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Editorial

Dear authors, reviewers, and readers

It has been a month since I was given the privilege to serve as the Chief Editor of the International Journal for Innovation Education and Research (IJIER). It is a great pleasure for me to shoulder this duty and to welcome you to ***THE VOL-5, ISSUE-2 of IJIER*** which is scheduled to be published on **28th February 2017**.

International Journal for Innovation Education and Research (IJIER) is an open access, peer-reviewed and refereed multidisciplinary journal which is published by the International Educative Research Foundation and Publisher (IERFP). IJIER aims to promote academic interchange and attempts to sustain a closer cooperation among academics, researchers, policy makers and practitioners from a wide range of disciplines, which contribute to state of the art in science, education, and humanities. It provides a forum for the exchange of information in the fields mentioned above by welcoming original research papers, survey papers, and work-in-progress reports on promising developments, case studies, and best practice papers. The journal will continue to publish high-quality papers and will also ensure that the published papers achieve broad international credibility.

The Chief Editor, appointed by the Associate Editors and the Editorial Board, is in charge for every task for publication and other editorial issues related to the Journal. All submitted manuscripts are first screened by the editorial board. Those papers judged by the editors to be of insufficient general interest or otherwise inappropriate are rejected promptly without external review. Those papers that seem most likely to meet our editorial criteria are sent to experts for formal review, typically to one reviewer, but sometimes more if special advice is needed. The chief editor and the editors then make a decision based on the reviewers' advice.

We wish to encourage more contributions from the scientific community to ensure a continued success of the journal. We also welcome comments and suggestions that could improve the quality of the journal.

I would like to express my gratitude to all members of the editorial board for their courageous attempt, to authors and readers who have supported the journal and to those who are going to be with us on our journey to the journal to the higher level.

Thanks,

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Eucharistic Fellowship and Its Relevance to Human Relationship

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Abstract

Man is naturally a social animal. For no single human being is an island, and simply put, no one is completely sufficient. Man thus naturally relates, and in this human relationship, personal interest, sentiment, bias, desire e.t.c, comes in and thus problems ensue. Man has also devised various academic means to resolve the problem, these means or ways include sociology, psychology, anthropology, history and international diplomacy and religious studies. Among the world known religions which of course speak peace and good human relationship, Christianity seems to stand out. Christianity, a religion traced to Judaism and the life and activities of Jesus Christ, gave man veritable tools of sustaining good human relationship. The importance of human relationship or the need for harmony, oneness and unity is showcased in the African Traditional Religion(ATR) among the Umunna in the Igbo community is demonstrated by the practice of “ Oriko” which exemplifies unity and also is synonymous with the Christian Eucharist fellowship. Having considered qualitative and hermeneutical methods, this paper is of the view that the Eucharist in the New Testament depicts strong lessons of love, peace, hospitality, acceptance, unity, harmony, forgiveness and sacrifice, faith/trust in God and in fellow man among others. If these are learned and practiced as explained in Eucharistic fellowship teachings by St. Paul in 1 Corinthians 10:16-17, the challenges encountered in human relationship will be a thing of the past.

KEYWORDS: Eucharistic Fellowship; Human Relationship; Man

Introduction

Human Relationship for a very long period of time has faced whole lot of challenges, possibly due to ignorance or lack of proper understanding of the concept. This paper seeks to address this issue from the New Testament background: Eucharistic Fellowship and its importance and contribution towards a better harmonious or homogeneous society.

Origin of Man

Charles Darwin (1859:76) has it that man, evolved from lower animals and after a long process of growth and maturity became human being, but he has not been able to state where this evolution continued and where it will end. However, he and many other scientists “then” held this to be acceptable. This is called the evolution theory “of man”. According to Wilbur O’ Donovan, (1996:81-84) in his book titled Biblical Christianity in African perspective, Chindo in a dialogue with Garba, agrees with the African perspective

of human origin, which has it that the soul of man had been created by the Supreme Being “God” from the onset and these souls dwell in the spirit world and enters the belly of pregnant mother and this comes out with new body and different behaviour, but a part of such soul remains with the spirit world and acts of the persons ‘guardian angel’. The soul returns to the spirit world when the bearer dies and thus returns again about seven times. This process is called reincarnation.

However, they could not identify the location of the human spirit world and its ruling principles except for the fact that the spirit and soul were created by God from the very beginning. Again continues O’Donovan, both the Bible and modern science indicate that the human personality and soul is formed at the moment of conception in the womb. Modern science also explains the reason for so many of the evidences given in support of human pre-existence.

All religions of the world directly or indirectly believe and own supremacy to Almighty God, despite the different names they call Him and of course their own creation story as ascribed to the Supreme reality. Succinctly we shall thus concern ourselves with Christian religious view on man’s origin.

Origin of Man as Held by Christianity and the Inception of Human Relationship.

The Christian Bible does not only have an extensive and elaborate credible story about the history of the origin of man, but also puts the answers to the questions that were left unanswered in both the evolutionary and African myth stories. The Bible tells us that God created man out of dust of the earth (Gen 2:7). By this He created man’s physical body. Then God breathed the “breath of life” into the physical body he had made and man became a living being (Gen. 2:7). When God breathed life into Adam’s body, he (Adam) became a living soul. “The LORD God said, it is not good for the man to be alone. I will make a helper suitable for him” (Gen. 2:13). This marked the start of human relationship, as Eve was made from the rib of Adam, and the (sexual) union of Adam and Eve led to the inception of procreation as God willed.

From this, God instituted and ordained marriage first, human relationship second and then sex in the marriage institution third. This puts to rest the ambiguity of the origin of man and human relationship, as from then till today, man has been on earth and has been relating with his fellow man and of course the marriage institution has also remained. According John Stott (1995:17) God, dignified man by addressing them in such a way as to assume their understanding, by giving them permission and prohibition, God allowed man to have moral choice/freedom, by asking Adam to name all things. He gave man a sense of creativity and responsibility, by giving Adam a wife, he instituted, love, marriage and companion among men, by visiting them in the cool of the evening, He created fellowship, union, re-union and spiritual worship. Hence, understanding, moral choice, creativity, love and fellowship were instituted by God for the benefit of man.

The Problem of Human Relationship

Due to individual differences, personal interest, quest for self-satisfaction, diversities and world policies, human relationship has posed a huge challenge to all the facets of human life. Scholars have written about

man in his various distinguished (unique) spheres, hence Keith Thomas in John Stott; contemporary Christianity collected a number of quaint suggestions in his book *Man and the World*. He points out that human being was described by Aristotle as a political animal, by Thomas Willis as a laughing animal, by Benjamin Franklin as a tool making animal, by Edmund Burke as a religious animal, and by James Boswell the Gourmet as a cooking animal; Others focused on the physical features of the human body, for instance Plato made much of our erect posture, saying that other animals look down, but man looks up to heaven. One thing is certain in all these, man's interest hugely differs, and when one is extremely consumed by any (good or bad) interest, desire, quest or ambition it turns human relationship and other social structures apart, because at this point it has become an obsession. For instance, a good pastor who is wholesomely dedicated to God and the church may be lagging behind seriously, in his legal family duties and vice versa. From the foregoing, it is obvious that human relationship and indeed fellowship (both spiritual, physical or social) was directly instituted by God himself, but, this relationship has been hampered by man starting from Adam, due to the type of "moral" choices we make which affects us and our fellowship or relationship with our fellow human beings and God. Thus, it is obvious that human choices and obsessions has become a threat to human relationship. We shall thus look at various attempts made to rekindle good human relationship.

Attempts Made to Rekindle Human Relationship

In as much as political science, Economics, Biology, Management, Psychology, Guidance and counseling amongst others are some of the fields of human relations is mainly one of primary interest of humanities faculty, which principally include Religion, Philosophy, Ethics/morality, History and International relations etc.

While philosophy will try to ask questions about and seek wisdom on why and how humans relate, ethics/morality tends to study intensively the right and wrong conduct of human beings and how best to better it. For history and inter-state (international) relationship, and how nations can best cohabit.

However, our focus will be on religious tools and attempts towards fostering good human relationship. To clearly understand religious attempts geared towards solving the problem of human relationship, it is imperative to briefly look at the meaning of the word, Religion.

The Concept of Religion

Like economics and many other relative courses, religion has no single generally accepted definition. While a sociologist will see religion from its institution and social functions, a philosophical approach will tend an abstract identification, a psychologist will see it from the Emotional feeling of dependence, a theologian will tend to go one direction and neglect other world religion's view, a phenomenological approach tends to search for physical visible characteristics of religion. Thus it has no universally accepted definition.

According to Obilor, in his book *Many Religions One God* (2010) there are three basic approaches to the definition of religion. These are etymological, scholastic and pedagogical.

Etymological approach to the definition of religion, religion is derived from the Latin noun *religio*. The beauty of this latin word is that it is most closely allied to other three verbs: *religere* which means “to turn to constantly” or “to observe conscientiously”, *religari* which means “to choose again”. A closer scrutiny shows that the three verbs point to three possible religious attitudes and thus a purely etymological probe can tell us much about religion and can also help to resolve most of the difficulties often associated with religion.

The scholastic approach: We can now no consider some of the definitions offered by scholars. According to A.D. Gilbert (1980:5), religion is describes as any system of values, beliefs, norms, and related symbols and rituals, arising from attempts by whether in this world or any future world, by means wholly or partly supernatural.

Baptista Mondin (1989:629) adds to this definition the ideas of knowledge, actions, norm and structure with which man expresses his true recognition and dependence upon the sacred (God).

Alston W. P. (1967:140) takes religion to mean the belief in an ever living God that is, in a Divine mind and will, ruling the universe and holding moral relations with mankind.

The pedagogical approach: Considers religion from two perspectives explicit religion and implicit religion: Explicit religion is that aspect of religion which comes from outside – learned or taught – revelation, belief system, holy books and persons, which often are based on authority. Every religion that has a founder belongs to this class. Implicit religion is man’s natural search for the beyond a humanly driven drive – that comes from within and is not imposed from outside. The truth of the matter is that man has a religion because he is religious. It is not true that man is religious because he has a religion. Religion is a product of man’s religiosity.

From the foregoing, religion here is seen as the fundamental outward practice worship of the supreme reality as apprehended by man and “belief” in his ultimate search for the transcendent. Every world religion makes an effort to bring people together, under one harmonious umbrella.

However, among the world religions, we shall concern ourselves with Christian religion and how it attempts to make for good human relationship. The word fellowship is variously used in different contexts, but mostly, it is used within the religious circle.

However, for a more direct and articulated use in this work, we shall first consider the word “fellowship” from its etymology. The word fellowship is derived from the Greek word Koinonia and it means having a share in, participating in or giving a share.

J Keathley II in Anukam Nneji defines fellowship as having or sharing with others certain things in common such as interest/ labour privileges and responsibilities, experiences and concerns. Fellowship can mean a partnership that involves working together and caring for one another as a company of individuals like a company of soldiers or members of a family. Wycliffe Bible Dictionary defines fellowship (Greek Koinonia) as companionship or partnership and communion with others on the basis of something held in common.

From the above, it is quite evident that they are various kinds of fellowship social or club fellowship, party or political, economic or financial, religious and other forms/levels of fellowship. However, we shall direct our focus to religious fellowship in general and Christian fellowship in particular. Religious fellowships are

those communions, worship or union in which adherence of same spiritual faith share their most spiritual belief together knowledge and doctrine about the ultimate reality as is grasped.

To this end, various world religions have their own patterns of fellowship and this various patterns of fellowship inform the way their assembling centre is structured and furnished.

CHRISTIAN: Eucharistic fellowship

Christianity is known as a religion of love as depicted by Jesus Christ, it also preaches and practices the Golden Rule “do to others as you will have them do to you” (Mac Gr e.g. or 1989:198, in Obi Des 2013:29). Of course worshipping is an indispensable aspect of the Christian fellowship.

According to Anukam Nneji, Christian fellowship can be considered in two ways; the vertical “I” representing man to God fellowship and the horizontal representing man to man fellowship. In the meantime, we shall consider the various types of Christian fellowship.

A careful observation of the bible shows that there are five kinds of fellowship or sharing enjoined by Christians, (Pfeiffer 2005:398, in Anukam Nneji 2015:18). We have communion or fellowship together at the Lord’s Supper (1 Corinthians 10:16-21), in which the believer professes his faith in Christ’s atoning blood and shows forth His death till He comes again (1 Corinthians 11:23-26). Paul gives very careful instructions concerning this fellowship and warns Christians to examine themselves before taking part in it. This is referred to as Eucharistic fellowship (1 Corinthians 11:27-28), shared by members in the church of our Lord Jesus Christ established in the New Testament church (ecclesia) or body of called-out believers, on the public profession of Himself as Saviour (Mathew 16:18). In Himself He established a vital unity, making of both Jew and Gentile one new “man” and body (Eph.2:14-16). He loved it as His own bride and gave Himself for it (Eph. 5:25f) in the local churches or assemblies, Christians are to be nurtured (Heb. 10:24-25; cf Mal. 3:16) and to enjoy fellowship in the word and prayer (Acts 2:42).

Giving is another form of fellowship which is commanded (1 Tim. 6:18; Heb 13:16) and may consist of systematic giving on a regular basis (Rom 15:26; II Cor. 8:4; 8:13, or it may occur in the gift of large sums or even all that one owns at a particular time (Acts 4:36-37, 5:1-11), in this case, the gift is entirely at one’s discretion (Acts 5:4) for example (the rich young ruler, in Luke 18:18f).

Ministration to the saints, such as relief funds for other churches (Acts 11:29; Rom 15:25), to help Christians in need (Rom 12:13; II Cor. 8:4) and perhaps others as well (Heb 13:16), and sharing other peoples burdens Rom 15:1). And finally, fellowship in suffering; this refers to suffering as a member of Christ’s body, partaking in the fellowship of his suffering” (Phil 3:10 cf Col. 24).

The Concept of Eucharist

The term Eucharist is etymologically derived from the Greek words “Eucharistein” and “Eulogein” respectively as used in numerous scriptural texts to recall the Jewish blessing that was proclaimed especially during a meal, depicting God’s work of creation, redemption and sanctification. In the New

Testament, the term Eucharist is not used for this same Rite; However, a related verb is found in the New Testament account of the last supper or Holy Communion (New Dictionary of theology).

The origins of the Eucharist are found in the Last Supper. "in order to leave them a pledge of this love, in order never to depart from his own and to make them sharers in his Passover, Jesus instituted the Eucharist as the memorial of his death and resurrection, and commanded his disciples to celebrate it until his

return; 'thereby he constituted them priests of the New Testament'"

(1337). In the context of the Last Supper Jesus instituted a new memorial sacrifice. As a perpetual memorial to his death and Resurrection, in the course of the Passover meal with his disciples, he took the bread "blessed and broke it and gave it to his disciples and said 'Take, eat, this is my body'" (Matt. 26.26). In like manner he took the ceremonial cup of wine "gave thanks and passed it to his disciples saying 'this cup which is poured out for you is the new covenant in my blood'" (Lk. 22.20). Finally, he commanded them: "Do this in remembrance of me" (1 Cor. 11.24).

Christ is present in a sacramental form under the appearance of bread and wine to become the spiritual food of the faithful. The communion of: literally, a participation in. By means of the cup we realize our share in the benefits wrought by Christ's precious blood shedding. The cup is at once a symbol and a medium. The blood of Christ: of which the wine is the sacramental symbol. By rightly drinking the wine, we spiritually partake of the blood of Christ; we become sharers in his Divine life. The bread; perhaps rather, the loaf, which was apparently passed from hand to hand, that each might break off a piece. Is it not the communion of the body of Christ? The best comment on the verse is John 6:41-59, in which our Lord taught that there could be no true spiritual life without the closest union with him and incorporation into his life.

Jesus established this ceremony at the last supper with his disciples (Mat 26. 26-28, Lk. 22:17-20), Apostle Paul called it the Lord's supper in I Cor. 11:20. According to Oral R. (1981:108) it is not a mere ritual but another powerful contact that God provides for as many to renew our faith in the new covenant.

For O' Donovan (1996:169), in Anukam Nneji 2015:14), the term Eucharist is popularly used by the Roman Catholic and Anglican Churches. According to Ugochukwu (2000:11), The Eucharist assumes a threefold significance namely. Sacrifice, communion and viaticum. The Eucharist is referred to as a sacrifice because it is the commemoration of Christ's passion. It is also called a communion because it is an ecclesiastical bond shown in the sharing of one bread and one cup. It is designated as a viaticum which strengthens the participants in their eschatological journey. For Wilson (2003:3-4) the Eucharist bears other names like Communion, Mass, Manudy Thursday, The Breaking of Bread, Divine liturgy, the table of the Lord, sacrament, ordinance or fellowship among others.

Having seen what Eucharist and fellowship means respectively, what then is Eucharistic fellowship? it is not out of place to put the two concepts together and thus define Eucharistic fellowship as one of the most important Christian communion, ordinance, mass or sacrament, meant with the sharing or one meal (bread

and wine-representing body and blood) in remembrance of the suffering and death of Jesus Christ known as the passion of Christ (I Cor 10:16-17).

Eucharist fellowship is a sacrificial communion of Christians which in practicing helps to bring them together in love, unity, worship, service and thus help them to pursue the same goal faithful life.

Exegesis of the Text (I Corinth. 10:16-17)

Exegesis is an attempt to bring out the original meaning of any writing for easy understanding. It will unfold understanding and increase the knowledge of the topic through the text. It will cover the following sub-headings, the content, the text, the exegesis of I Cor. 10:16-17, the structure, the context and the critical analysis and interpretation of the text.

