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NON-SCIENTIFIC BELIEF MISCONCEPTIONS ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN PHYSICS

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ABSTRACT

This study employed a survey design to investigate the influence of nonscientific belief misconceptions on secondary school students' achievement in physics. One hundred senior secondary school II physics students drawn from ten co-educational public schools in Ika Local Government Area of Akwalbom State using simple and purposive sampling techniques, responded to the researcher-made instrument validated for data collection. Results obtained using the t-test of independent means at P.05 for df= 98 showed that there was significant influence of biblical accounts of formations of rainbow, thunderstorms and floatation phenomena on students' achievement in physics with continual distortion of scientific views in disfavor of female students. From the findings, the study recommended that preachers and teachers of the Christian Bible should be literate in the basic science of physics so that they could espouse both biblical accounts and scientific views of science-related phenomena to a balanced and well informed membership.

KEYWORDS: Nonscientific Belief Misconceptions, Biblical-Scientific Conceptions, Gender, Students' Achievement And Rainbow-Thunder-Floatation Phenomena.

INTRODUCTION

Science educators' efforts of investigating cognitive processing capabilities of students to serve as the basis for improving learners' achievement in physics at the senior secondary school level of education, are more intense now than ever. From the perspective of conceptual change pedagogy, Kyle, Family, Louis and Shymansky (1989) and Kalu (2004), there seems to be a somewhat inertial resistance to the restructuring of cognitive structures of learners wherever a concept taught appears to contradict with preconceived notion. Although the understanding of beginning a lesson from where the "the learner is", has been acknowledged by science teachers through examining prior behavior (prior knowledge, prior expectation, pre-conception and previous learning.) Wheeler (1967), this has not been seriously considered until students begin to obviously manifest underachievement in both physics internal and external school examinations.

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While total annual students' enrollment in physics hardly exceeds 20-40% Effiong and Nkwo (2014), Nkwo's (2015) analysis of record of national statistics of students' achievement in May/June West African Senior Secondary School Certificate Examination (WASSCE) from 2008-2012 in physics, reveals a borderline improvement of students at 54.82% at credit level passes (1-6).

This figure simply shows that students still encounter obvious difficulties in physics classroom learning. Among many other factors, the learner has been identified as one source of underachievement Science Teachers Association of Nigeria, STAN (1992) in Okebukola (2002). One of such learner -related issues is his or her prior conception or prior knowledge, defined as knowledge available to the learner before the related teaching-learning situation (Wheeler, 1967; Edinyang, 2006). This is known as pre-existing conception or pre-conception or preperception which learners come with them in a physics class, most often at variance with what is being taught in the class. In literature, this is typically labeled naïve conception or alterative conception or misconception. This is consensually defined by Kyle, Family, Louis and Shymansky (1989) as a differing framework between learners' prior conception and scientists' view of a concept. Misconception tends to block proper conceptual understanding of a teaching concept. There are many shades or categories of misconceptions. These includes: preconceived notions, conceptual misunderstanding, vernacular misconception, factual misconceptions and non-scientific belief misconception (Okabukola, 2002). This study is concerned with investigating influence of nonscientific belief misconceptions on senior secondary school students' achievement in physics, given the unprecedented preponderance of religious institutions in Nigeria today.

Nonscientific belief misconception is an alternative framework on views learnt by students from other educative sources other than science education (Okebukola. 2002; Samuel, 2015). To this extent given the age-long participation of the learners, there seems to be a possible block of proper conceptual understanding of a given concept taught students in physics classroom. This blocking or restriction does make students to resist cognitive restructuring by refusing to accept a new idea that is more scientific. This therefore brings inertia to conceptual change. Posner, Strike, Hewson and Gertzog (1982) note that in teaching and learning for conceptual change, the learner should experience conflict, discrepancy or disequilibration with expectations. It is further remarked that learners would not subject to cognitive restructuring without first feeling that their existing or pre-existing views are unsatisfactory in some way. Posner, Strike, Hewson and Gertzog (1982) opine and suggest that if students would change their preconceived view to a new scientific idea:

a. They should be dissatisfied with their pre-existing conception
b. The new scientific conception should be intelligible
c. The new scientific conception should be plausible (reasonably true)
d. The new scientific conception should be useful and transferable ina variety of new situation (i.e. applicable to real-life situations).

