support Idris (2009) in that most of the learners showed positive perceptions at oc= 0.05 towards the use of the GSP compared to those with negative perceptions. Comparably, this study found that most (70.8%) of the learners showed positive perceptions towards the use of the GSP when compared to those with negative perceptions towards UbD at a = 0.05.

The next section looks at the relationship between gender and learners' perception levels.

Relationship between Gender and Perception Levels

This sub-section presents a Chi-square test on the relationship between males and females and their perception levels.

Table 2: Chi-Square Test of Gender versus Perception Level

Null Hypothesis: *There is no association between gender and perception level*			
Test statistics	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.426	2	.180

Table 2 shows the Chi-square (x^2) = 3.426 and p = 0.180. With p = 0.180 > a = 0.05, it implies that the null hypothesis of the Chi-square can be rejected at a 95% level of significance, as there is a very weak association between gender and perception level. Therefore, both males and females either had a positive, negative or neutral perception of the ICT-driven approach to teaching. However, the findings of this study (with reference to Table 2) do not support the research findings obtained by Barkatsas, *et. al* (2009) who found boys to have more positive attitudes (Absolute value, (|V|) = -5.13) than girls.

Relationship between Performance and Perception Levels

The Chi-square test (Table 3) shows a relationship between the performance ruling of the learners and their perception level.

Table 3: Chi-Square Test of Performance versus Perception Level

Null Hypothesis: *There is no association between performance and perception level*

Test statistics	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	0.758	2	0.685

Table 3, shows that the Chi-square = 0.758, p = 0.685. This implies that there was an association between the performance level and perception level at 95% level of significance. This implies that those learners who had passed the post-test had a positive perception and those who had failed had a negative perception level of the ICT-driven approach to teaching. A strong association between performance and perception level could imply that there was a relationship between achievement in Geometry topics and each of the five components of the TAM. In general, the majority (70.8%) of the learners in this study showed a positive perception of the ICT-driven approach to teaching even though only 63.9% had passed the post-test.

The findings of this study support those by Slouti and Barton (2007), namely that the use of ICT in teaching and learning had a positive impact on learners' perceptions and it accounts for better performance in Mathematics. Learners' positive perception in this study could be attributed to the comfort learners felt when learning Geometry topics that were taught by means of the ICT-driven approach to teaching. It may also be attributed to the process of teaching and learning by using the ICT-driven approach to teaching as being understandable and straightforward. Thus, learners believed that the ICT-driven approach to teaching would help them in understanding the topic better and improve their performance in Geometry.

Relationship between Gender, Performance and Perception Levels

The relationship between gender, performance and perception levels shows a correlation between performance and perception levels towards UbD (r = 0.560, ρ =

0.001 < 0.05). This study also found a very weak negative correlation between gender and performance (r = -0.122; p = 0.052 > 0.05) and between gender and perception level (r = -0.034; p = 0.120 > 0.05). This implies that there was a minimal association between gender and perception level and performance. The findings of this study support that of Mubeen, et al. (2013) that there was no statistically significant relationship between gender and academic performance (t = 0.85; oc= 0.05). This was because, in principle, both females and males will produce exactly the same scientific knowledge (Mubeen, et al., 2013). However, the research findings of this study contradict that of Ondiek (2010) who found a statistically significant relationship between learners' gender and attitude towards the content of Mathematics, which included Geometry topics.

Conclusion

This study found that learners perceived the ICT-driven approach to teaching as easy to use and useful, and this influenced their behavioural intentions to adopt technology positively. Females were found to hold more positive perceptions regarding the ICT-driven approach to teaching when compared to males. In addition, this study also found a weak negative association (r = -0.034; p = 0.120 > 0.05) between gender and perception of the ICT-driven approach to teaching. Furthermore, there was an association (r = 0.758, ρ = 0.685 < 0.05) between the performance and perception at 95% level of significance and a very weak, negative correlation (r = -0.122; p = 0.052 > 0.05) between gender and performance on the post-test. The findings of this study conform to TAM as learners' behaviour changed positively in terms of technology use. The change in behaviour resulted into increased intrinsic interest, curiosity and attention and improved performance in Geometry.

Recommendations

Based on the findings of this study, teachers should be encouraged to use the GSP in teaching Geometry to arouse more interest and boost performance. In addition, a more detailed study on the relationship between the ICT-driven approach to teaching versus gender, perceptions and performance in Geometry should be conducted, mainly focusing on why females perform better in Geometry topics when taught by means of the GSP.

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