The Content of the Passage

English Version (Revised Standard Version)

1 Corinthians 10:16-17

The cup of blessing which we bless, is it not a participation in the blood of Christ? The bread which we break, is it not a participation in the body of Christ? 17 Because there is one bread, we who are many are one body, for we all partake of the one bread.

Literary Context of the Text

1 Corinthians 10:16. The key-word of this passage; the Lord's Supper constitutes a "communion" centering in Christ, as the Jewish festal rites centered in "the altar" (I Corinthians 10:18), and as "the demons," the unseen objects of idolatrous worship, supply their basis of communion in idolatrous feasts (I Corinthians 10:21 f.). Such fellowship involves (1) the ground of communion, the sacred object celebrated in common; (2) the association established amongst the celebrants, separating them from all others; "The word communion denotes the fellowship of persons with persons in one and the same object". These two ideas take expression in I Corinthians 10:16-17) in turn; their joint force lies behind the protest of I Corinthians 10:20 ff, appealing to the Eucharist of Eulogia. The passage begins with "the cup" (cf. the order of Luke 22:17 ff.), the prominent object in the sacrificial meal (I Corinthians 10:21), containing, as one may say, the essence of the feast (cf. Psalm 23:5). Is attributive genitive (like "cup of salvation" in Psalm 116:13). Christ blessed this cup, making it thus forever a "cup of blessing"; this can be compared with the early sacramental phrases, in or in Matthew 10:25, and from the Catacombs. On this view, is no repetition of the but is antithetical to it in the manner of Ephesians 1:3, "the cup which gives blessing, for which we give blessing to God".

According to Dickson (2011:1461) the prevalent interpretation that makes the phrase a rendering of the third cup of the Passover meal, over which a specific blessing was pronounced (often identified with that of the Eucharist); referring to Luke 22:20, the fourth, which closed the meal and was attended with the singing of the Hallel, are by inverse relative attraction, not unknown, though rare, with the merging of these nouns

in the clause, the Acts of blessing the cup and breaking the bread becomes the real subject in each instant, “when we bless the cup, break the bread, is it not a communion?”.

In any case, the “communion” looks beyond the bare and to the whole sacred action, which they form the centre. “The bread” is “blessed” equally with “the cup,” but in its case the prominent symbolic act is that of breaking, which connotes the distribution of “many: of the “one the “one loaf.” Thus “the sacramental bread came to be known as the. Mayer (1992:53) observes: that the passage speaks out of the consciousness of the Christian fellowship, in which it is a matter of indifference who may be, in this instance or that, its administrative organ.” It is not a communion of (or in) the blood, the body, of Christ” – not “a communion with the blood, etc.” (Meyer 1992:61) is of the opinion that the stress lies on in both questions: through the cup and loaf believers participate together in Christ, in the sacrifice of His blood offered to God (Romans 3:25, Ephesians 1:7; Ephesians 1:11), and in the whole redemption wrought through His bodily life and death and resurrection carries our thoughts from the incarnation (Phil 2:7), through the crucifixion (Colossians 1:22), on the heavenly glory of the Redeemer (Phil 3:21). The cup and bread are here styled “a communion in Christ’s blood and body”, in His own words (I Corinthians 11:25), “the new covenant in My blood,” – a communion on the basis of the covenant established by the sacrifice of the Cross.

I Corinthians 10:17 confirms the statement that the bread is a communion of the body of Christ. For it is one bread; one body are we, the many, i.e. for though one bread being eaten in the Supper, we Christians, although as individuals we are many, form together one (ethical) body. This union into one body through participation in the one bread could not take place unless this bread were of the body of Christ, which is just that which produces the one body – that which constitutes many into this unity. One is just the same, because (for), so common in argument, and there is no need whatever to substitute for it; is to be supplied after the two clauses are placed side by side asyndetically so as to make the passage and in particular, to bring out with more emphasis the idea of unity (compare Acts 25:12). Which follows leaves us no room to doubt how the asyndeton should logically be filled up (and therefore also); for this last clause of the verse excludes the possibility of our assuming a mere relation of comparison (as there is one bread, so are we one body. The too, forbids our supplying after for these words indicate the presence of another conception, in as much as, repeating the idea conveyed they thereby show that the Aptos(απτος) was aid of literal bread, “because it is one bread, therefore are we, the many, one body”. In that case either we should have a further exposition about the bread, no sign of which, however, follows; or else this whole thought would be purely parenthetical, a practical conclusion being drawn in passing from what had just been stated. But how remote from the connection would such a side-thought be! And would not Paul have required to interpose an or some such word, after in order to avoid misunderstanding? Interpreters would not have been taken themselves to a device so foreign to the scope of the passage, had they not took hostile assumed that I Corinthians 10:17 contained no explanation at all of what preceded it. “Because there is one bread, therefore are we, the many, one body,” but makes this not a subordinate thought brought in by the way, but an essentially new point in the argument: he does this, however, by supplying after “with Christ the Head” and finding the progress of the thought in the words supplied.

But in this way the very point on which all turned would be left to be filled in, which is quite unwarrantable; Paul would have needed to write or something to that effect, in order to be understood correlative to the (compare I Corinthians 10:15; I Corinthians 10:19); the many who are fellow-participants in the Lord's Supper, the Christian multitude. The very same viewed however, in the aspect of their collective aggregate, not as here, of their multitudinousness, are the whole; compare Romans 5:15 and Romans 5:18. The unity of bread is not to be understood numerically but qualitatively, as one and the same bread of the Supper. The thought of the bread having become a unity out of many separate grains of corn is foreign to the connection. It is interpreted by some as if there were no "since we are all partakers of one bread".

This is contrary to the linguistic usage, for is joined with the genitive (I Corinthians 10:21; I Corinthians 9:12) or accusative, but never with and the assumption that Paul, in using was thinking of the verb (I Corinthian 11:28), is although arbitrary. The linguistically correct rendering is: for we all have a share from the one bread, so that in analyzing the passage we have to supply, the indefinite indication of a part, before. Bruce (1986:1356) gives the correct portative sense to the expression. The article before points back to the fact that we are one.

The passage I Corinthians 10:16-17, is an extract from the first letter to the Corinthians. This letter is said to have been agreed by historians, Christian theologians and scholars, that Paul wrote this letter to the Corinthians. Yamsat (2010:25) says that, "There is no contention regarding the Pauline authorship of first Corinthians. Scholars all agreed that Paul is the author of the letter. Paul's authorship was attested by Clement of Rome as early as A.D. 96.

However, the only place where scholars disagree is whether it is a composite letter or it is a single letter. The idea of composite letter is based for example, on passage like I Corinthians 5:9, where Paul made mention of an earlier letter written to the church. Secondly in 1 Corinthians 1:2, Paul mentioned Sosthenes as a co-author. Smith, (2005:10) says that this Sosthenes may be the man from Corinth mentioned in Acts 18:17, who was said to be the synagogue ruler, presumably appointed as the successor to Crispus in Acts 18:8, Crispus is said to be the synagogue ruler (I Corinthians 1:14) if so, then, Sosthenes must have become a believer after the incident described in Acts first Corinthians. Smith agrees that Paul's inclusion of Sosthenes as a co-author may have been motivated by the support that such a prominent Corinthians believer would lend to his letter.

Moreover, scholars who argue for single authorship based their argument on the consistent use of first person singular throughout the letter. This implies that he is the real author and Sosthenes' ancillary contribution is impossible to reconstruct. Based on I Corinthians 16:8-9, 19, the letter was written in Ephesus during Paul's third missionary journey. The verses show that the letter was written between three to five years after Paul left Corinth, meaning that the letter probably was written in between 54 AD.

According to Muddiman (2011:1130) Four years prior to writing the letter, first Corinthians, the apostle had spent 18 months in Corinth, so he was intently familiar with the church and many of its congregants. The recipients of the letter must have understood the letter's significance, not only to their own circumstances but for the church worldwide in AD 95, Clement, the bishop of Rome wrote a letter of his own to the Corinthians, in which he invoked the authority of Paul's instruction in I Corinth only a few

decades after its origin this letter to the Corinthians had traveled out of Corinth and was considered authoritative beyond its initial Corinthian context.

Yamsat (2010:26) is of the opinion that the purpose of this letter can be classified into two. First is to exhort the church in Corinth on certain matters pertaining to the faith and the Christian life. Second to response to questions sent to Paul by the church regarding practical Christian life like, marriage, divorce, single life, spiritual gifts and the resurrection. Division, immorality, litigation in court of law, lack of consideration for the weak, head covering at worship and partaking of the Lord's supper, based on the status of the members and support for the needy in Jerusalem.

The Structure of I Corinthians 10:16-17

The cup of blessing which we bless, is it not the communion of the blood of Christ? The bread which we break, is it not the communion of the body of Christ? For we being many are one bread, and one body: for we are all partakers of that one bread. 1 Cor. 10:16-17(KJV)

Communion (Κοινωνία) is the key-word of this passage (see parls.); the Lord's Supper constitutes a "communion" centering in Christ, as the Jewish festal rites centred in "the altar" (1 Corinthians 10:18), and as "the demons," the unseen objects of idolatrous worship, supply their basis of communion in idolatrous feasts (1 Corinthians 10:21 f.). Such fellowship involves (1) the ground of communion, the sacred object celebrated in common; (2) the association established amongst the celebrants, separating them from all others: "The word communion denotes the fellowship of persons with persons in one and the same object" Evans [1489]. These two ideas take expression in 1 Corinthians 10:16-17 in turn; their joint force lies behind the protest of 1 Corinthians 10:20 ff.—Appealing to the Eucharist—or Eulogia, as it was also called—P. begins with "the cup" (cf. the order of Luke 22:17 ff., and Didaché ix. 2 f.), the prominent object in the sacrificial meal (1 Corinthians 10:21), containing, as one may say, the essence of the feast (cf. Psalm 23:5). τ. εὐλογίας is attributive genitive case (like "cup of salvation" in Psalm 116:13; see other parls., for both words); so Calvin[1491], "destinatus ad mysticam eulogiam," and C. F. G. Heinrici's [1492] (see his note). Christ blessed this cup, making it thus forever a "cup of blessing"; the Acts of blessing the cup and breaking the bread becomes the real subject of κοινωνία in each instance. The action of blessing and breaking, of which the elements are the objects, makes them the κοινωνία. "The bread" is "blessed" equally with "the cup," but in its case the prominent symbolic act is that of breaking (see parls.), which connotes the distribution to "many" of the "one loaf." Thus "the sacramental bread came to be known as the κλασμός: so Did., § 9" T. C. Edwards' On the plural εὐλογοῦμεν, κλῶμεν, Meyer observes: "Whose was it to officiate in this consecration? At this date, when the order of public worship in the Church was far from being settled, any Christian man was competent. By the time of Justin (Apol. i. 65) the function was reserved for the προεστώς, but on the understanding that he represented the community and acted in communion with it (see Ritschl, Altkath. Kirche, 2 pp. 365 f). The pls. of our passage speak out of the consciousness of the Christian fellowship, in which it is matter of indifference who may be, in this instance or that, its administrative organ."—οὐχὶ κοινωνία τοῦ αἵματος, τοῦ σώματος, τοῦ Χριστοῦ; "Is it not a communion of (or in) the blood, the body, of Christ?" (cf., for the gen[1510] after κοινωνία, note on 1 Corinthians 1:9—not "a communion with the blood, etc." The stress lies on τοῦ Χριστοῦ in both questions: through the

cup and loaf believers participate together in Christ, in the sacrifice of His blood offered to God (Roman 3:25, Ephesians 1:7; Ephesians 1:11), and in the whole redemption wrought through His bodily life and death and resurrection. τὸ σῶμα τοῦ Χριστοῦ carries our thoughts from the incarnation (Php 2:7), through the crucifixion (Colossians 1:22), on to the heavenly glory of the Redeemer (Php 3:21). The cup and bread are here styled “a communion in Christ’s blood and body”; in His own words (1 Corinthians 11:25), “the new covenant in My blood,”—a communion on the basis of the covenant established by the sacrifice of the Cross. Paul names the cup first, not because at the sacrificial feasts men thought less about food than about a pleasant meeting primarily for enjoying wine (they came for eating and drinking), but because he means to speak at more length about the bread, and in connection with it, especially to discuss the Israelitic partaking of the sacrifices, as it suited his theme of the meat offered to idols. For this reason he begins here by disposing briefly of the point concerning the cup. In chap. 11 he does otherwise, because not regarding the matter there from this special point of view.

The cup, i.e. its contents as these are presented and partaken of, is the medium of this fellowship; it is realized in the partaking.

It is this communion which makes us all one: by partaking of one and the same bread, we are united and formed into one mystical body. “This account of the Lord’s supper, the apostle gave to show the Corinthians, that as by eating thereof, the partakers declare they have the same object of worship, the same faith, the same hope, and the same dispositions with the persons whom they join in that act of religion, and that they will follow the same course of life; so, in all reasonable construction, by eating the sacrifices of idols, the partakers declare they are of the same faith and practice with the worshippers of idols, that they have the same objects of worship with them, and that they expect to share with them in the benefits to be derived from that worship.”

Did not the joining in the Lord's Supper show a profession of faith in Christ crucified, and of adoring gratitude to him for his salvation? Christians, by this ordinance, and the faith therein professed, were united as the grains of wheat in one loaf of bread, or as the members in the human body, seeing they were all united to Christ, and had fellowship with him and one another. This is confirmed from the Jewish worship and customs in sacrifice. The apostle applies this to feasting with idolaters. Eating food as part of a heathen sacrifice, was worshipping the idol to whom it was made, and having fellowship or communion with it; just as he who eats the Lord's supper, is accounted to partake in the Christian sacrifice, or as they who ate the Jewish sacrifices partook of what was offered on their altar. It was denying Christianity; for communion with Christ, and communion with devils, could never be had at once. If Christians venture into places, and join in sacrifices to the lust of the flesh, the lust of the eye, and the pride of life, they will provoke God.

The cup of blessing which we bless - The design of this verse and the following verses seems to be, to prove that Christians, by partaking of the Lord's Supper, are solemnly set apart to the service of the Lord Jesus; that they acknowledge Him as their Lord, and dedicate themselves to him, and that as they could not and ought not to be devoted to idols and to the Lord Jesus at the same time, so they ought not to participate in the feasts in honor of idols, or in the celebrations in which idolaters would be engaged; see 1 Corinthians 10:21 He states, therefore:

1. That Christians are "united" and dedicated to Christ in the communion; 1 Corinthians 10:16-17

2. that this was true of the Israelites, that they were one people, devoted by the service of the altar to the same God, 1 Corinthians 10:18
3. that though an idol was nothing, yet the pagan actually sacrificed to devils, and Christians ought not to partake with them; 1 Corinthians 10:19-21 The phrase "cup of blessing" evidently refers to the wine used in the celebration of the Lord's Supper. it is called "the cup of blessing" because over it Christians praise or bless God for his mercy in providing redemption. It is not because it is the means of conveying a blessing to the souls of those who partake of it - though that is true - but because thanksgiving, blessing, and praise were rendered to God in the celebration, for the benefits of redemption; see Note, Matthew 26:26 Or it may mean, in accordance with a well known Hebraism, "the blessed cup;" the cup that is blessed. This is the more literal interpretation; and it is adopted by Calvin, Beza, Doddridge, and others.

The cup is put for the wine in the cup (which is very ordinary). The cup, or wine, of blessing, signifies that cup of wine to which the blessing is added, or with which in that holy institution we thankfully remember the death of Christ, and bless his name for that great mercy; and the wine or cup of blessing, also, here signifies our religious action in drinking of that cup of wine so blessed. This, saith he, is the communion of the blood of Christ; that is, it is an action whereby and wherein Christ communicates himself and his grace to us, and we communicate our souls to him; so that Christ and believers in that action have a mutual communion one with another. And as it is with the one element in that holy sacrament, so it is also with the other.

The bread which the minister breaks (according to the institution and example of Christ) for the church to make use of in the celebration of the Lord's supper, that is, their action in eating of that bread so broken and divided amongst them, is the communion of the body of Christ; an action wherein Christians have a fellowship and communion with Christ.

1 Corinthians 10:17 confirms the statement that the bread is a communion of the body of Christ. For it is one bread; one body are we, the many, i.e. for through one bread being eaten in the Supper, we Christians, although as individuals we are many, form together one (ethical) body. This union into one body through participation in the one bread could not take place unless this bread were κοινωνία of the body of Christ, which is just that which produces the one body—that which constitutes the many into this unity.

1 Corinthians 10:17 contained no explanation at all of what preceded it (Rückert). Rodatz agrees with the rest in rendering: "because there is one bread, therefore are we, the many, one body," but makes this not a subordinate thought brought in by the way, but an essentially new point in the argument; he does this, however, by supplying after ἐν σῶμα, "with Christ the Head" (comp also van Hengel, Annot. p. 167 f.), and finding the progress of the thought in the words supplied.