These four opinions would manifest if the physics teacher acknowledges that students' improved achievement thrives in conceptual change and therefore comes to terms with the following issues:

i. Students' come to a physics class with ideas or conceptions

ii. Students conceptions are often different from scientists' view
iii. Students' preconceptions are strongly or tenaciously held in the cognitive structures
iv. Conventional strategies of instruction and learning stereotypes (rote memorization) will not lead to substantial conceptual change.
v. Effective strategies of teaching enable teachers to teach for conceptual change and understanding.

It is obvious from above that certain institutions and their source books which the students are born to receive learning or decide to be educated, contribute significantly to fuel their preconceptions which are brought to the physics classroom teaching and learning. In the Nigerian society, such nonscientific educative institution sources of teaching include: the Christian Bible, the Moslem Koranthe Grail Message, Ancient Mystical Order Rosae Crusae(AMORC), Eckankar, Etherius Temple, the book of Mormon and other sacred books.

For the purpose of this study, the Christian Bible and it stipulations on certain scientific concepts such as formation of rainbow, formation of thunder storm and floatation of objects in fluid, are of utmost considerations. The biblical and scientific accounts present interesting frameworks for explaining the extent to which students' knowledge from both sources complement one another towards learning for achievement in senior secondary school physics.

BIBLICAL AND SCIENTIFIC ACCOUNTS OF FORMATION OF RAINBOW

Biblically, the first mentioning of a rainbow is in Genesis 9: 8-17. Here, God covenanted with Noah and his children after the great flood by setting His bow in the cloud as a token, and looking upon it to remember the covenant, that He would forever no longer destroy the earth with flood. This was God's way of glorifying, beautifying and pacifying Noah after the 40 days flood and rainstorm. Augments and counter-augments seem to ensue as to whether this was the first time human beings had seen a rainbow. Some bible commentators held that this was not the first time. It is opined that God setting the rainbow after the flood was really a giving of special meaning to a previously existing phenomenon. Proponents of this view believed that the flood was local and did not substantially change the atmosphere (Greenwood & Woods, 1999).

Others who argued against maintain that no human had seen rainbow before the flood. They opined that there would have been no real force in God's making it an outstanding sign of the covenant. It would have been a commonplace experience and not a significant feature of something new. Although there is no clarity of description of the atmospheric condition just prior to the flood, it was apparent in the atmospheric condition that until a change came about when the floodgates of the heavens were opened (Gen. 7:11) no human persons before Noah and his family had seen a rainbow. Observably even today, atmospheric conditions can be such that the weather is eclipsed to the extent of determining whether a rainbow can be seen by naked human eyes.

Samuel (2015) informs that atheists claim that God did not create the first rainbow until the flood. This implies that the natural laws of reflection, refraction and the phenomenon of dispersion were of none effect until the flood long after "there was light" (Gen. 1: 3). This position does not seem to be true because the bible in Hebrew translation states "I have set" which in English translation means "I do set my bow in the sky" (Gen. 9: 3). Therefore, nowhere in the bible is it stated that `this was the first time the rainbow was visible on the earth.

From scientific perspective, the rainbow is an optical and meteorological phenomenon of multicolored arc caused by reflection, refraction and dispersion of white light in atmospheric water droplets resulting in a spectrum always appearing in the section of the sky directly opposite the sun. Rainbow can be full circles, but an observer with the naked eyes sees only the arcs, formed by illuminated atmospheric water droplets above the ground and centred on a line from the sun to the observer's eyes. Rainbow is not an object and cannot be physically approached; thus, it is an optical illusion with the water droplets acting like a miniature prism.

It is therefore not possible to see a rainbow at any other angle from water droplets except at the customary angle 42^0, from the direction opposite the light source. The rainbow is multicolored because it spans a continuous white light spectrum. Any distinct band perceived is an artifact of human vision. For colours seen by the human eye, the most commonly observed sequence is Newton's sevenfold "ROYGBIV": R = Red; O = Orang; Y = Yellow; G = Green; B = Blue; I = Indigo and V = Violet. In this spectrum of decreasing wavelength, red, R is least deviated or refracted while violet, V is most refracted (Tom, 2011).