1 Corinthians 10:17 unfolds the assertion virtually contained in the question just asked: "Seeing that (ὅτι) there is one bread, we, the many, are one body";

The saying is aphoristic: One bread makes one body C. F. G. Heinrici's [1520]—a maxim of hospitality (equally true of "the cup") that applies to all associations cemented by a common feast. "The bread" suggests the further, kindred idea of a common nourishment sustaining an identical life, the loaf on the

table symbolising the ἀληθινὸς ἄρτος of John 6, which feeds the Church in every limb (1 Corinthians 12:13).—"For (γὰρ of explanation) we all partake from (partitive ἐκ, cf. 1 Corinthians 9:7) the one bread"; eating from the common loaf attests and seals the union of the participants in Christ. The passage proves, that the cup and the bread are the communion; for the bread by itself does not make them that eat it, become one body; but the bread does so, in so far as it is communion, etc.—εἷς ἄρτος (one bread), viz. there is [and indeed it is such bread as is broken, and carries with it (implies in the participation of it) the communion of the body of Christ.

Are one bread - One loaf; one cake. That is, we are united, or are one. There is evident allusion here to the fact that the loaf or cake was composed of many separate grains of wheat, or portions of flour united in one; or, that as one loaf was broken and partaken by all, it was implied that they were all one. We are all one society; united as one, and for the same object. Our partaking of the same bread is an emblem of the fact that we are one. In almost all nations the act of eating together has been regarded as a symbol of unity or friendship.

To facilitate easy comprehension of I Corinthians 10:16-17, the text can be structured thus:

The Cup and the Bread

The cup of blessing which we bless, isn't it a sharing (GK of the blood of Christ (v. I Corinthians 10:16). The cup of blessing was the third cup, drunk at the end of the meal and accompanied by a prayer of thanksgiving for blessings received from God. It was probably this third cup that Jesus used to institute the Lord's Supper. "He took the cup, gave thanks, and gave to them, saying, "all of you drink it, for this is my blood of the new covenant, which is poured out for the remission of sins" (Matth 26:27-28). He commanded, "Do this in memory of me" (Luke 22:19, I Corinthians 11:24-25). Paul says, "for as often as you eat this bread and drink this cup, you proclaim the Lord's death until he comes" (I Corinthians 11:26). Paul strongly affirmed that when Christians participate in Eucharistic fellowship, they are communing with the blood sacrifice and universal body of Jesus (I Corinthians 11:23-32) making reference to the universal body of believers that (I Corinthians 10:16). The bread which we break, isn't it a sharing (GK κοινωμία) Christ thus "God is faithful, through whom you were called into (fellowship) of his son, Jesus Christ our Lord (I Corinthians 1:9). He implies that our participation in the Eucharistic puts us into a deep fellowship with Christ and his person. It reminds us that Christ suffered death on the cross for our benefit that he shed his blood for us.

One Bread and One Body

I Corinthians 10:17 in eating at the Eucharistic fellowship, Christians manifest their unity of one faith in worship of one Lord. The bread is symbolic of the unity of the body of Christ. Therefore, every time Christians, meet together for Eucharist, they proclaim the unity of the church throughout the world Paul wants us in the Eucharistic fellowship to remember the oneness of the body of Christ. Each individual member is part of that body regardless of the denomination where they participate in the Eucharistic fellowship; therefore, Christians throughout the world must remember that they are part of the universal

body of Christ. Although, they do not participate in the Eucharistic fellowship the same place or at the same time, but because they eat the bread of the Eucharistic fellowship of the Lord in remembrance that they are part of a universal body of Christ. This is the evidence that they expressed oneness in Christ.

Context of the Text

The text I Corinthians 10:16-17 is located in Paul's first letter to the Corinthians within the discourse, the first letter to the Corinthians has sixteen chapters Willington (1984:414) divided the first Corinthians into two sections chapter 1-6 he tagged seven corruption and chapter 7-16 he tagged six question. The concern of this paper is on the second section because it is where the text I Corinthians 10:16-17 falls on. In this second section, each of the questions is introduced with the phrase "Now concerning..." "the text under study falls on the second question "Now concerning food offered to idols.

Yamsat (2010:121) says that, I Corinthians 10:16-17 is not written to present a doctrinal position regarding the Lord's Supper. Rather, this argument is brought in to strengthen Paul's point regarding the consequences of their present practice, which tended to give no regard to the "weak" brother who stood in danger of slipping away from the partnership as a result of the lack of caution on the part of other brethren. In this way, Paul is able to preserve a kind of check and balance over the freedom to eat sacrificial food. Instead of going straight on to demonstrate that eating sacrificial food is partnership with idols or demons, he raises two rhetorical questions that state the unifying nature of the Lord's Supper. "The Cup we bless is it not the Blood of Christ? The bread we break is it not the body of Christ? Though we are many we are one body because we all share in one bread" (I Corinthians 10:16-17).

Dickson (2011:149). What we have here is participation between believers in the one cup and the one bread. Paul does not elaborate on the drinking of the cup of blessing and the eating of the bread, because he does not intend to discuss the Lord's Supper. He brings it here simply as an illustration in support of the subject under discussion. As we have said, he brings it in here to illustrate his point of argument that there is a unifying factor in eating sacrificial food.

Since that is his aim, he moves straight into an interpretation of this drinking of the cup of blessing and the eating of the bread in v. 16, using the Greek word (partnership, sharing). He says that the partaking together in the cup, or in the blood of Christ and in the bread, is partnership in the body of Christ. The cup of blessing they partake expresses their partnership in the death (blood) of Christ and the bread, an expression of partnership in the body of Christ (the church). In this way, the participation in the cup and the bread goes beyond mere eating together, but expresses their partnership or sharing in the suffering and death of Christ, an argument Paul would want to apply to those who eat sacrificial food. What he is aiming at by this illustration with the Lord's Supper is made clearer in v 17 in a poetic style. Because there is one bread, we who are many are one body, since we all partake of the one bread. Here, the language of unity is derived from the act of sharing together in the one bread by "the many", since there cannot be sharing where there is only one person involved. That is, those gathered are many and different individuals who have become "one body" by their partaking or sharing in the one bread.

Africa and the Concept of Eucharistic Fellowship

As we have seen, Christianity is traced to Judaism and Jesus Christ and these two are alien to Africans and their history, therefore, Eucharistic fellowship can only be relevant to Africans who are Christians. Notwithstanding, irrespective of how true this may sound, it will not actually be true since Africa is a strong religious continent.

Africans and African religion has its own way of Eucharistic fellowship, though not practiced with the same name and in completely same manner, but has similar religious connotations and spiritual implications. According to Okefor, African culture is embedded in her religion and the two cannot be separated. African understanding and practice of Eucharistic fellowship will be exemplified here, by the Igbo people of South Eastern part of Nigeria in West Africa.

The Igbo Nation

The Igbo occupy the South Eastern Nigeria. This includes the area east of the River Niger and west of the Cross River. Although the bulk of the Igbo live in the former East-Central State of Nigeria, (now sub-divided into Abia, Ebony, Enugu, Anambra and Imo States) yet, they stretch into the Ahoada Division of the Rivers State, and into Asaba, Ika and Aboh Divisions of the Bendel State.

The people speak a common language called “Ibo”, although there are dialectal variations. But the dialects are usually mutually intelligible. Igbo people believe that they were created by the Supreme Being to settle in what is now called Igboland. Igbo traditions, as well as excavations carried out in Nsukka, Okigwe, Awka, Bende and Afikpo divisions have shown that the Igbo have settled in these parts for thousands of years. They have Nri in Awka and Amaigbo in Orlu as their spiritual and ideological headquarters, the centres from which their different branches spread out to occupy their present locations.

The Igbo traditionally had no central organization. The systems of political organization were structured on the village. The King (Obi) was the head and the religious leader of the community. He was the symbol of unity. But he ruled in association with a council of state made up of chiefs and titled men.

The Igbo have always been an active and progressive people. In economic, cultural, social and political affairs, they had already attained an enviable standard before the advent of the British. The Igbo culture and identity is embellished in her religion.

Eucharistic Fellowship and Its Relevance in Igbo Land

The Igbo's according to Nwosu (2003 x 1 in Anukam 2015:80) refers to kola nut as Igbo sacramental communion which is restated by Rev. Fr. Ogbonna in Nwosu (2003). Thus they Igbo celebrate brotherhood, unity love, harmony using the kola nut as a symbol of communion”. This celebration of brotherhood, unity love and harmony is what Okorocho in Anukam 2015; 81 explains as “Oriko bu isi mmeko” Eating together, especially from one dish is the surest sign of trust, unity, love, harmony and group solidarity. That is how to show that we are of the same, blood and have absolute trust for each other”.

Adding his words, Charles F.P in Anukam: 81 says that eating and drinking together has the significance of a covenant meal which the two parties had fellowship and pledged their loyalty to each other.

Like the Christian sacrificial and sacramental Eucharistic fellowship, the Oriko (especially with the Kola nut) binds Igbo people together in a covenant, helping to build love, trust, unity, brotherhood and solidarity etc. In this Oriko, the most elderly or the most spiritual, handles the Kola and its elements, blesses it, before it is shared amongst the people. Among the people that partake in the eating, none is expected to harm the other. Oriko binds Igbo people together, it removes fear, it ensures good human relationship and conviviality among other things it does in Igbo community. It affects relationship and behavioural activities, principles and guardians of human relationship in Igbo land. It is widely consumed as a stimulant and hunger suppressant; hence Kola nut is widely used and celebrated in Igbo land.

Among the Igbo the aspects of communalism are celebrated with kola nut which is both a spiritual and symbol of unity. Not everyone is permitted to participate in the Oriko, as unqualified, and excommunicated or the socially stigmatized called “OFEKE” are not allowed to partake in the Oriko like the Hebrew whose condition of admittance into the Eucharist is “CIRCUMCISION”, in Igbo land the condition of admittance is Igba Oriko. Nwosu (2003:73 in Anukam 82) says that the person who blesses the Kola nut as presented clears his throat with the intention of alerting the ancestors that he is about to communicate to both the living and the dead. He makes supplication to God Almighty “CHUKWU” or “CHINEKE”, the ancestors and the guiding spirits of the land requesting for their protection in the day’s activities.

Due to the strong covenantal attachment to oriko “Eating together” the defaulter may die or suffer protracted deadly disease. This is in line with St. Paul’s assertion in I Cor. 11:29-30 “Anyone who eats and drinks without recognizing the body of the Lord eats and drinks judgment on himself. This is why many among you are sick and a number of you have fallen asleep”.

Though kola nut is used in every occasion both public and private, which will be like Jewish bread which is served at every gathering both public and private. It is wonderful to know that Eucharistic fellowship is fully practiced in Igbo land, and with parallel similarities with the Jewish/Christian pattern, one begins to wonder, why this is practiced extensively and with detailed instructions, warnings and benefits.^{hp}

The reasons for the importance and benefits of the Eucharist in Igbo land both for the Christians and traditionalist are not far-fetched.

Both the Igbo Eucharist fellowship with “kola nut” and the Christian Eucharist “Holy communion or last supper”, have both “I” vertical and “representations.

Vertically, Eucharistic fellowship is spiritual, sacramental and ritualistic. It relates man to his creator “God” or “CHUKWU”/“CHINEKE” as God is traditionally referred to in Igbo land. This is why at the Zenith of the vertical height is God and at the ground level is man who looks up to God, for protection, guidance, provision, life sustenance and after life as well as how to relate with fellow human beings on this

terrestrial world. On the horizontal level is where Eucharistic fellowship tends to relate man with his fellow man. At this level is where man mingles with his fellow man.

Conclusion and Recommendations

Notwithstanding the various views and ambiguities surrounding the origin of man and human relationship, the bible has been able to put all that to rest by giving us an elaborate insight into the issue. Furthermore, Eucharistic fellowship both in the Christian and traditional (igbo oriko) setting have provided us some varitable ways of curbing the problems human relationship

Eucharistic fellowship epitomizes some of the highest levels of love, as the meal or kola shared together emits a deep sense of love of God for humanity which he also expects man to share with his fellow man. It also depicts oneness or togetherness, as everyone sits down in one place with one aim or purpose in mind, which is among other things to share together that which revitalizes the spirit consciousness of man. It also serves as a re-union for human communal relationship.

Eucharistic fellowship brings about peace both in the church and in Igbo society. This is why in a disputed home or marriage when an elder is called to settle the dispute, the elder brings a kola nut, blesses it and breaks it for the disputed individuals to partake as a sign of settlement peace and reunion. It brings the rich and the poor, the haves and the have not together under one table thereby eliminating class and inequalities, breeds harmony; it gives a sense of belonging etc. It offers a forum or avenue for people to communicate and share their plights, prospects and progress together. These are some of the direct and immediate effects of the Eucharistic fellowship. On a wider scope, one will understand that Eucharistic fellowship, will serve as a tool to checking corruption, misappropriation of public funds, unemployment, laziness, marginalization, insecurity and other societal ills. And thus make for a good, harmonious and sustainable human development.

Finally, the Eucharistic fellowship, should not just be seen or fulfilled only as a religious ritual, and thus be made a ceremonial formality, but should rather be observed with its full horizontal implication as an integral element that fosters the deepest values and virtues that keeps and maintains the sanctity and sanity of the society, especially in Igbo land both with Christians and non-Christians alike.

Since the essence of both the Christian Eucharist and the Igbo oriko are the same, therefore the public who partake in this are advised to be careful to live out its lessons, essence and importance, which among other things include love, unity, harmony, hospitality, forgiveness, sacrifice, faith/trust in God and in fellow man etc. One should control the thoughts of his heart as good and bad emanates from it (james 4;1-8)

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The Impact of Taxation on Efficiency of Water Usage: Evidence from Karakalpakstan Region, Uzbekistan

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Abstract

In this article, we tried briefly to look through the issue from the point of objective necessity and importance of the efficient use of water resources in these conditions. In fact, as it is obvious from the mentioned data and opinions above, while the global economic and financial crisis is threatening the world, inefficient use of all resources, including water resources, might have negative impact on the attempts to overcome this crisis. Uzbekistan suffers from the problem of shortage of water resources more than other countries of the Central Asia and successful solution of the problem of efficient use of water resources has a particular importance. In order to find the impact of taxation on the usage of water resources we have collected the data for descriptive analyses and conducted the unstructured interview in Karakalpakstan region, Uzbekistan.

Keywords: Taxation, water resources, Aral Sea, water shortage

I. Introduction

Institutional condition of successful realization of reforms carried out in the state, achievements and preservations of economic stability the steady condition of public finances and first of all growth of tax revenues in budgets of all levels is important. Formations of the tax income of the state in many respects are defined by quality of tax planning. In the conditions of permanent reforming of tax system and a tax policy of the Russian Federation tax planning also develops and improved.

On one side, tax planning serves as an object of scientific research, representing a relatively new direction for Russian finance science and on the other side it represents an area of practical activity. Tax planning can and should be considered both from the perspective of the state and local government bodies represented by their authorized agencies and from the perspective of a certain economic entity, i.e. on macro- and micro-levels. In spite of positive movements they pay inadequate attention to theoretical and methodological aspects of tax planning in Russia. Therefore, it will be logical to begin with a more precise definition of tax planning and the criteria of its classification.

Taking into consideration geographic and economic location of the Republic of Uzbekistan, water resources play a significant role in the welfare of the people providing the development of the economy. As historical sources prove, the water has been valued in the territory of the country as a source for vitality and has been considered as one of the factors of carrying out household and economic activities. Therefore, the

water resources were used very carefully and always tried to be economized. Nowadays, it is impossible to imagine development of the economy of the country, especially, agriculture sector without proper water supply. Therefore, an effective utilization of water resources, in the first place implies their targeted and economical use and this has become very important in conditions of the market economy. It is connected with the fact that growing cotton and grain, which are considered the main part of agriculture and other agricultural products are directly connected with water resources. Taking all mentioned above into consideration we propose the following research question:

1. What is the impact of taxation on effective usage of water resources?
2. What are the main problems in implementation of efficient taxation for the usage of water resources?

II. Literature Review

There are a lot of theoretical and empirical studies which review the impact of taxation on effective usage of natural resources, particularly water resources, in the case of various developing countries. Hoque and Wichelns (2013) describe the observed variation in water tariffs, with the goal of highlighting key features and the degree to which some tariff programs achieve local objectives. To this end, the domestic and non-domestic water and wastewater tariffs in 60 cities across 43 countries were examined. The non-weighted average of the per unit domestic water and wastewater bills in the cities considered was USD 2.10/m³. The average per unit bills in Asia and Africa were generally lower than those in Western Europe, North America and Australia. On average, households spend about 1.5% of their monthly incomes on water and wastewater bills. In Asia and Africa, the average unit bills for the non-domestic sector were higher than those for the domestic sector, suggesting cross-subsidy. The study also analyzed the components of a metered tariff schedule with regard to the goals of cost recovery, demand management and affordability. The article also discusses the effectiveness of existing tariffs in addressing local challenges in the context of water pricing examples from Singapore, Los Angeles and Manila.

One of the influential studies on environmental taxation theory with special reference to developing countries and countries with economies in transition belongs to Bluffstone (2003). Central and Eastern Europe and the former Soviet Union and China have large-scale systems of pollution taxes and other countries are also experimenting with this type of instrument, particularly to reduce water pollution. Several countries have used taxes on environmentally harmful products, such as transport fuels, to raise revenues and reduce pollution. Challenges are associated with the use of environmental taxes in developing and transition countries, but the evidence suggests that despite shortcomings these instruments are making important contributions to environmental protection and economic efficiency.

Janmaat (2003) reviews salt and water transport external costs of irrigation are borne disproportionately by lower elevation farmers. The relationship between fields for an optimal Pigouvian tax plan varies considerably as the amount of available water changes, demonstrating that a simple rule cannot be relied upon. A numerical example demonstrates the optimal application pattern and Pigouvian tax plan in contrast to the sequential Nash equilibrium. Shadow values for water are used to argue that between distributaries,

the second best optimum is unlikely to be equal allocation. Physical measures of soil state are also shown to be worse under the optimal plan, throwing doubt on their usefulness.

In the case of China, Shen and Wu studied water pricing reform in China after 1980, including framework, process, forces and considerations. China collects a water resources fee, a water supply tariff for hydraulic engineering, an urban water supply tariff, a wastewater collection and treatment tariff, and a pollutant discharge fee. The reform has been an exploration process. In theory, a comprehensive, systematic and advanced policy and framework have been developed. However, in practice, the reforms fluctuate among economic, social and environmental targets; do not comply with the reform objectives; and are heavily affected by external social and economic factors rather than by internal factors.

Coeck, S'jegers and Verbeke (1995) empirically investigated the water and solid water levies in Flandes. Their paper aims to determine the actual effect of environmental taxes on pollution levels. In particular, a case study of Flemish environmental taxes on water and solid waste pollution is reported. A quantitative model for testing the actual effectiveness of environmental taxes is developed, based on similar studies that analysed Dutch environmental policy. The conclusions of this analysis are extended with a qualitative analysis of information provided by in-depth interviews. Data-driven empirical research of the Flemish situation does not.

To the best of my knowledge, there is only one study which analysis the water usage issues in case of Uzbekistan. In his most recent study, Zinzani (2015) discusses the logic of IMT implementation and the establishment of Water Users' Associations (WUAs) in Uzbekistan, specifically in Samarkand province. These dynamics have been analysed over the last 10 years showing different trajectories within Uzbekistan. Data were collected through extensive fieldwork in three districts in Samarkand province. The evidence acquired shows that, on the one hand, WUAs were established to be a new structure for state control over water and agriculture, in conflict with IMT rationale, and, on the other, that WUAs were created in the province as a result of a local initiative promoted by the hydraulic bureaucracy and accepted by the national authorities due to influential power relations.

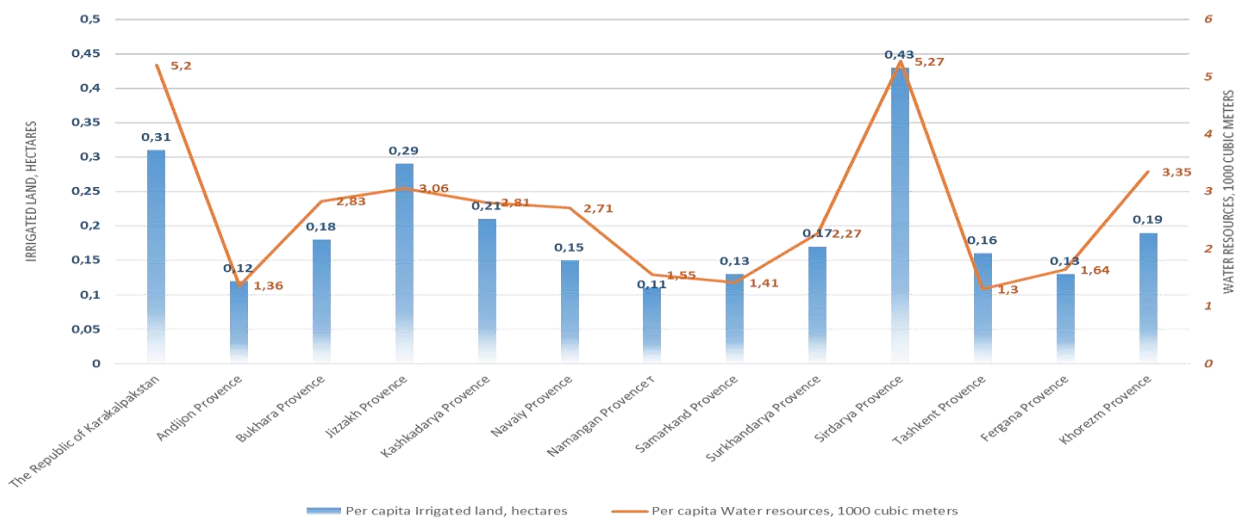
III. Methodology

We have collected data from the Tax Committee of the Republic of Uzbekistan and the Ministry of Agriculture and Water Resources to use it for the descriptive analyses. In order to have objective data from the field analyses and collect the primary data we have chosen Uzbekistan as a sample for our research, particularly we have targeted the data collection in Karakalpakstan region of Uzbekistan. Uzbekistan's agriculture has enough issues related to water shortage and there is a field for future researches. Beside of it, the economy of Uzbekistan is highly dependent on agriculture as the share of agriculture in GDP of the country is over 25 % for 2014, thus is this region is very suitable to use in our research.

We have used qualitative methods to analyse the research question. First, we have defined the biggest taxpayers in Uzbekistan and tried to define the share of tax amount related to the usage of water resources. We found that the amount of taxes paid by "big players" in agriculture industry is significantly low, which can cause the non-efficient usage of water resources and this assumption led us study closely the relationship between amount of taxes paid and the efficiency of the usage of water resources. In order to

have accurate research and valuable results we decided not to use quantitative methods for our analyses, which recently became popular among researchers, but have focused on qualitative research methods. Thus, we have conducted detailed unstructured interview among 21 respondents from Karakalpakstan region. This region is chosen because of high significance of related topic due to Aral Sea's continues problem on water shortage. Interview been conducted in face-to-face form, and control questions were allowed to use. None of interviews lasted more than 40 minutes. The shortest interview time was equal to 25 minutes. Questions were generated during the interview by the author based on the personal judgment and experience.

Figure 1: The degree of water availability of per capita irrigated land on administrative territories of the Republic of Uzbekistan ¹



IV. Main Results

On the basis of conducted research we have attained the following results and conclusions:

First, 70-80% of reserves of water resources of the states of the Central Asia are located in the mountain areas of Tajikistan, Kirgizstan and Kazakhstan. According to the calculations, only 8,0 million hectares of the area situated near the Aral sea has been irrigated recently. 126 billion cubic meters of water resources suitable for drinking and irrigation occur in this territory. If we can get about 25-30 hundredweights of harvest from 1 hectare so about 10 000 cubic meters of water resources will be needed for this purpose. These figures mean that agriculture and farming are done due to the big volumes of water resources spent. For example, in our country annually is used 60 billion cubic meters in average and among them about 50 billion cubic meters are used for irrigation. In average 11 – 12 thousand cubic meters are spent in each hectare of irrigated land.

Second, our country utilizes almost the half of the resources used in the countries of the Central Asia. The most part of these resources comes from the territory of neighbor countries. 85% of water resources utilized

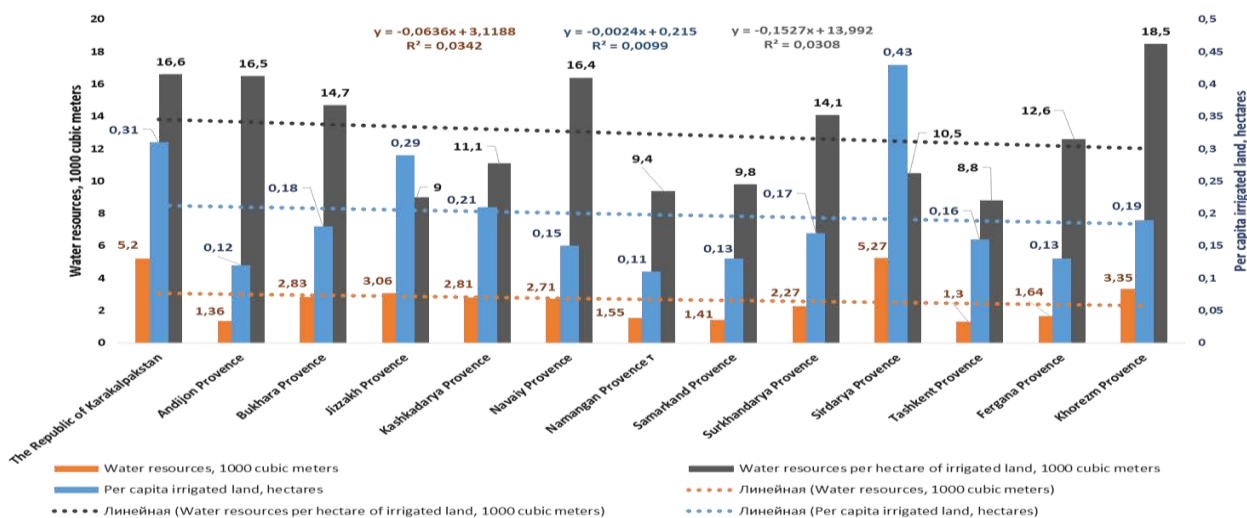
¹ Author's calculations based on information from the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan. www.agro.uz

in our country are used in our country. 98% of land allocated for farming and agriculture make irrigated land.

Third, an overall volume of water resources in the territory of our country in recent years does not exceed 8 – 10 billion cubic meters. It means that each hectare of irrigated land make approximately about 1000 cubic meters of water resources. If we take into consideration the fact that our republic is located in semi-prairie and prairie areas we can observe an obvious deficit of water resources in the territory of our republic.

Fourth, water resources existing in our country, are not equally distributed. The level of its distribution can be seen from the table 1 given in the next page. At the same time, unequal distribution of water resources by administrative areas of our country is more increased by its seasonal fluctuations. Therefore the balance of water resources and its seasonal distribution influence on the water supply of rivers.

Figure 2: The degree of water availability of irrigated land on administrative territories of the Republic of Uzbekistan



Unequal and unsuitable seasonal distribution of waters in rivers makes efficient use of water resources complicated and creates various problems in the agricultural balance.

Fifth, in order to reduce water scarcity and improve its security, despite the fact that, in our country within several years, several water reservoirs have been built (for example, Toktogul, Andijan, Charvak, Kayrakum, Chardarya, Nurek, Tuyamuyun, Talimardjan, etc.) and channels ("The Big Fergana", "The Big Andijan", "The Big Namangan," "South Mirzachul", "Parkent", "Tashkent", "Karshik highway", "Amu-Bukhara", "Karakum "etc.) and as a result it has made a worthy contribution in the ordered and efficient use of existing water resources in agriculture, energy, industry and other sectors of the national economy, we cannot say that the problem of effective use of water resources has been fully resolved;

Sixth, industry development, the transition intensity of agriculture and population growth have led to increase of the degree of consumption of water resources. Basing on calculations, in 1950 the total water intake in the Republic of Uzbekistan was 40 cubic km, while in 1960 this figure was 50 cubic km, in 1970 - 55 cubic km, in 1980 - 57 cubic km, in 1985 - 60 cubic km, and in 2002 - 56 cubic km. It shows that the

use of water resources over the past 50 years has increased by 1.5 times. According to experts, in the nearest future demand for water will grow further;

Seventh, the widespread construction of housing, creation of municipal and water-sports facilities in our country require a sharp increase in the capacity of water supply sources. Over recent years in our country more than 6% of all water resources have been consumed in the system of housing and communal services;

Eighth, in practice, water resources are mostly used in the industry. According to published data, to produce 1 ton of steel average of 350 cubic meters of water is consumed. In iron factories 800 cubic meters of water are used to produce 1 ton of product. The manufacture of 1 ton of silk requires 1,200 cubic meters and 1 ton of nylon fiber needs 2500 cubic meters of water resources. In general, almost $\frac{1}{4}$ of the acquired water resources are used in industry;

Ninth, water resources contain 90% of all plants and 75% of the weight of the animals. From 60 % up to 80% of the human body is water. If the human body loses 6% of water, the person loses consciousness, if the loss of water is more than 10% it leads to hallucinations; loss of 12% is fatal. If at the beginning of the twentieth century, the irrigated area was 40 million hectares, then in 1975 this number reached 135 million hectares, and in 2000, it went up to 420 million hectares. In our planet, there are more than 6.5 billion people. They should develop the industry and the processing of land. In agriculture and industry, the amount of water supply is not reducing, but it is increasing year by year. While in some European countries 150-160 liters of water is used per capita, 120-130 liters in Berlin, in other countries, including in our country, 500 liters of water are used every day. In Western countries, 1 cubic meter (1000 liters) of water costs 4.3 euros, in Russia 7-8 rubles, and in Uzbekistan, it is 140 soum² (UZS) 50 tiyin. Basing on current data, 1 euro is 2749 soum, 1 ruble is 41 soum³, and it shows that in Europe the cost of one cubic meter of water is expensive more than 57-78 times, and in Russia it is 2-3 times more expensive than in our country. In addition, the cost of water delivery from one reservoir to another is very high. Therefore, it is not economically efficient to deliver water to "far" distances. Thus, the project "Swapping Siberian Rivers to Central Asia" in Soviet Union was not implemented formerly. If the project had been fulfilled, it would reach only 3 cubic meters of each 10 cubic meters of water would have been transferred to its destination, and the water would cost more expensive than oil.

Tenth, and finally, according to some objective (in particular, the reduction of the Aral Sea basin, the case of natural drought) and subjective (the actions of states located in the upper areas of the rivers in Central Asia, in particular Tajikistan, for the construction of artificial reservoirs and hydropower plants in the headwaters of the particular rivers) causes, an increase in the possibility of water scarcity, at the same time, determines the need for and the importance of their effective use.

V. Conclusion

In conclusion we can say that in this article we have tried briefly to look through the issue from the point of objective necessity and importance of the efficient use of water resources in these conditions. In fact, as it is obvious from the mentioned data and opinions above, while the global economic and financial

² According to the Internet. Information for 2015. www.lex.uz/pages

³ cbu.uz/eng/main

crisis is threatening the world, inefficient use of all resources, including water resources, might have negative impact on the attempts to overcome this crisis. Uzbekistan suffers from the problem of shortage of water resources more than other countries of the Central Asia and successful solution of the problem of efficient use of water resources has a particular importance.

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Strategies and Approaches for Cultivating Normal-school Mathematics Students' Math Problem Solving Ability

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Abstract

Normal school students are the new force of the future teachers, and the quality cultivation of them directly determines the quality of teachers. As mathematics students' math problem solving ability (MPSA) declines after the entrance of normal college, a great negative impact on the formation of future teachers' quality is being exerted. On the basis of analyzing the present situation of normal-school mathematics students' MPSA, this paper discusses the significance, strategies and approaches for cultivating MPSA.

Keywords: normal-school mathematics students; math problem solving ability (MPSA); strategy; approach

From 2016 onwards, student who wants to obtain a teacher certificate has to participate in the national unified examination (referred to as "national exam") which has a considerably low pass rate. After gaining the teacher certification, however, if anyone want to take a teaching position, especially in public schools, he or she must participate in a unified public recruitment examination. This means that normal school students are no longer standing a leading edge in the education industry.

In addition to examining the educational concept, professional ethics and educational regulations that enable an applicant to engage in the teaching profession, the basic abilities such as scientific and cultural qualities, reading comprehension, language expression, logical reasoning and information processing, and the applicant's basic knowledge of education and teaching, student guidance and class management, it focuses on the applicant's basic knowledge of the expected teaching subject. Also during their working, their teaching quality is still the mostly inspected by the employer.

Therefore, in training normal students, more attention should be paid to the cultivation of core attainment and qualities for a teacher, including solving math problems. Mathematics, as the backbone subject of primary and secondary school teaching, is playing a vital role in the high-school and college entrance examinations. We can even say that the success or failure of math, to a large extent, will determine the result of the high-school and college entrance examinations. In normal school mathematics students' training process, one should put the development of MPSA in the most important position.

1. The connotation of mathematics normal students' MPSA

Teachers' qualities include reading comprehension, information gathering and feeling ability, oral expression, written expression, media expression and modal expression, general ability, teaching ability, professional ethics and behavior, general knowledge, subject knowledge and educational science

knowledge. The teaching ability includes the study and treatment of teaching materials, teaching design, classroom organization and management, classroom feedback and regulation, teaching measurement and evaluation and subject problem solving ability. For a math teacher, MPSA is by all means the core attainment. MPSA refers to the teacher's ability to solve and answer all kinds of math problems in the specific or crossed teaching boundaries.

For normal-school mathematics students, MPSA also includes solving a variety of primary and secondary school mathematics competition problems. Currently the officially or privately sponsored mathematical contests are mushrooming in different forms and scales. Although there are some controversies on these contests in the education field, it is very necessary for mathematics teachers to improve their ability and knowledge of solving math problems through studying mathematical competition problems and to deepen the depth of their understanding of mathematics subject.

2. Status quo: normal-school mathematics students' MPSA

The aim of normal schools, or teacher-cultivating colleges and universities, is to train primary and middle school teachers who will serve the elementary education in the future. Therefore, students in these schools are bearing the social responsibility and historical mission. The teaching ability and quality of normal school students as prospective teacher force in the future will largely affect and even determine the quality of basic education and training.

At present, the basic MPSA of normal-school mathematics students is not optimistic. In occasional tests of college or high-school entrance exams on students of the school that the author works for, their average score is around 80 (out of 150) only, which is very alarming. As the analyzing suggests, the main reasons for their declining MPSA are: (1) the emphasis is put on the teaching of theoretical knowledge in universities rather than in students' practical ability, causing the students to lack basic operational ability; (2) the advanced mathematics courses, such as ordinary differential equations, real variable functions and so on, are aloft from basic education courses, unable to adapt to the needs of basic education; (3) learning is a heavy duty for mathematics students who are really struggling in university courses; (4) students lack the proactivity in learning, reluctant in find time to study primary or high-school math problems; and (5) there is the absence of a certain height in math learning to establish a bond or bridge between the university mathematics and the primary and high-school mathematics.