Rozycki (1999) notes that students' knowledge of myth acquired from teachings of the Christian bible on rainbow formation distorts internal reflection and dispersion, and donot complement their knowledge and understanding in physics classroom. This affects their achievement because of confusion with reality of observation. Rainbow can be formed by any forms of air-borne water such as rain drops, mist and airborne dew. This explanation conflicts with what most students are made to believe about rainbow formation as God's bow set in the cloud. Such conflict may extend to students' understanding of thunderstorm.

BIBLICAL AND SCIENTIFIC ACCOUNTS ON FORMATION OF THUNDER STORM

From biblical point of view, thunder is described as the sound of God's voice (Psa. 18; Psa. 29; Psa. 77; Exo. 19; Job 40: 9; 2Sam 22: 14; John 12: 28; Rev. 4: 5 and Rev. 10: 3). The Lord answered Moses in thunder. When the seven seals on the book were opened, there was thunder clap. Thunder was heard when Jesus was baptized. God used thunder as instrument of invoking awe and fear into those who do not yet fear him. In Job 39:4 the house smelled the thunder of the captains. Thunder acts as warning signal of God's visitation in power, might and judgment, much like the ancient trumpet warning. Rev. 4: 5 says that flashes of lightning and sounds and peals of thunder come out the throne of God. In Exodus 20:19, Israelites were scared out of wits upon hearing, and asked Moses to pray to God not to speak aloud again. The mystery of the seven thunders can be recalled (Rev. 10:1-4).

Hestenes (2008) posited that the mythical beliefs contained in nonscientific educative sources which children are exposed to, from their formative stages of development can affect physics students. This plunges them in the regime of underachievement in schools. It is added that children bring their spiritual knowledge of abridged formation history of say thunder into classroom.

Scientifically, the cause of thunder has been the subject of speculation, controversy and inquiry through centuries. Samuel (2015) explains that the first recorded theory on the cause of thunder was attributed to Aristotle in 3^{rd}century BC. The speculation was that thunder was caused by collision of clouds. But what caused the collision was not yet certain.

Subsequently, numerous other theories were proposed, specifically in the 18^{th} Century. In 1752Benjamin Franklin (physicist) observed

that atmospheric cloud is charged because it is electrified. In 19thcenturythere evolved a theory that lightning produced a vacuum. In the 20thcentury, a consensus was reached that thunder begins with a shock wave in the air to the sudden thermal expansion of the plasma in the lightning channel. NOUN (2006) in Nkwo and Effiong (2013) explains the formation of the phenomenon of thunderstorm from the background that clouds are electrified and therefore charged. The discharge of the moving charged clouds within a certain small area in the atmosphere amounts to intense increase in temperature (about 1500^{0}C) with associated high amount of current (about 20KA) and great amount heat. The molecules of this hot cloud move faster within the small area, and in the course of discharge into the cooler surrounding cloud, give rise to great spark seen as lightning. As these cold molecules move further, they reflect on surrounding cloud cover, hills, mountains and other obstacles to produce the rumbling intense sound called thunderstorm or thunder clap or thunder peal, heard shortly after lightning along the space charge. This reveals a fundamental principle that light travels faster than sound.

The occurrence of thunder can further be described in terms of temperature inversion and temptation non-inversion conditions (Taber, 2009). In inversion temperature condition, the air mass or cloud above the ground is hotter while the cloud near the ground is cooler. Here, thunder strikes between the cloud and the ground, the sound energy is prevented from refracting vertically and is thus concentrated in the near-ground layer.

Again and under temperature inversion condition, the hot cloud that passes over the cold results in thunder sound being significantly louder when heard, according to the principle of refraction where the energy moves towards the normal in the cold cloud of higher density. These would not be the case for non-inversion temperature condition, where the cloud above is cooler and the cloud near the earth is hotter and moves away from the normal.

Typically, Nigeria is characterized by thunder and lightning phenomena associated with non-inversion temperature condition because Nigeria is within the tropics. Its atmosphere is hot and humid (Charles & d'Appolonia, 2003; Nkwo & Effiong, 2013).