In fact, a lot of normal-school mathematics students, in addition to tutoring as a part-time job, seldom will take the initiative to revisit the techniques on solving primary and secondary school problems ever since entering the university. Their good problem solving habits formed in the early high school period are slowly abandoned. At the end of their college year when they begin to realize the importance of MPSA during their internship, to start over is often less effective.

The cultivation of MPSA has gradually attracted attention of schools and students. At present, several normal schools have launched the Excellent Teachers Cultivation Program which aims to train a group of excellent teachers who are devoted to basic education with solid professional knowledge and strong teaching ability. More explicitly, four specific objectives have been put forward: acquiring good teaching and scientific research ability; acquiring good teaching material analysis and processing ability; acquiring

good MPSA and question setting ability; acquiring higher class management and control ability. At the same time, a four-year normal school student skill training frame is being implemented, and normal school students must complete their professional practice credits and practically gain the ability to apply the learned subject knowledge to solve problems after being trained on listening, hand writing, speaking, teaching, calculation and other basic skills, teaching techniques and microteaching.

3. Significance of cultivating mathematical normal school students' MPSA

3.1. MPSA is required for future teaching

Mathematician Polya pointed out that the primary task of secondary school teaching is to strengthen the training on MPSA. The value of MPSA lies in understanding the context of solution, and clarifying the reasons behind. In fact, problem solving practice can help to digest basic subject knowledge, optimize thinking quality, and strengthen the problem solving methods; moreover, it enables students to know better the taught material, form teaching ability and flexibly use teaching materials via the problem solving training.

3.2. MPSA is required for future scientific research

Math problem solving is an important content and part of research on mathematics teaching. Normal-school mathematics students should take advantage of the rich literature resources of university library, collect extensive data of problem solving, fully participate in problem solving practice, deeply analyze the process of problem solving and develop more research topics. They can also use the abundant peer resources to build problem solving research team, select appropriate research topics, and try preliminary teaching study. Such teaching research practices also greatly promote a normal-school student's qualities and core attainment as a teacher.

3.3. MPSA is needed for improving professional development

At present, all countries attach great importance to the professional development of teachers. From the perspectives of "professional consciousness, professional knowledge and professional competence" brought by the United States, and the perspectives of "professional commitment, professional knowledge and professional practice" by Australia, the professional development is expressed. Whatever ability is being developed, it is rooted and growing in a variety of practice. Normal-school mathematics students should harness various practice platforms, accumulate problem solving experience, master the thinking methods, and improve MPSA, through part-time job and primary and secondary school internships, through communication with classmates, and through a large number of problem solving training practices, so as to upgrade the qualities and core attainment as a teacher, and to provide power for achieving professional development.

4. Strategies for cultivating normal-school mathematics students' MPSA

4.1. Learn the theory. Lay emphasis on learning problem solving theory from *Elementary Algebra*, *Elementary Geometry*, *Elementary Number Theory*, *Competition Mathematics* and other courses. Learning problem solving theory is a systematic project; only with a certain problem solving theory as a guide can one stand at a higher level to see problem solving process, and only with it can one turn the process of MPSA training into efficient learning behavior, and achieve new upgrade in the process.

4.2. Analyze typical examples. Analyze and research problems in the high-school or college entrance exams as well as various international and domestic competitions, and choose the most representative problems to do in-depth study. With a specific problem as a clue, sort out a series of related problems, and gradually form a category. Through analysis on a variety of typical cases, probe into problem solving ideas, summarize problem solving rules, and then naturally generate solutions. With this methodology as a guide, classroom teaching and teaching research can be flourished with rich first-hand materials.

4.3. Reflect the process. Some say that "teaching is an art of pity". Again, no problem can be solved perfectly. After solving the problem, seriously reflect on the process of solving it, study the proposition intention, think over different solutions and optimize the problem solving strategy. Through the research on the old problems and the collection of the new, deepen the understanding of subject knowledge, comprehend the thinking pattern and promote the optimization of thinking structure and the sublimation of the quality of thinking, so as to improve the application of subject knowledge in problem solving.

4.4. Focus on problem explaining. Normal-school mathematics students should give the answers to mathematical problems through independent thinking and extensive reading of literature, improve the process of solution through team discussion, and turn MPSA internal force into mathematical literacy through the problem explaining. In problem explaining that is based on the education theory and problem solving theory, a teacher faces his peer and expresses generally how a specific problem is solved. Problem explaining is a very critical means to improve MPSA of mathematics students. What to explain? The significance and meaning of the problem, the way and seeking of thinking, the induction and comparison, the expanding and promotion, how to reach the goal, the educational value, etc. What to discuss? The applicability and solution of the problem, the student's understanding of the subject, the value of improving the student's learning effect and so on. Simply put, Problem explaining settles on talking about the problem, the thinking way, the thought, the promotion, the value, etc.

5. Approaches for normal-school mathematics students to improve MPSA

The cultivation of MPSA is of great significance to the formation of teacher quality of normal-school mathematics students, and thus more attention should be paid to methods and strategies of the cultivation. Cultivating of MPSA should be different from the simple problem solving in secondary school which only focuses on getting the answer, chooses only their familiar part to solve and therefore ignores strange

areas. The normal-school mathematics students should pay more attention to understanding the problem accurately, using the appropriate solution proficiently, and integrating the comprehensive subject knowledge so as to promote the in-depth study on the curriculum standards and the syllabus, in order to actually raise their teacher quality and core attainment via MPSA.

Normal-school mathematics students should make full use of college time, and link the basic subject knowledge, basic ideas and basic methods into a network by answering and researching the questions on teaching materials. Through the study on original problem types in high-school or college entrance examinations and various model tests, continue to accumulate new knowledge and new methods, and grow with the time in the practice of solving problems. Through the study of related competition problems, they will be familiar with those novel, simply expressed and solution-cleverly-set good exam questions, and train their thinking agility, depth and creativity. Through accumulating and sorting out good questions, prepare for the future classroom teaching and after-school counseling preparation, and collect more valuable materials for problem solving research, teaching research and teaching reform.

As to the specific methods to improve MPSA, firstly, normal-school mathematics students can seize spare time and practice on solving random questions at any time anywhere. Such random problem solving training mainly cultivates normal-school students' MPSA, which is flexible, easy to operate, and easy to link, deform, expand and promote the questions. Secondly, they should also squeeze a block of time for time-limited training. Time-limited training is mainly to help developing good problem solving habits. Choose questions from the college or high-school entrance examinations, good questions from model tests as well as middle to high class questions in math competitions, reduce the problem solving time, and then start the time-limited exercise to train the problem solving thinking and cultivate thinking ability.

6. Conclusion

It is suggested that, in the process of cultivating normal-school mathematics students, normal schools can adjust the traditional mode of cultivation by combining the requirements of "National Exam" (teachers' qualification certificate exam), focus more on training students' comprehensive practical ability, including problem solving and teaching, to form and optimize the four-year system of practical ability cultivating model. In practice, we should strengthen the training of listening, speaking, reading, writing and problem solving, so that they can be familiar with educational theory and laws and regulations, and constantly improve their class lecturing, teaching method explaining, problem solving and explaining levels, so that students can be handy in the Q&A session after obtain a certificate in the written test.

With respect to the math MPSA, better MPSA would not only help normal-school math students to pass the teacher certification examination, but also empower them to face the employment market with self-confidence. After entering the primary school or the secondary school, they can easily deal with classroom teaching and student guidance, become skilled in education, teaching and class management soon, finish the internship quickly, and grow into outstanding young teachers and backbone teachers promptly.

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Attitudes towards Error Correction, Corrective Moves and Their Effects in College English Classrooms in China

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Abstract

This study explored the relationships among teachers' and students' attitudes toward error correction, teachers' actual corrective moves and their effects in college English classrooms in China. The major findings are as follows. Firstly, comparatively speaking, teachers are more negative toward errors and error correction than students. Secondly, Teachers and students have different views of how errors should be corrected. Finally, negotiation of form, favored by both teachers and students, has the best effects among all error correction types; explicit correction, welcomed by students but disliked by teachers, is less effective than negotiation of form but more effective than recast, which is favored by teachers but distasted by students.

Key words: Attitude; Error Correction; Effect; College English Classroom

1. Introduction

There are two opposing views of how students' errors should be treated in the EFL classroom. One is that errors are inappropriate language forms due to lack of language competence, so they are undesirable. As Brook (1960: 58) said, "like sins, errors should be avoided and their impact should be eliminated". Another view is that errors can show the psychological process of language learning, so they are not completely insignificant (Ellis 2000: 47). As Chastain (1971: 249) said, "it's more important to create an atmosphere for students to speak than requiring them not to make errors when speaking". With the deepening of our understanding of learner errors, a common view has gradually been formed: errors are inevitable in the process of language learning, and they are useful and even necessary under certain circumstances (Shi and Liu 2008: 29). Although errors are inevitable in the process of language acquisition, it is still a double-edge sword for language learning. Hu (2002) pointed out, "from a developmental perspective, a learner, whose language is accurate but not fluent, will gradually become fluent if given more opportunities to communicate with English speakers. However, a learner, whose language seems to be fluent but is full of errors, is difficult to become a competent English speaker, because he/she has formed a bad habit of mistaking errors for correct forms and has fossilized some wrong expressions." Based on the above understanding, scholars and language teachers have paid much attention to errors and have studied them from different perspectives.

2. Relevant Studies

The results of investigations on attitude toward errors are consistent with the above understanding. Chenoweth et al. (1983: 79) found that ESL students generally hold a positive attitude toward errors, and they even hope teachers correct more of their errors. Qiu (1997: 44) also found that Chinese EFL learners hope that teachers correct their errors completely instead of selectively.

What is the effect of error correction on learner's language acquisition? This question has also attracted much attention. Carroll and Swain (1993) and Dekeyser (1993) examined the effect of error correction on learner's language acquisition, resulting in different conclusions. Lyster (2000) discerned the following types of error correction: Explicit Correction: teacher supplies the correct form and clearly indicates that what the student has said was incorrect; Recast: teacher implicitly reformulates all or part of student's utterance; Negotiation of Form, which includes elicitation, metalinguistic clues, clarification requests, and repetition.

Recently, recast and its influence on learner's language development have been hotly studied. Han (2002) and Leeman (2003) found that recast significantly facilitates learner's language learning performance. Lyster and Ranta (1997) and Lyster (2000) found that recast is not very effective in eliciting learner's self repair. Zhao and Wang (2016) explored the impact of recasts on the production of English questions and found that recasts bring more benefit to low-level and intermediate-level learners than to the high-level group. Uptake (i.e., students' immediate response toward teachers' error correction) is also hotly studied in recent years. Ellis (2001) found that the form of teacher-student interaction affects the quantity and quality of learner uptake. Panova and Lyster (2002) found that teachers obviously favor such error correction types as recast and translation, etc., but the resulting student uptake and repair rates are very low. Wei (2015) found that recast doesn't lead to students' high uptake and repair rates.

The above studies explored error correction in foreign language teaching from different perspectives. However, so far, no empirical research has been conducted on the relations among teachers' attitude, learners' attitude, teachers' actual corrective moves and their effects in College English Classrooms in China. The present study is a preliminary attempt in this regard.

This study tries to find answers to the following questions: 1). What are the similarities and differences of teachers' and students' attitudes toward errors and error correction in College English classroom teaching? 2). What are the similarities and differences of teachers' attitudes toward error correction and their real error correction moves? 3). What is the result when teachers' and students have different attitudes toward error correction?

3. Research Description

3.1 Participants

Six English teachers and 240 students at Nanjing Normal University and Nanjing Xiaozhuang University participated in the research. Nanjing Normal University is a key (211 Project) university, while Nanjing Xiaozhuang University is not. The six English teachers are non-native English speakers but all have over three years' teaching experience. The students are all freshmen and sophomores. The classes range from 35 to 55 students.

3.2 Data Collection

Firstly, the researcher administered the questionnaire survey on the students and teachers. Then, the researcher observed and audio-recorded 18 classes of the six teachers (three classes each teacher), resulting in 15.2 hours of audio-recordings. The researcher then interviewed each teacher immediately

after their classes. Finally, the researcher transcribed the audio-recordings into written documents for further analysis.

3.3 Conceptual Framework

This study employs the conceptual framework the author used in his previous study of teacher correction and learner uptake in Chinese junior middle school English classrooms (Shi 2005). According to the framework, there are three major types of learner errors: grammar, pronunciation, and lexical; three major types of error correction: explicit correction, recast, and negotiation of form; two major types of uptake: repair and needs-repair. Repair is further divided into: repetition, incorporation, self-repair and peer-repair, while needs-repair is composed of acknowledgement, different error, same error, hesitation, off-target, and partial repair.

4. Research Findings

4.1 Comparison of Teachers' and Students' attitudes towards Errors and Error Correction

Hendrickson (1978) attempts to find out the answers of the five questions:

1. Should students' errors be corrected?
2. When to correct students' errors?
3. What students' errors should be corrected?
4. How to correct students' errors?
5. Who should correct students' errors?

The questionnaire used in this study to investigate teachers' and students' attitudes toward error correction is based on the above questions. Because the teachers either correct students' errors immediately or don't correct at all, the questionnaire does not involve "Question 2: When to correct students' errors?", but includes a part of "general understandings of errors". The questionnaire is composed of 19 close-ended (multiple choice) questions and one open-ended question. The multiple choice questions use the five-response Likert scale (1-5), indicating totally agree (5), agree (4), neither agree nor disagree (3), disagree (2), and totally disagree (1). The data were analyzed with SPSS22, displaying statistics such as the Mean (hereinafter referred to as M) and the Standard Deviation (hereinafter referred to as S. D.)

Part One (Questions 1-4) involves the general understandings of errors. The statistical results show that: teachers and students generally think that errors are not terrible; they are even helpful for language acquisition. Part Two (Questions 5-7) investigates the question "Should students' errors be corrected?" The findings indicate that teachers and students generally think that errors should be corrected. There is some difference in the answers to Question 7 "Teachers' constant correction of students' errors will discourage students' endeavor to use English". The M of the teachers is 4.3 and that of the students is 2.9. The S. D. of the teachers is 0.62 and that of the students is 0.88. This shows that compared to teachers, the students generally hold a more positive attitude toward error correction.

Part Three (Questions 8-10) is about "What students' errors should be corrected?" The results show that: teachers and students all think that grammar, lexical and pronunciation errors should be corrected. Pronunciation errors should be given top priority (Teachers' M is 4.33; Students' M is 4.3), followed by grammar errors (Teachers' M is 3.67; Students' M is 4.03) and finally lexical errors (Teachers' M is 3.67;

Students' M is 3.98)

Part Four (Questions 11-13) deals with "Who should correct students' errors?" The statistical results indicate that: teachers and students generally think that grammar and lexical errors should be corrected by teachers. 70% of students and 53% of teachers think that lexical errors should be corrected by the students themselves. It is worth noting that most students don't like peer correction. The possible reason may be that due to certain affective features, the students would like to study independently. Thus, certain protection mechanism is developed among the students and peer correction tends to be ineffective (Qiu 1997:44).

Part Five (Questions 14-19) involves "How to correct students' errors?" The result of Question 14 (Explicit Correction) is as follows: Teachers: M=2.63, S. D. =0.65; Students: M=4.16, S. D. =0.8. This shows that the teachers generally disapprove this type of error correct, while the students generally hope that their teachers correct their errors explicitly. The result of Question 15 (Recast) is as follows: Teachers: M=4.0, S. D. =0.85; Students: M=2.65, S. D. =0.98. This shows that the teachers generally approve recast as a type of error correction, while the students generally don't like the teachers recast their errors. Questions 16, 17, 18, 19 are about negotiation of form, the teachers' M is 3.53 while the students' M is 3.62, showing that both teachers and students generally identify with this type of error correction. The above statistics show that the teachers like recast most, followed by negotiation of form, but don't like explicit correction. In comparison, the students like explicit correction most, followed by negotiation of form, but don't like recast.

4.2 Relations among Teachers' Attitude, Corrective Moves and their Effects

This section mainly involves Part Three and Part Five in the questionnaire. Statistics in Section 4.1 show that teachers think that the errors they should correct most are pronunciation errors, followed by grammar errors, and finally lexical errors. This does not completely accord with their actual corrective moves. In classroom teaching, the correction rates of the three types of errors are: lexical errors: 91%; pronunciation errors: 84%; grammar errors 76%. The above comparison shows that: although the teachers think that they should give top priority to pronunciation errors, in actual teaching, they correct lexical errors with the highest rate. When asked about the reason for the difference, some teachers said in the interviews after class that, although they know pronunciation errors should be corrected whenever possible, due to the tight schedule and limited time in class, and the time-consuming repeating and rereading by the students after the correction, in many situations, pronunciation errors cannot be unhurriedly corrected. However, comparatively speaking, lexical errors can be conveniently corrected without affecting the teaching schedule. The teachers can provide the suitable words directly and proceed with the teaching, without detailed explanation like when correcting grammar errors, and without requiring the students to repeat and reread the words like when correcting pronunciation errors. Lou et al. (2005: 271) also found that due to the influence of a variety of factors, there is a disconnect between (college) English teachers' belief and actual classroom teaching.

The repair rates of the three types of errors after correction are as follows: pronunciation errors: 78%, lexical errors: 62%, and grammar errors: 43%. The above statistics show that pronunciation errors, which the teachers think should be corrected whenever possible, do not have the highest correction rate in actual teaching, but have the highest repair rate. Lexical errors, with the highest correction rate in actual

teaching, have a much lower repair rate than that of pronunciation errors. The possible reason for the highest repair rate of pronunciation errors may be: 1) as a lingua franca of today's world, the importance of English has been commonly recognized by the people. A good mastery of English has even become a necessary part of people's life and work. English learners are required to not only be good at writing, but also be able to speak English correctly and fluently. In order to improve oral English, learners must correct their pronunciation errors; 2) Listening takes a large proportion in all the influential English tests such as IELTS, BEC, TOEFL, GRE, etc. English learners are aware that if they cannot master the standard pronunciation, it will be very difficult for them to improve their listening competence and performance (Qiu 1997: 45).

The statistics of Part Five (How to correct students' errors?) show that the teachers' think that their favorite error correction type is recast, followed by negotiation of form, but they don't like explicit correction. This is consistent with their actual error correction in class. Table 1 shows the numbers of correction of the three types of errors in the classroom: Generally speaking, recast is the most frequently used (106 times, 49%), followed by negotiation of form (87 times, 40%), while explicit correction is the least frequently used (22 times, 11%).

Table 1 Three types of error correction in relation to three types of errors

	Grammar Error	Lexical Error	Pronunciation Error
Recast 106 (49%)	60 (5 6 %)	24 (3 9 %)	22 (4 8 %)
Negotiation of form 87 (40%)	43 (3 9 %)	29 (4 8 %)	15 (3 2 %)
Explicit Correction 22 (11%)	5 (5 %)	8 (1 3 %)	9 (2 0 %)

We conducted ANOVA (Analysis of Variance) on the differences between different types of errors and error corrections and their mutual influence. Because the number of explicit correction is very small, it was excluded in the analysis. The results indicate: there is significant difference between the two types of error correction: $\chi^2(1, 193) = 265.68, p < .001$; there is also significant difference between the three types of errors: $\chi^2(2, 193) = 388.58, p < .001$. The mutual influence of error correction types and error types is not significant: $\chi^2(3, 193) = 2.75, p = .252$. (also See Shi and Liu 2008: 31)

4.3 The Effects of Error Corrections Favored by Teachers and Students

This section mainly involves Part Five (How should errors be corrected?) As indicated above, the teachers and students mainly differ in their attitudes toward explicit correction and recast. The teachers generally have negative attitude toward explicit correction, while the students generally hope their teachers correct their errors explicitly. The attitudes toward recast are just the opposite. The teachers generally favor this type of error correction, while the students generally don't want teachers to recast their errors. As for negotiation of form, teachers and students have the same attitude; they generally accept this type of error correction.

Then, what are the effects of the three types of error correction? Table 2 shows the uptake (including repair and needs-repair) rates of the three types of error correction.

Table 2 Numbers and percentages of uptakes and non-uptakes

Correction Type	Attitude		Correction Effect		
	Teachers	Students	Repair	Needs-Repair	Non-Uptake
Explicit Correction (22)	—	+	12(55%)	3(14%)	7(31%)
Recast (106)	+	—	37(35%)	22(21%)	47(44%)
Negotiation of form (87)	+	+	71(82%)	15(17%)	1(1%)

Note: In the “Attitude” column, ‘+’ indicates positive attitude, ‘—’ indicates negative attitude

Table 2 shows that recast, which is the most popular among the teachers but the most disfavored by the students, has the lowest uptake and repair rates (56% and 35%, respectively). On the contrary, explicit correction, which is the most popular among the students but the most disfavored by the teachers, has much higher uptake and repair rates (69% and 55%, respectively). While, negotiation of form, approved by both teachers and students, has the highest uptake and repair rates (99% and 82%, respectively).

5. Discussion

The reasons for the lowest uptake (including repair) rate of recast are as follows: First, the degree of explicitness of recast is not high. When the teachers recast the students’ errors, they usually implicitly correct the whole or parts of the students’ erroneous utterances, which is similar in form to non-corrective repetitions they use after students’ correct utterances. Recast shares with non-corrective repetitions some common conversational functions, and thus, its original corrective function is, to some degree, ignored by the students. Secondly, the corrective potential of recast is further weakened by all kinds of approving discourses used by teachers to respond to students’ utterances (correct or not) (Lyster 2000: 187-188). Zhu et al. (2005: 176) also found that the students’ perception of the explicitness of the feedback significantly influences the rates of error recognition and correction. Thirdly, recast, as a type error correction, is ambiguous. In classroom teaching, teachers frequently use recast to correct students’ errors. Its inherent implicitness may lead to ambiguity. Chaudron (1988) considered this ambiguity one of the most serious problems of corrective feedback: teachers’ feedback on students’ utterances has several functions, which can be both positive and corrective (e.g., approval, appreciation, and correction, etc.). This has brought about a problem on the part of the students: error correction may be ignored or is just regarded as a type of feedback. Especially, when the teachers recast students’ grammar or lexical errors, the students may regard the recast as other possible forms of feedback (Shi 2005: 247). Finally, the students generally don’t like their teachers recast their errors. Therefore, they are likely to raise their affective filter against teachers’ recast (input). In this case, although they can understand what the teachers say, they would not intake the language point readily (Krashen 1982:31).

The uptake rate of explicit correction is higher than that of recast, which is understandable. First, explicit correction doesn’t have the major weaknesses of recast, i.e., implicitness and ambiguity. Explicit correction means that teachers explicitly show that the students’ utterances are wrong and provide the correct forms. Its corrective function is self-evident and is impossible to be confused with any non-corrective feedback, so it does not have ambiguity. As was pointed out by Lyster (2000: 191), explicit correction has the highest explicitness among the three types of error correction: explicit correction, negotiation of form and recast. Secondly, because the students like explicit correction most, so they tend to accept it affectively and more cooperatively. Finally, because teachers seldom use this type of

error correction, so it tends to be more salient. When the students have attention fatigue towards the implicit and ambiguous recast, teachers' explicit correction is easy to be positively responded by the students.

Negotiation of form, which is favored by both the teachers and students, has the highest uptake and repair rates. The reasons are as follows: negotiation of form can provide the students opportunities to establish some important form-function associations in the target language, without interrupting the communication. In other words, when the teachers use negotiation of form to correct errors, they, on the one hand, give the "discourse right" to the students, and on the other hand, prompt the students to retrieve their own language reserves, which renders negotiation of form bi-directional. Thus, negotiation of form benefits second language acquisition at least in the following two aspects: 1) providing students opportunities to program their internalized declarative knowledge of the target language; 2) allowing the students to reanalyze and repair their language output which does not conform to the target language when they test their new hypothesis about the target language. This will make the students pay attention to the language form in the communicative interaction (Shi and Liu 2008: 32).

6. Conclusions

The following conclusions can be drawn from the research findings. Firstly, comparatively speaking, the students are more positive toward errors and error correction than the teachers. They think that even if they make errors frequently, they won't lose confidence in learning, and even if the teachers correct their errors repeatedly, this won't discourage them from using English. The teachers' view is just the opposite. Secondly, teachers and students have different views of how errors should be corrected. The teachers generally don't like explicit correction, while the students generally hope their teachers correct their errors explicitly. The teachers generally favor recast, which, however, is disliked by the students. This disagreement, to some extent, influences the success of teaching. Finally, the effect of error correction shows such a trend: the error correction type favored by both the teachers and the students (negotiation of form) is the most effective (having the highest uptake and repair rates); the error correction type liked by the students but disliked by the teachers (explicit correction) has the median effect; the error correction type approved by the teachers but disapproved by the students (recast) is the least effective.

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‘Constructive reflection’

Getting the best out of reflective learning

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Abstract

This paper proposes a constructive reflective model that offers learners a layered and developmental approach to embed learning and the application of learning within the seemingly constantly changing professional environment. The model is different from other popular reflective practice frameworks because it embraces the influences of personal epistemology of assumptions and consciousness and recognises how our identity, values, opinion and experiences impacts on the way we react or behave in particular situations. It recognises the need to facilitate the reconceptualization of knowledge and learning by questioning, evaluating and critique of knowledge to draw higher levels of cognitive and moral development, whilst it aims to explicitly raise awareness of the necessary competent knowable, skills and attributes for professional practice through its constructive and methodological process. This leads to a holistic and effective professional learning process (Moon, 1999)

Keywords: Reflective practice, Constructive reflection, Epistemology, Consciousness, Identity and values, Professionalism, Knowledge trajectory, Contextual learning, Professional development

Introduction

This paper seeks to create a structured and constructive reflection model as a guide for learners to undertake reflective learning. The model is different from other popular frameworks for reflective practice because it embraces personal epistemological influences in the learning process and guides the questioning, evaluation and critique of an experience to facilitate a higher level of a learner's cognitive and moral development, whilst explicitly raising awareness of the necessary learnable skills and attributes for competent professional practice through its structured, guided and methodological process. It is intended that by following the structured reflective process, a learner will have the opportunity to become reflexive, to question and challenge their ways of practice and implement and evaluate initiatives to effect change.

The design of this framework stems from a number of motivations. My own experience of reflection as part of my training as an academic started off as being descriptive; focusing on what I have done, what I should have done, identifying the gaps and action planning. Based upon the literature I read, I could see the true potential of reflecting and this newly-found awareness made me realise that I wasn't analysing my own thought processes or actions on a sufficiently deep level to be able to improve my level of competency and practice in present and future situations. I realised that by deepening my level of analysis

and thought I would be able to question and critique my current thinking, become more aware of assumptions and preconceptions and gain the confidence needed to take on new approaches to practice (Vygotsky & Vygotsky 1980). I began to create a checklist to help me question deeply and explore my thoughts more analytically. The items for reflecting on the checklist evolved after each reflective experience and overtime I settled with seven key features for effective reflection.

Another key motivating factor is the strong impetus within legal education to embed reflection into the law curriculum as a learning and assessment tool (Stuckey et.al, 2007). The 2013 Legal Education and Training Review in England and Wales requires that law programmes provide opportunities for student reflection (LETR, 2013). Prior to this, the Carnegie Foundation's Educating Lawyers in the US in 2007 called for a more integrated law school curriculum that would combine both formal knowledge and the experience of practice by building practical skills and reflecting on professional responsibility as missing pieces of legal education (Carnegie Foundation, 2007). Furthermore, the Solicitors Regulation Authority's (SRA) Competence Statement of 2015 defines the standard of service to clients in England and Wales and within this is an expectation for practicing and trainee solicitors to consider their strengths and weaknesses and determine their professional development needs.

I have successfully integrated reflective learning practices into the law curriculum at the University of Cumbria. This was achieved through a number of modules and in particular in the new Virtual Law Clinic (VLC), a practice simulation tool to enable law learners to gain experience of real-world law transactions and a realistic view of the emerging trends in the legal profession (Thanaraj & Sales, 2015). The VLC allows learners to build a working relationship with a client, exercise their problem solving abilities and establish an acceptable level of professionalism. Aside from this, learners gain an understanding of appropriate data handling and security practices and experience of web-based practice management applications.

At the end of a lawyering transaction, the intended learning outcomes of the VLC curriculum and experience gained from working on the VLC are conceptualised into learning by way of reflection (Boud, 2000; Fook, 1999b, 2004d). Learners are expected to reflect in detail on their performance in the context of professional development of the skills, knowledge and attributes of a modern and digitally competent lawyer and show an understanding and appreciation of a range of ethical considerations relevant to legal practice (Moon, 1999; JISC, 2011; Barry, Camp, Johnson & Klein, 2012). The reflection takes place after key milestones, for example, after a fact-finding interview, after an advice interview, after an out of court settlement, after the completion of a case. Learners are also expected to provide well-informed and well-researched reasons for making particular choices or decisions and identify areas for improvement where a gap is identified in their level of competency.

However, there were a number of challenges with the reflection process. When the word 'reflection' is mentioned, there is an assumption of what it is – exploring or thinking and writing about something

which has been undertaken. This assumption can lead to describing an event or task in an unreflective or superficial manner (Bengtsson 1995; Bleakley 1999). Furthermore, despite consulting the theoretical frameworks there is little clarity on the cognitive and philosophical methods and attitudes of reflection (Van Rossum & Hamer (2010) so as to pinpoint the key factors which draw out deep consciousness to rationalise an activity undertaken. From my review, there is also little literature which works out a structured and meaningful method of carrying out reflection.

From my own experience of growing as a reflective practitioner in academia and from assessing varying quality of reflections, I created what I call a 'constructive reflection' model – this is where the reflection process is undertaken in a structured and layered manner – a step by step method which builds from descriptive based knowledge to a higher cognitive development to learn, improve and develop professionally. As such, this paper shares the constructive reflective model and the framework and intended learning around the model. The model utilizes the influence of epistemology and the theory of cognition in reflective practice. The premise of my work to date suggests that any initiatives which are embedded into curriculum, whatever the drive for enhanced student learning and academic experience, none of these would materialise and meet the desired outcome without the space and structure created for learners' to undertake timely and constructive reflection.

A missing dimension in reflection: The influence of personal epistemology in reflective learning and evaluation

Reflective practice is seen as the cornerstone to effective professional learning because of its potential to promote the development of autonomous, self-directed, and responsible professionals (Hofer, 2000, 2004a). I would submit that it also has the potential of creating a responsible citizen with self-awareness for improvement, creativity and dedication to the wider society. Utilizing the paradigm of constructivism (Piaget 1990, 1994) to successful learning, it is acknowledged that new knowledge and meaning is created from a learner's experience in an actual professional workplace or through active and immersive-designed learning activities. Within this experience, by creating space and opportunity for learners to assess, explore and evaluate their own learning, the reflective learning process helps a learner to bridge their understanding between theory and practice, challenge the concepts and theories, develop new skills, new attitudes and new ways of thinking through reconceptualising knowledge and renewing their identity and values (Finlay and Gough, 2003).

Education literature dating back to the early twentieth century discusses the benefits of reflective learning. First instigated by Dewey (1933), his constructivist interpretation of reflective learning is an '*...the active, persistent and careful consideration of any belief or supposed form of knowledge...*' (p.118). In order to reach the full learning benefits of reflection, Dewey's interpretation requires the reflection process to be undertaken continuously (p.39), methodologically and rigorously to make new meaning (p.74). Accordingly, he advocates that if undertaken well, reflective learning allows the learner to build their knowledge each time they move from one experience to another, such as with a higher order

of learning, deeper understanding of each experience and its connections to other experiences and ideas (p.119) and the possibility of personal, moral, emotional and intellectual awareness and growth (p.99).

Another helpful interpretation of reflection was from Boyd and Fales (1983) who explained that reflective learning is the '*...process of internally examining and exploring...which creates and clarifies meaning... results in a changed conceptual perspective*' (p.100). Interestingly, this interpretation focuses on the process of cognitive and experiential examination, questioning and rethinking of the dominant, taken-for-granted epistemological assumptions of knowledge (Fook, White and Gardner, 2006). The intended outcome of this process is a conscious renewed meaning and reconstructed knowledge which can be applied to new experiences.

Building upon Dewey's (1933) constructivist interpretation and Boyd and Fales' (1983) internalization to challenge meaning, Schön's (1983, 1987, 1991) leading literature specific to the context of improving professional learning created a method in which learning can take place in action and on action. He explains that reflection is a methodology of learning which involves a continuous iterative '*dialogue of thinking and doing through which I become . . . more skilful*' (p.31). He explains that through this dialogic process, a learner has the opportunity to review past experiences whilst consciously evaluating the way in which one's practices, conduct, personal epistemology, assumptions, and values, actions, and responses had impacted the experience. It also allows consideration for other ways of doing things differently, building understanding of existing theory and being able to customize its use in different professional settings. Schön's (1991) explains that the awareness gained from the dialogue and conscious evaluation, can lead to improvement to performance and a higher level of understanding.

This deeply internalized process of reflection has the potential to draw out an 'attitudinal shift' (Brookfield, 2000) through the transformation or reaffirmation of one's beliefs, attitudes, opinion, and emotional and epistemic reactions, in turn creating new meaning and knowledge. The new knowledge can be assimilated into tacit knowledge and previous experiences, developing new outlooks, rethinking what were once misunderstandings, and evaluating what is important, ultimately altering one's perceptions. On the other hand, the new meaning may help to reframe and transform existing knowledge and interpretation (Hofer & Pintrich, 1997).

2.1 Epistemological influences in reflection

A person's epistemology determines their approach to learning and development. Individual epistemology encompasses the values, assumptions and preconceived notions a person may possess about knowledge and the means upon which it is acquired (Brownlee, Petriwsky, Thorpe, Stacey & Gibson (2011). As such, some awareness of defining personal epistemology is helpful especially in understanding the how it could influence one's learning practices, professional practice and more importantly one's decision making thought processes. In order to develop a reflective learning model which can be designed to bring out many of the potential benefits of reflection, as proposed in this paper, it is helpful allow a learner's

epistemic stance to be explored, allowing a learner to become conscious about how their perceptions, assumptions and values may influence their reasoning, actions, responses and decision making skills (Hofer & Pintrich, 1997; Brownlee, Petriwsky, Thorpe, Stacey & Gibson (2011).

Reflective learning which has been designed to raise awareness and consciousness of one's epistemic stance can help to reconceptualise the learning process. Within the context of professional learning, these developments together with an established or renewed epistemic stance may influence how a learners' thinking processes, moral reasoning, professional judgement skills, taking a holistic view and being open to new perspectives (Fook, 2000, 2004a; Mezirow and associates, 2000).