Popsi (2000) presents a vivid explanation of the condition of non-inversion thunderstorm experienced in Nigeria. Thunderstorm develops when the atmospheric air mass or cloud is unstable i.e. a case where hot cloud exists underneath cold cloud. As the hot air rises upward, it is cooled and condensed forming small droplets of water. As the instability intensifies, the rapidity of rising of hot air also intensifies along with condensation. The resulting water vapour quickly forms cumulonimbus cloud. With continuous rising of the hot air, the water droplets coalesce to form larger droplets which freeze to form ice crystals. With continuous circulation of air in the cloud, water freezes on the surface of the droplet crystal. This makes the crystal too heavy to be supported by the updraughts of air as it thus falls down as hail. As the hail moves through the cloud, it picks up negative charges by friction through rubbing against smaller positively charged crystals of ice.

The negative charge cloud is formed at the base of the larger crystals as the hail collects, while the lighter ice crystals remain near the top of cloud and create a positive charge. A strong electrostatic field is thus set up between the positive charged cloud of small crystals, the earth surface, other objects and the negatively charged larger crystals of hail. There then results an attraction between these oppositely charged clouds. Towards the equilibrium separation or distance, repulsion occurs, leading to high heating and expansion, thereby

causing a discharge seen as a spark of light flash called lightning strike or lighting bolt. The rumbling sound called thunder is caused by the rapid expansion and heating within a small area element near the earth surface. This explains why the land masses experience more thunderstorms than the oceans, and in tropical areas than those in higher latitudes (Attran & Norenzayan, 2004).

Hake (2008) asserts that religious and mystical beliefs tend to distort students' conception of scientific ideas, noting that students' classroom achievement in topics such as lightning conductor and sound is below an acceptable threshold. It is therefore suspected that similar misconception arising from students' spiritual induction can extend towards distorting their scientific conception on floatation and buoyancy of objects in fluids.

BIBLICAL AND SCIENTIFIC ACCOUNTS ON FLOATATION OF OBJECT IN FLUIDS

From 2kings 6:5 -7, the sons of the prophets went out to River Jordan with Prophet Elisha to cut down beams to make living houses. The axe head of one them flew out of the axe and fell into the water. He raised alarm and shouted "Alas, Master it was borrowed". Prophet Elisha asked about where the axe head fell, and was shown. He cut a stick and cast into the place, the axe head came up or was buoyed up and he asked the man to take it up and he took it.

God's miraculous power was exercised in this circumstance to swing the law of nature to obey His will through Prophet Elisha even in defying natural law of buoyancy. Divine miracle is defined as God's intervention in ordinary situation evident in supremacy. The iron axe-head became positively buoyant by being caused to move from the depth of water to float on the surface of the water. Ordinarily, this should not be expected, as iron is known to sink in water. But the iron head defied the natural law of floatation which Archimedes stated:"any solid object wholly or partially immersed in fluid is buoyed up by a force equal to the weight of the fluid displaced by it". Technically, this weight of the fluid displaced is called the upthrust, U. The weight of the solid object is denoted by W. The difference between the solid weight, W and the liquid upthrust, U is called the viscous drag denoted by F, which opposes the motion of the solid body in the fluid as a reaction force under equilibrium condition. This can be schematically represented by use of an orange fruit dropped into water contained a measuring cylinder (Fig. 1), (Abbott, 1979; Nelkon, 1981; Nelkon & Parker, 1982; Ike, 2002; Ike &Okeke, 2003; Cossy, 2003).

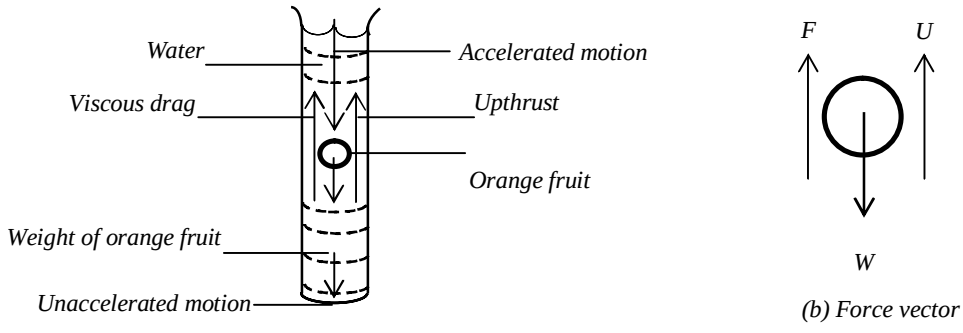

Figure 1.(a) Schematic diagram representing an orange floating in water

From parallel vectors (Fig. 1b):

F + U = W - (i)

F = W-U -(ii)

Assuming a spherically shaped orange fruit and the weight of fluid displaced:

the forces W = mg and U = m^1g, where F = (m-m^1)g- (iii).

where m = ṕv = 4/3πr3 ṕ;m1= 4/3πr3ṕ1 and V = 4/3πr3 while ṕ, ṕ1 = densities of solid and fluid respectively. But F α V_T (as the solid object moves through the fluid according to Stokes' law).

Then F= KV_T where K = 6πrn; V_T = terminal velocity and n = coefficient of viscosity of fluid, which in this case is water. Then equation (iii) becomes $6\pi rnV_T$=4/3 r^3g(ṕ - $ṕ^1$)— (iv); 'r' is the assumed spherical object radius, ṕ = density of the solid object and $ṕ^1$ is the density of the fluid displaced.

Thus $9V_T$n= 2r2g (ṕ-$ṕ^1$) - (v)

: .V_T =$\underline{2r^2g}$ (ṕ-$ṕ^1$) –(vi) .

9n

In Equation (vi) V_T is called the terminal velocity.

The terminal velocity V_T is defined as the constant velocity value obtained when a solid body moving through a fluid experiences a zero resultant force under equilibrium condition. This equilibrium condition is attained when the weight of the moving solid is equal to the sum of the upthrust and viscous drag.

Plottinga graph of velocity, V against the time t, of fall of the body through the fluid, yields a two-phase graph (Fig. II) which first part is a curve due to initial accelerated motion and the second part is a straight line (due to un-accelerated motion) as a tangent to the curve.

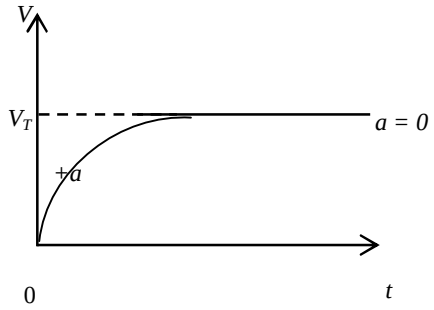

Figure 2.Terminal velocity of a spherical solid object falling through fluid

From Archimedes law; an object that floats over a fluid is positively buoyant, while that which sinks is negatively buoyant. Buoyancy or floatation is therefore affected by some factors, namely:

i. Gravity, g:a property which attracts any body of mass downwards towards the earth's centre.
ii. Mass, m: the greater the mass of a body, the more positively buoyant it becomes
iii. Weight (w=mg): this combines gravity and mass. It is a resultant force exerted on a body of mass by the earth's gravitational pull. The greater the weight of a body, the more positive buoyant it becomes. An object sinks when its weight is more than the weight of fluid displaced.
iv. The volume v: is derived from mass, m = ṕV. Object with greater volume v has greater buoyancy because the displaced volume of the fluid rises up and pushes up the object in equal amount.
v. Shape: the more compact the structure of object the more negatively buoyant it

becomes, because the displaced volume and weight of fluid are unequal in amount and this therefore cannot support it afloat, hence, it sinks; but the more hollowed a solid structure is, the more positively buoyant it becomes, because the displaced volume and weight of fluid can equally support it to be buoyant. An object that floats at the same level of fluid is said to be neutrally buoyant. This is a condition of fullimmersionas the object is acted upon on all its sides by up thrust.