The works of Perry (1970), King and Kitchener (1994) and Hatton and Smith (1995) are helpful in illustrating the learning trajectory which learners go through in developing the ability to critically think, evaluate and reflect.

Perry's (1970) longitude study took place in Harvard University for a period of four years in which he investigated how learners learn using interview techniques. In particular, his focus was on the progress and development of their learning and how the relationship between the student and how they acquire and retain knowledge. The study found that at the start of their course learners adhered to knowledge from their tutors and their research materials as absolute. Learners also held beliefs of certainty of knowledge which was either deemed to be correct or incorrect in a given situation. Half way into their studies, there was a shift in the way learners viewed knowledge.

Being able to hold views from multiple perspectives enabled learners to become aware of and understand conflicting views in different contexts. However, it was also evident that learners still believed that there is a specific correct piece of knowledge for a given situation. As the learners approached the completion of their studies, there was evidence of relativism to knowledge. Learners had the ability to use universal principles to weigh competing interests, making and evaluating flexibly held beliefs and values whilst exercising abstract thinking using reason and enquiry.

Similarly, Vermetten, Vermunt, & Lodewijks' longitude study (1999) with a broad spectrum of learners from social science, economics, law and arts learners in a Dutch university found early on during a study programme learners undertake surface learning. This changes to deep learning as learners' progress through their course of study. The authors argue that the epistemic stance of learners influences their learning styles. The depth of learning adopted by learners hinged upon their view of knowledge. Those who were accepting of knowledge being fluid and constantly developing learned at a deeper level, whereas others who simply accepted knowledge at face value utilised the surface learning approach.

Another study which set out to explore how learners develop their knowledge and the relationship between the acquired knowledge and how it is utilized to solve problems was undertaken by King and

Kitchener (1994). Their study found that epistemic assumptions, and therefore the certainty of knowledge is capable of change (p.10). This finding is a similar reflection of Perry's (1970) and Vermetten, Vermunt, & Lodewijks' (1999) findings whereby over time the way knowledge is perceived and utilized goes through a development trajectory of change. Using this finding of capable epistemic change, King and Kitchener (1994) went on to develop a reflective model mapping out how knowledge is developed. Similar to Perry's (1970) model, it begins with a pre-reflective state where the conception of knowledge is perceived as absolute where no challenge to what is known takes place. Next is a quasi-reflective state where knowledge begins to be seen as perhaps uncertain and ambiguous and capable of being challenged by personal opinion or other perspectives. Finally, the learners embark on the reflective stage where a knowledge is questioned, evaluated and then accepted taking into account a wider worldly perspective.

The most prominent framework on the conceptions of knowledge is by Magolda (1992). Knowledge is seen as fixed or certain or absolute - essentially taking in knowledge without applying a deeper level of critical thought or questioning of the subject matter. The next phase is where a student reaches the transitional stage, which is where knowledge is no longer fixed, they acknowledge the uncertainty in what they have learned and an awareness and need for understanding emerges, rather than simply memorisation of the topic. With tutor support at this stage directing learners to how knowledge can be malleable and applicable in different situations, a learner's knowledge is now linked to their personal values and beliefs. By applying a deeper level of thought and analysis and through the use of evidence a learner will gain the confidence to know when it is appropriate to use specific knowledge. At this stage a tutor is viewed as a purveyor of ideas and viewpoints, whereas the learner is a constructor of knowledge.

In analysing the models presented above, it appears that the manner in which knowledge is created, interpreted and applied is interchangeable from absolute to pluralistic to contextual depending on a number of factors. A brief synthesis of the studies reviewed above show that the factors which may influence the transition of how knowledge is perceived may be due to:

- The learner's ability to relate to the context of the knowledge
- Prior experience possessed by the student within a particular discipline
- Amount of previous experience gained in the subject area
- The learner's perceptions, assumptions, beliefs and values

As such, dependent upon context and application, learners may perceive acquired knowledge as static and unchanging, or as dynamic, questionable and evolving. The acquisition of knowledge and knowing can come from multiple-sources including one's own opinion and observations. As such, one's epistemological beliefs develop and change over time. Despite identifying the value and impact of epistemological beliefs in the knowledge process the existing models of reflection and reflective practice are excellent tools for use in curriculum to assist learners to undertake reflections, the models do not take into consideration the underlying personal epistemic stance of a learner or facilitate the opportunity for assumptions and preconceptions to be drawn out, questioned and critiqued in order to develop critical

consciousness (Brookfield, 2000, 1995).

A proposal for a constructive reflective model

This paper proposes a constructive reflective model will offer a layered approach which helps to build the trajectory of a learner's journey in professional practice. The intention of the reflective model is to embed learning and the application of learning within the seemingly constantly changing professional environment by raising awareness of assumptions, diverse views and opinions, identifying one's approach to learning and knowledge, power and socio-political impact.

The model embeds seven layers of development process (Piaget, 1974; Perry 1970) based upon analysing the beliefs, values, perceptions and assumptions of learners and practitioners in order to generate alternative, broader perspectives and new values. This consequently raises awareness of a learner's reasoning, cognitive and moral development and allows reflection to be made in action during the experience and after the event (Schön 1991) to continually build learner's self-improvement, improve decision making and judgement skills and attitudes necessary for a professionally responsible lawyer. The final stage – reconceptualization – is where the awareness gained from the reflection is discussed with an expert to help contextualise and future application of new learning.

The model will be designed with inspiration from reviewing the literature on reflective learning and some of the models of reflection available. The proposal for a constructive reflective model takes into consideration the existing frameworks which are most popularly used in the education paradigm: Kolb's (1984) learning cycle where reflection is seen as the glue which helps to recognise situations where abstract concepts can be applied (p.38); Gibb's (1988) straightforward stages of reflective cycle considers feelings, experience, and takes into consideration multiple perspectives to find suitable solutions for future transactions; Johns' (2002) model of structured reflection encourages the use of dialogue and supervision to develop an epistemological understanding of reflection; and Rolfe et. al.'s (2001) framework for reflexive practice uses the 'what? so what? and now what? questions to construct theories of how to deal with similar situations in the future.

Building upon the premise of the existing models, it strives to offer a way forward for deep reflective learning to help a learner develop into a practitioner and professional by encouraging a holistic understanding of the world and identify ways of working together. In doing so, it is anticipated that a learner's previously compartmentalised ways of thinking and practice will be transformed enabling new ways of working and knowing to emerge (Finlay and Gough (2003).

A constructive reflective model for use in legal and professional education

Introductory phase for tutors

The aim of developing this model is to help learners learn how to undertake reflection. From my own

experience of teaching, initially it appears that learners are unable to understand what is required when asked to reflect on a task or skill undertaken. It is good practice to begin with the basics - by explaining what is meant by reflection. For example, in synthesizing the literature on reflection discussed earlier, a simple definition would be that reflection is a thinking process which is continuously and methodological that examines and explores an action, a task or an idea to evaluate and attach new meaning. A detailed discussion around the key focus of reflection using a definition is helpful as a starting point.

To introduce learners to reflection, tutors could introduce a simple 'trailing out' exercise where learners are asked to discuss their experience on a particular topic in small groups. In my first lesson with the students on the VLC module, students are asked to reflect on their exam grades which they received a few months prior to the start of the new academic year. Sometimes, I would ask them to reflect on their work experience or summer jobs over the summer months when they were away from the university. A few minutes later, this usually leads the whole group into a discussion about the topic itself. Tutors can begin to discuss the process of thinking learners went through to undertake this examination, benefits of reflection and a comparison of each other's thinking process. There is also collaborative learning taking place through sharing of experiences and actions with peers. This pool of multiple observations and ideas help learners to generate new knowledge.

Another challenge of introducing reflection to learners is the personal nature of the exercise. The use of the word 'I' is an exception to most advice on good academic writing practice. In order to help learners understand the value of personalisation in their learning and thinking process, we hold a discussion around 'knowledge', how it is created and the role of one's epistemic stance. This helps address the importance of the first person in reflection. This will help learners see the difference between academic writing and reflective writing, and perhaps even the value of 'I' in discovering themselves and their identity through the process of reflective learning.

Another helpful method of introducing learners to reflection is to offer examples of reflective writing. Learners are then asked to discuss the features of each reflection and select with justification their preferred reflection. It becomes quite clear to learners at this stage that reflections are not simply a description of an event. At this stage, some learners, but not all will also note that reflection is also not just an evaluation of weaknesses and strengths. Learners are encouraged to draw up a list of criteria which make up a good piece of reflection. This is used together with the model presented below to help generate high quality, deep and conscious constructive reflection.

Finally, a consolidation is helpful for learners to share their interpretation and conceptions of reflection and reflective learning. This is also a good opportunity to introduce learners to some of the literature on reflective learning and the importance of addressing personal epistemology in learning, especially in a professional context.

Step 1: Development of competency awareness

Learner begins by narrating with thick description about their experience of undertaking a professional transaction

The narration is set out quite simply to describes what happened, usually chronologically setting out the activities as they unfolded. There is little by way of discussion. This acts as the backdrop to develop deeper levels of reflection as the learner works through each of the steps proposed. Some narrations can show some evidence of deeper levels of consideration such as any emotional reactions, however at this stage there is little by way of multiple perspectives and alternative viewpoints which may challenge the learner.

Learner identifies competency of lawyering or professional skill

By building on the tacit knowledge gained from lessons, reading of practice guides, observing others and from prior experience, the learner is expected to identify what it means to be competent in relation to a professional skill. This may require the learner to undertake further reading and research on the professional standard of competence. The question to address here is ‘What would a competent lawyer/professional do in this situation?’ The aim is for the learner to become familiar with the competent standard of a professional and be able to articulate and interpret with understanding what the level of competency is.

4.2.3 Learner evaluates their competency

The learner is expected to demonstrate elements of stepping back from ~~the~~ events and actions to observe the actions and decisions exercised. The learner needs to undertake a comparative study into their performance as set out in the competency standards. Here learners could be asked to describe the standard of competence for a skill or action being reflected on and then to apply that standard to their performance.

Building on knowing what a competent lawyer/professional will do in a given situation of exercising a particular skill or undertaking an activity, the questions to address here are:

- To what extent were your actions, decisions and outcome similar to that of the competent professional?
- Did you meet the standard of competence?

In order to address these questions fully, learners are expected to give consideration to their decision making process and their level of knowledge about the skill and corresponding facts at the time of undertaking the activity. Reflection and evaluation at this stage should demonstrate some evidence of analytical and integrative perspectives.

Learner identifies gaps in their competency

The overarching theme of this phase of reflection is to gauge what would be necessary to achieve a basic level of competence in the performance. Once the process of evaluation of individual performance against the standard of competency is completed, the learner will be able to generate a higher level of inquiry about what is known and what is unknown with the aim of formulating an action plan to bridge this gap.

The learner undergoes a process of deep reflection at this stage where there is self-questioning/internal dialogue deliberating on improvement and development, taking into account the perspectives of competency and what this means or may look like. There is evidence of standing back and evaluating, learning from experience and the need for bridging the gap between what is already known, how to improve what is already known and learning what is unknown. There may also be some evidence of a learner perhaps moving away from an absolute and fixed conception of knowledge.

In order to focus on identifying gaps in knowledge, the following questions could be of help:

- Drawing upon the evaluation above, what are the strengths and weaknesses
- Is there room for improvement within areas of strength identified - If so, what? how?
- Break down the areas of weaknesses and tackle what the problems are - knowledge, technical skills or 'soft' skills/behaviours?
- If so, what knowledge, skills or behaviours were lacking?
- What do I need to do to get to where I need to be – here set out the actions and goals to achieve.

Through this process the learner would build upon their knowledge of professional competency by developing new knowledge and a deeper understanding of law through problem solving, research and analysis in an independent and self-directed manner to improve judgement and reasoning skills.

Step 2 – Embracing a variety of approaches to completing tasks competently

Building on the rich identification of professional competency of a particular skill or task, a learner become aware of the variety of different ways in which a task can be handled professionally and competently such as a client interview or in undertaking a piece of will drafting. With knowledge about these new ways of working, a learner will need to consider which method of working are most suited to them, taking into account the task at hand, the impact of the task, their confidence and level of understanding of each choice and the consequence of ~~making~~ choosing one way of working over another.

The learner's own analysis of their conscious or subconscious decision-making will help to bring out aspects of professional values and professional identity because of the learner's shift from adhering to one prescribed competency to evaluating and deciding upon one themselves. Over time when the learner interprets and implements the chosen competency, there will be elements of the learner's own professional identity and personal standards utilised.

It is at this stage, where the learner undergoes a process of deep reflecting, self-questioning/internal dialogue deliberating on the different ways in which professionalism and competency can be achieved. Perhaps there may have been prior experiences which could have influenced the learner's decision making, or the learner's personal frame of reference to learning could have played a part.

The reflection that takes place is now located within a wider and broader set of perspectives and there is realisation that there is no one absolute way of task action, instead there are multiple different ways of working. The learner may begin to question their thinking process, what motivates their decision making and what needs to change to adopt new or different practices. It is also here where a learner may start to question their personal conceptions and beliefs in the hope of achieving the lawyering skills needed to work competently and professionally for their clients.

The extent of the reflection as to why a particular choice of working was made will require further investigation. Stages 3 and 4 will aim to unearth some of the reasons for choosing a particular method or technique and their underlying epistemological perspectives to learning. There is evidence of a learner transiting from an absolute perspective to knowledge to a more diverse and pluralistic perspective, being open to consider a variety of perspectives to make decisions or to learn a new or improved way of undertaking a task.

Step 3 – Putting the 'I' into reflecting: Raising self-awareness of epistemological beliefs

At this stage, the learner's values, identity and the learner themselves become the focus of the reflection. It is an opportunity to explore the reasons for their decision making, what empowers and motivates them to adopt one form of working over another. This analysis will require the learner to confront their epistemological stance on learning, on lawyering, on professionalism, on skills and aptitudes needed in the workplace and it sets out to identify the epistemic factors such as assumptions, characteristics, experiences, preferences and viewpoints to explain the what, how and why of the learner's professional decision-making process. This part of the reflection aims to facilitate the realisation of the power of how one's personal values, emotion and beliefs can influence a decision. This can be explored more broadly in the context of upholding justice, serving a client's needs and developing one's professional responsibility and identity.

Noting that this is not an exhaustive list, here are some guiding questions to raise self-awareness and realisation of one's epistemology which may give rise to more questions for reflection:

- What are my basic ideals or values?
- How do I view myself and others?
- What do I understand about professionalism?
- How does professionalism apply within the context of lawyering?
- Do I contradict my values and beliefs with the way in which I implement professionalism?
- What influences my actions?

- To what extent does someone else's perception of me influence how I act?
- Why did I choose to act in a particular way?
- What would have made me act differently/make a different choice within the context of this reflection?

During this process of internalising, exploring and examining one's own beliefs, emotion and values, the learner undergoes a process of deep reflection, self-questioning/internal dialogue deliberating on improvements, different views, perhaps even the view of others. There may be reflection on professional responsibility and what this means and a recognition of how prior experience, thoughts and beliefs could shape and affect meeting the standards required. Over time it is possible for a learner's personal epistemological stance to change due to a growth in self-awareness. This sees a shift in opinions from static to dynamic and a broader more open-minded outlook on challenging opinions and perspectives.

Step 4 – Factors influencing my decision making and task performance

Having identified one's personal identity, it is helpful at this stage to consider the factors which may influence decision making, ways in which multiple perspectives and stakeholder needs are considered and how tasks are completed. For example, a competing priority in any professional setting is the needs and expectation of the client, followed by team members, supervisors and any third-parties involved in the transaction. Equally importantly, the way a learner conducts themselves in a professional setting is regulated by their subject-related professional codes of conduct including specifics of professional responsibility and ethics. Professional codes of conduct are crucial to meeting the required competency standards of any profession.

Within the law curriculum, this is an opportunity for the learner to focus on the concepts of justice, rule of law, respect and equality. The obligation of a lawyer's role is varied and requires an understanding and maintenance of the highest standards of ethical conduct. The level of professional competency, responsibility and ethical conduct and character needs to be upheld. In order to ensure this, being reflective and responsible about own behaviours and actions can help to ensure continuous self-improvement, integrity and sensitivity towards clients and others, making decisions that are just, fair and ethical. The concept of professionalism however encourages the desire to do better and continually improve, maintaining the respect and confidence from others in the profession and the society.

When a learner begins to consider the wider external influences upon undertaking tasks and demonstrating competent skills, there is opportunity to develop personal values and identity, demonstrating an awareness of how others may perceive an action, and more so towards the values and behaviours of professional responsibility which may influence how better to perform on a task. It is possibly at this stage where the learner's professional identity begins to flourish through the exploration of reactions may relate to their decision, ideas are questioned and considered using multiple perspectives.

Step 5 – The wider perspectives: Reflecting on socio-political and economical perspectives to exercise professional judgement

At this stage, learners are required to consider their actions, decisions and epistemological stance and the impact of these within the wider perspectives within which the law operates. The practice of law is deeply embedded within society and as such it is useful for learner's to consider the ways in which law has helped shape our society and history and vice versa. In addition, it is important for learners to take on board the effects of law within the contexts of power and governance, culture, religion and legal awareness within day to day life.