Isaac (2001), Morton and Doran (2008) argue that the Christian religious beliefs that "all things are possible through faith in God" can affect children's scientific conception about floatation in fluids and thus their achievement in physics. This is to an extent of believing that any object of whatever geometry and material, can be made to float in fluids irrespective of any condition for or against buoyancy. Thus, this biblical doctrine seems to oppose Archimedes principle through teaching that object can be made to float through words of prophecy.

Samuel (2015) maintains that when such knowledge rooted in the "take it or leave it" dogma is borne in children's mind during practical, there is a bound to be misconception with scientific view, making them to be prone to errors and mistakes (Hestenes, Wells & Swackhamer, 1999). It is well reported that low achievement in senior secondary school physics acknowledges boundary or is divided between male and female students or boys and girls. Such perceived influence may not be unconnected with socio-cultural prejudices attendant upon the Nigerian and other underdeveloped democracies. A strong link with such gender stereotypical stance may be identified with some religious doctrines and teachings which are buried in the minds and cognition of learners, that the women are weaker vessels (I Peter 3: 7). Okebukola (2002) notes that the learning of physics is more difficult towards the direction of the girl-child. But a recent study of achievement trends of male and female physics students seems to show girls outperforming boys (Nkwo, 2015). However, this is on borderline with greater number of boys than girls, having more access to physics related learning opportunities, job opportunities and self-employment. This can be further probed using appropriate study method.

METHOD

The study adopted the survey design. The area of the study was Ika Local Government Area of Akwalbom State. The population of the study was all public senior secondary school II physics student in the study area. A sample size of 100 students was chosen using the simple random sampling techniques by balloting while purposive sampling technique was used to choose ten schools which satisfied the criteria with equally ten students drawn from each school. The instrument used was a 20 - item researcher- made questionnaire called physics nonscientific belief misconception rating scale at four points of: strongly agreeSA (4), Agree A (3), Disagree D (2)and Strongly disagree SD (1). These points were reversed for negative items. A reliability of the instrument was established upon trail-testing of the questionnaire in a school in Uyo Local Government Area. A Pearson product moment correlation coefficient of 0.68 was obtained. When subjected to the split-half reliability formula, a reliability index of 0.82 was found to be adequate.

RESULTS

The emerging data was analyzed using t-test of independent means. Four hypotheses were tested as stated:

i. There is no significant influence of biblical and scientific accounts of formation of rainbow on senior secondary school students' achievement in physics.
ii. There is no significant influence of biblical and scientific accounts of formation of thunderstorm on senior secondary school students' achievement in physics.
iii. There is no significant influence of biblical and scientific accounts of floatation of objects in fluid on senior secondary school students' achievement in physics.
iv. There is no significant influence of biblical accounts of nonscientific belief misconceptions on senior secondary school male and female students' achievement in physics.

Table 1: A t-test analysis of achievement scores classified according to nonscientific belief misconceptions of biblical and scientific accounts of formationsof physical phenomena of rainbow, thunderstorm and floatation

Group	N	$\bar{x}$	S^2	t-cal	Decision at p. 05
Biblical accounts on rainbow	50	42.2	4.12		
Vs				19.34	*
Scientific accounts of rainbow	50	33.6	5.76		
Biblical accounts on thunderstorm	47	35.4	5.24		
Vs				-13.67	*
Scientific accounts of thunderstorm	53	41.4	4.45		
Biblical accounts on floatation	52	43.6	5.26		
Vs				7.71	*
Scientific accounts on floatation	48	40.2	4.42		
Male students' nonscientific belief misconceptions	55	44.2	4.22		
Vs					
Female students' nonscientific belief of misconception				29.72	*
	45	31.6	4.76		

**=significant at P.05; tcrit = 1.98; NS = Not significant; df = 98*

From Table 1, a test of all the four hypotheses showed that the calculated t-test values were greater than the critical value of 1.98 atP.05 for df = 98, with the negative value simply indicating the change in direction of mean difference. Altogether, the results show that nonscientific belief misconceptions exist and influence senior secondary school students' achievement in physics and across the gender level to the disfavor of the female students. Thus, the null hypotheses are rejected.

DISCUSSION

A discussion of the findings following hypothesis-by-hypothesis testing reveals from the table that there is a carryover of misconceptions of certain scientific concepts, principles and phenomena into the physics teaching-learning classroom.

Hypothesis one states that there is no significant influence of biblical and scientific accounts of formation of rainbow on senior secondary school students' achievement in physics. This is rejected for the alternative hypothesis in accordance with Rozycki (1999) that students ' exposure to myths of rainbow formation distorts the reality of what happens thereby influencing them to achieve lowly in physics because of subsisting confusion.

Hypothesis two states that there is no significant influence of biblical and scientific

accounts of formation of thunderstorms on senior secondary school students' achievement in physics. Again, Table 1 shows a rejection of this hypothesis for the alternative hypothesis. It is argued that teaching the child that thunderclap is simply the sound of God's voice, from the formative years of learning to when the child enrolls in a physics class places the child between and betwixt in a way that sets him or her at warpath with scientific conception. Hestenes (2008)postulates that the mythical belief of thunder formation and its cause, directly affects physics students' achievement as they bring their spiritual knowledge to bear on conceptual understanding in the classroom.

Again, hypothesis three states that there is no significant influence of biblical and scientific accounts of floatation on senior secondary school students' achievement in physics. Table 1 further shows a rejection of this null hypothesis for the alternative hypothesis in agreement with Archimedes principle. This states that any object whollyor partially immersed in a fluid floats with its weight equal to the weight of the fluid displaced.

It is contested that a student fed with this "all thing are possible" mythMortan and Doran (2008) and how Elisha brought out the axe head from River Jordan, would resist restructuring of the schema for physics learning. This would affect achievement on concept and principle of floatation or buoyancy and gravity. Unconsciously, a carryover of this teaching or belief into physics classroom would affect students' achievement Isaac (2001), and make them prone to errors and unguarded mistakes (Hestenes, Wells & Swackhamer, 1999).

Lastly, the table shows that a test of hypothesis four, stating that there is no significant influence of biblical accounts of nonscientific belief misconceptions on senior secondary school male and female students' achievement in physics is rejected. This rejection impliedly agrees with observational trend of women or girl-children register predominant membership in Christian churches and worship centres. This shows that women seem to be more misconceived of physics concepts and principles than men. The likely reason could be that most Christian bible teaching and leadership positions are now increasingly directed and held by women. They could be more receptive and subject to bible doctrine which may be unconsciously or consciously carried into the physics teaching-learning classroom. This finding agrees with Nkwo's (2015) position that more male students seem to be found in physics-related careers and professions than female students despite the relative higher mean achievement in favour of the latter.

CONCLUSION

The basic outcome of this study is that the preponderance of the Christian churches and its mythical teachings are affecting students' achievement of fundamental concepts in school physics, with the female students being more receptive because of their growing leadership roles. There seems therefore to be unconscious carryover of these myths to the physics classroom. This resists physics students restructuring in mental processing for conceptual change, and perhaps explains also why achievement in senior secondary school physics is markedly low and persisting.

RECOMMENDATIONS

The researcher believes in the scientific process that children stand to gain in understanding science (Daniel 1: 4) and recommends that:

1. Christian preachers and teachers should acquire basic literacy in the science of physics so that they will address their audience on scientific concepts related to the bible, while espousing the miraculous

and exceeding power of God in reversing natural phenomena to show the limit of science.

2. As much as possible, preachers of the Christian bible should adapt their expositions to the immediate environment to bring to concrete terms biblical position and natural reality as referents, in order to build up a properly informed membership.
3. Physics teachers should identify students' misconceptions by exploring their prior behaviour on any teaching concept and principle to ensure envisaged conceptual change based on appropriate cognitive processing abilities.
4. The teaching of physics should be complemented with practical to enable students' contextualization of concepts and application to real-life situation and practice environment.
5. Teachers should adopt and adapt learner-friendly methods that are compatible with examining "where the students are'.
6. Churches should establish schools so that there could be a blending of bible doctrines with nature and the real world during the formation stage of children's development.
7. Scientific conceptions on related natural phenomena should be espoused alongside the biblical teachings in order to ensure "balancing" of the learners as the basis of effecting smooth transition from one regime to the other at any stage of learning. This can avoid the sliding of developing societies into another "geocentric theory crisis" between the Christian church and scientific world.

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