Through undertaking a much broader reflection, this will help learners develop a critical awareness of the interplay between societal, political, cultural, economic and religious influences in policy and law. It also creates an opportunity for learners to evaluate their current practice in light of these theoretical considerations, whilst being able to offer reasoned and justifiable opinions on the effectiveness of specific laws, the desirability of reform and to recognise and understand competing arguments for reform.

This deeper level of understanding and reasoning will be of assistance developing professional responsibility and judgement skills. Further, a learner's awareness and knowledge transits from concrete levels of understanding to more abstract understanding of law, the lawyering process, professionalism and its significance in society.

Step 6 – Conceptualising learning through constant evaluation to improve personal reflection process

In the final stage, the learner conceptualises what they have learnt and the learning process, drawing together the previous five stages.

Here they engage in critical thinking that is purposeful, reasoned and goal oriented by synthesising, evaluating and demonstrating an awareness of how they came to acquire their knowledge of ways of working within the context of the reflection undertaken, why they have made certain decisions, and their own process of learning. Learners' problem solving approaches are questioned and reviewed along with the rationale behind selecting these strategies for particular tasks.

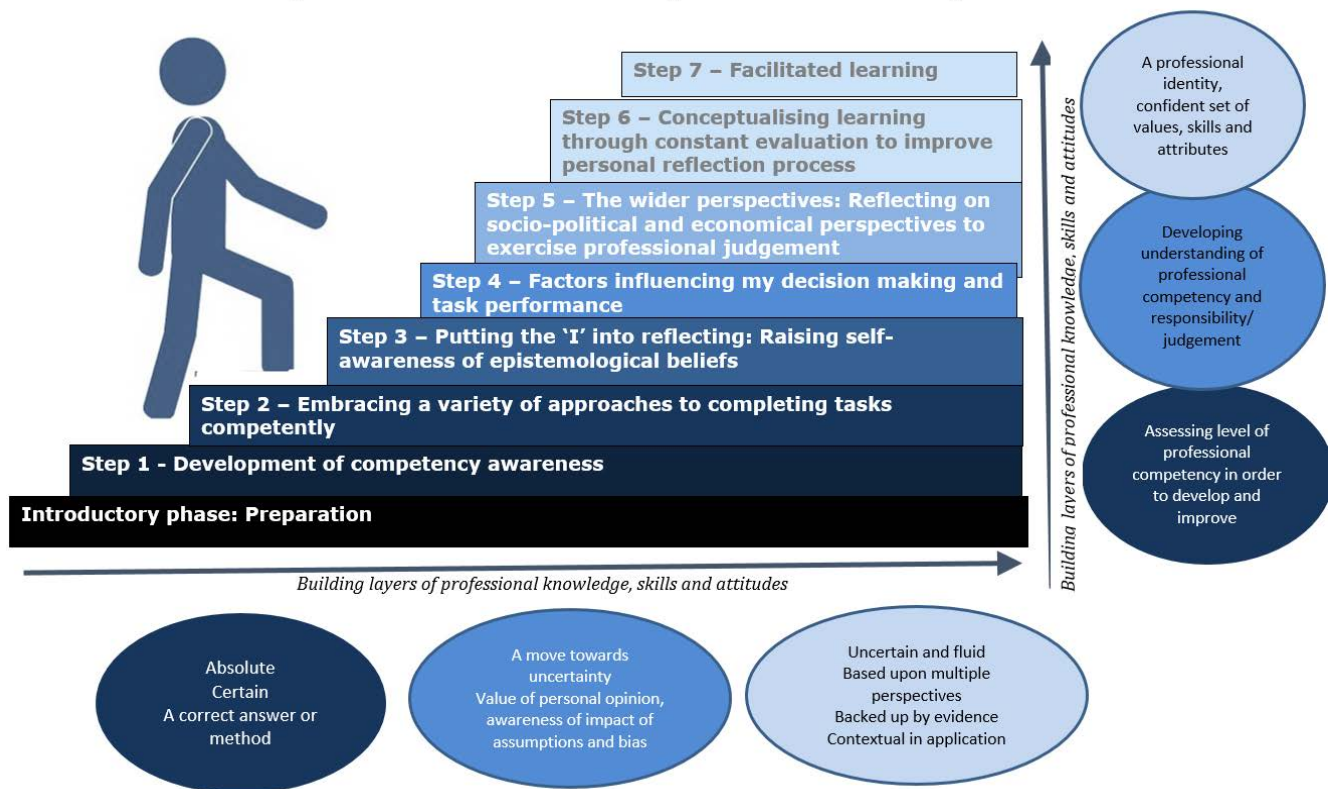
Learners will also be able to review their epistemic thinking about attitudes, beliefs, and emotions, identifying any changes or reaffirmation of beliefs, providing reasons for this. There is also development of cognition where learners are now in a position to make informed and well-reasoned connections to previous knowledge, experiences and utilize this effectively in new experiences, modifying knowledge to fit the context of application and accommodating new ideas at the same time. This helps to improve and integrate one's professional identity and autonomy and creates a sense of ownership of learning.

Step 7 – Facilitated learning through dialogue

Once the six stages of reflection are completed, it is important that the findings of the reflection can be

discussed with a supervisor or more experienced professional for feedback. It is also an opportunity for the learner to gain some practical and professional insights into their new understanding and appreciation for the matter that was reflected upon. Through a dialogue, a learner and the expert/supervisor/tutor would be able to review the gaps in the competencies and review the action plan set out by the learner to address areas of improvement. This constructive process allows for competency to be developed and learned while evaluating how practices could be improved through expert tips and techniques. It is an opportunity for the learner to discuss areas that require improvement, develop a clearer understanding of what elements of the competency are deficit and feedback on tackling the improvements.

Figure 1: An illustration of the reflective learning model and its associated learning outcomes



The intended learning outcomes of the proposed constructive reflective model

The proposed reflective model offers a layers and structured process of drawing out awareness and consciousness of a learner's appreciation for professional competency skills, the development of judgement and decision-making skills and consequently their professional identity. The model has a built-in measure to critically enquire one's epistemic consciousness is one of the most important factors in leading a holistic and effective professional learning process.

The model has been designed to provide opportunities for the following intended learning:

- To gain insights about a learner's strengths and weaknesses through self-evaluation
- To think more deeply about the step-by-step action and thinking undertaken to complete a task
- To consolidate and evaluate knowledge by identifying the extent and manner in which knowledge is applied in a professional or experiential setting.

- To question and unpack difficult concepts and its relevance in different professional situations
- To seek continuous self and professional improvement on competency of skill, technique, and expertise
- To question and critique what is known to be absolute. This could lead to developing new and varying professional knowledge, improved critical thinking and evaluation of existing practice
- To question and critique personal assumptions about practice and becoming aware of its impact on professional practice with a view to making the necessary changes for optimum competency
- To use experience gained in practice in order to continuously develop and improve upon knowledge and skills through the use of critical thinking, analysis and review. In addition, forming connections between previously learned concepts and theory and discovering where gaps exist in the understanding of theory and identifying the necessary steps required in order to improve professional competency.
- To build a capacity for improved professionalism by questioning and identifying one's personal values, a philosophy of practice, emotional intelligence, ongoing ethical and moral development, self-awareness, self-direction and self-discipline
- To enhance performance within professional practice by forming new insights and opinions into approaches to lawyering by questioning established assumptions and beliefs.
- To continuously improve upon reasoning and judgement skills by questioning, analysis and reviewing of actions taken.
- To learn directly from professional practice in action by reviewing actions in the midst of their performance with the ability to make constant adjustments as we undertake an action, facilitate the development of continuing improvements in quality.
- To take appropriate action based on the momentum created by that reflection by setting goals and objectives with measures by being self-aware and self-directed to improve practice. This practice becomes a way of being for optimum professional competency
- To be client-focused and practice-ready

This model demonstrates that reflection is more than simply thinking and describing an event. It requires some recognition of our identity, values, opinion and experiences and their impact on the way we react or behave in particular situations. The impact of personal consciousness and epistemology has a significant impact on how we view learning, knowledge, professionalism and others around us. As such, the model develops a learner's reflection in a holistic process of continual improvement, continual exploration, continual changes and adaptation. The layers within the model can be applied in-action when exercising a particular skill or decision-making and of-action thinking about an activity, evaluating its success and forming ways of improving.

Conclusion

This paper proposes a constructive reflective model that offers learners a layered and developmental approach to embed learning and the application of learning within the seemingly constantly changing

professional environment. The model embraces the influences of personal epistemology of assumptions and consciousness and recognises how our identity, values, opinion and experiences impacts on the way we react or behave in particular situations.

It is hoped that the internalized process of reflection will help to draw out an ‘attitudinal shift’ (Brookfield, 1987) so that learners are encouraged to consider their epistemic stance in detail, questioning and reviewing how this impacts on their learning, practical skills and decision-making skills, with the opportunity to reframe and develop new perspective or reaffirm their beliefs.

Focusing on a person's beliefs, values and perceptions is a key aspect of personal development through reflection. A person's epistemic position shapes their attitude, thought processes and approach taken to reasoning, judgement and problem solving, as well as their view of others. Reflection opens up a new dimension to a learner or practitioner whereby they consider new ideas and opinions on particular issues.

Further, the popular frameworks used in the education sector shows that the manner in which knowledge is created, interpreted and applied is interchangeable from absolute to pluralistic to contextual depending upon a learner's previous experience and level of existing knowledge; the specific context the knowledge is described and implemented within; and the learner's current epistemic stance.

The structured process of the outlined reflective model steers learners towards a broader way of thinking through personal evaluation of their knowledge and its implementation reconceptualise knowledge and learning by questioning, evaluating and critique of knowledge to draw higher levels of cognitive and moral development, whilst it aims to explicitly raise awareness of the necessary competent knowable, skills and attributes for professional practice through its constructive and methodological process.

This leads to a holistic and effective professional learning process.

The proposed constructive reflection model demonstrates that reflection is more than simply thinking and describing an event. It requires some recognition of how our identity, values, opinion and experiences and its impact on the way we react or behave in particular situations. The impact of personal consciousness and epistemology has a significant impact on how we view learning, knowledge, professionalism and others around us.

In order to effectively undertake the process, set out in the proposed constructive reflective model, tutors are advised to undertake some preparatory work with learners first.

Preparation tips:

- *Explaining what is reflection.*
- *Put it into practice - learners to discuss one prescribed activity or experience in a small group*
- *Class discussion about the benefits of talking about an experience*

- *Comparison of thinking process and multiple observations of the same experience*
- *Discussion around what is knowledge and how it is created*
- *Encouragement to use first person speech*
- *Introducing examples of reflection*
- *Learners to utilize examples of reflection to draw out helpful criteria of do's and don'ts' of successful reflections*
- *Learners to be encouraged to share their interpretation and conceptions of reflection and reflective learning.*
- *Tutors to introduce some literature on reflective learning, conceptualising learners' viewpoints and experiences*
- *Draw out its relevance in a professional context*

Step 1: Development of competency awareness

- *Learner begins by narrating with thick description about their experience of undertaking a professional transaction*
- *Learner identifies competency of lawyering or professional skill*
- *Learner evaluates their competency*
- *Learner identifies gaps in their competency*

Step 2 – Embracing a variety of approaches to completing tasks competently

- *Learner is confronted with different ways of completing a professional task or achieving a particular goal*
- *Learner is expected to consider and confront the factors which influenced their choice of method employed to complete a task/make a decision*
- *Learner to become more conscious and aware of their own values and identity both professionally and personally as they move from adhering to prescribed methods of functioning to making decisions on what suits them and their practice best*
- *Learner may begin to question about their thinking process, motivations, areas for improvement*
- *Learner to become aware and begin questioning their personal conceptions and beliefs and the impact this has on learning and professional conduct*
- *Learner becomes open to multiple perspectives; realisation that knowledge is not always certain; it is open to diverse options and perspectives*

Step 3 – Putting the 'I' into reflecting: Raising self-awareness of epistemological beliefs

- *Learner may have become aware of some personal conceptions, assumptions and bias from the process above*
- *Learner to realise the power of their own epistemic stance, values, emotion and beliefs and its impact on decision-making. Learner undergoes a process of deep reflecting of self-questioning/internal dialogue*

- *Learner to consider how their epistemic stance shapes and affects their professional responsibility*
- *Learner becomes aware that their personal frame of reference is capable of change through this process*
- *Learner appreciates that knowledge and application of knowledge can be interpreted within the context of one's personal opinion.*

Step 4 – Factors influencing my decision making and task performance

- *Learner to make a conscious effort to learn about the roles, character and expectations of a competent lawyer*
- *Learner to consider own behaviours and actions in light of these expectations questioning and seeking improvement*
- *Learner has the opportunity to develop personal values and identity which may influence how better to perform on a task.*

Step 5 – The wider perspectives: Reflecting on socio-political and economical perspectives to exercise professional judgement

- *Learners to appreciate the role and context in which their decision making can influence and impact the wider society*
- *Learners have the opportunity to develop critical awareness of the interplay between societal, political, cultural, economic and religious influences in policy and law.*
- *Learners to evaluate their opinion, assumptions and practice in light of these theoretical considerations*
- *Learners develop improved reasoning and decision-making skills*
- *Learners improve their level of competency and responsibility/judgement skills*
- *Learners view knowledge in a more abstracted based on needs and evidence within the context of its application.*

Step 6 – Conceptualising learning through constant evaluation to improve personal reflection process

- *Learners engage in critical thinking about the process undertaken*
- *Learners consider what has changed and what has remained the same through this process – knowledge, application of knowledge, assumptions, personal views and epistemic stance, level of competence, responsibility, identity as a professional*
- *Learners to develop reasons to articulate their own professional practice*

Step 7 –Facilitated learning through dialogue

- *Learner engages in a conversation with an expert professional*
- *Learner to gain practical and professional insights*
- *Learner to develop a clearer understanding of the gaps in their skills and aptitudes to help with*

action planning

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Validation of the Garmin Forerunner 920XT Fitness Watch VO_{2peak} Test

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Abstract

Aerobic capacity (VO_{2peak}) testing equipment can be expensive. Garmin fitness watches are significantly cheaper, and Garmin has developed a fitness test that estimates VO_{2peak} . The purpose of this study was to validate the Garmin fitness test, using a Garmin Forerunner 920XT fitness watch, against VO_{2peak} measurement, using a Parvomedics TrueOne 2400 open circuit spirometry device. Sixteen college students (10 male and 6 female) volunteered to complete the Garmin fitness test followed several days later by a Bruce treadmill test while oxygen consumption was measured via open circuit spirometry. The average VO_{2peak} from the Garmin test was $45.4 (\pm 5.6)$ ml/kg/min, compared to $45.0 (\pm 8.9)$ ml/kg/min from open circuit spirometry. There were no significant differences between the measurements ($t = 0.221$ with $p = 0.828$). The two measurements were highly correlated with a correlation coefficient of 0.84 ($p = 0.000$). The Garmin fitness test seems to be a highly accurate estimation of VO_{2peak} .

Keywords: maximal aerobic capacity, indirect spirometry, Bruce treadmill protocol, heart rate sensor

Introduction

Aerobic capacity is defined as “the maximum rate at which an athlete can produce energy through oxidation of energy sources” (Haff & Triplett, 2016, p. 261). Aerobic capacity has also been called maximal oxygen consumption, maximal oxygen uptake, maximal aerobic power, and $\dot{V}O_{2max}$ (McArdle, Katch, & Katch, 2016, p.165-166). In the late 1800s, Wilber Olin Atwater and Edward Bennett Rosa created the first calorimeter designed for a human (McArdle, Katch, & Katch, 2016, p. 178). These early pioneering experiments measured the body’s heat production as a means of determining energy expenditure. These early studies led to the discovery of a direct relationship between energy expenditure and oxygen consumption, paving the way for indirect calorimetry to be used as a means of estimating energy expenditure (McArdle, Katch, & Katch, 2016, p. 179; Powers & Howley, 2015, p. 21).

The development of indirect calorimetry to evaluate aerobic capacity led to the decline of direct calorimetry. Brooks, Fahey, and Baldwin cite 4 reasons for this decline: “First, such devices are very expensive. Second, the heat generated by an ergometer...may far exceed that of the subject. Third, body temperature increases during exercise because not all the heat produced is liberated from the

body...Finally, the body sweats during exercise, which also affects the calorimeter and changes body mass” (Brooks, Fahey, & Baldwin, 2005, p. 51). Thus, direct calorimetry was not a great tool for evaluating exercise energy expenditure. Indirect calorimetry increased in use over direct calorimetry as these issues did not apply to the new technique.

According to Powers and Howley, open-circuit spirometry is now the most popular method used for indirect calorimetry (2015, p.21). Open-circuit spirometry allows the subject to breathe ambient air. The exhaled air is collected and compared to ambient air for its oxygen and carbon dioxide content. Inhaled and exhaled air are measured to evaluate the amount of air consumed. By knowing the volume of air consumed and the difference in content of exhaled air versus ambient air, energy expenditure can be determined (McArdle, Katch, & Katch, 2016, p. 180).

Open-circuit spirometry devices may be significantly cheaper than direct calorimeters; however, they are still quite expensive (e-mail from info@parvomedics.com dated April 18, 2016). This cost is prohibitive for many educational and fitness facilities. For this reason, other, cheaper means of estimating aerobic capacity have been sought out. Some of these include the use of pedometers, accelerometers, heart rate monitors, and even personal fitness devices (such as FitBit, Jawbone Up, Nike FuelBand, VivoFit) (Porcari, Bryant, & Comana, 2015, p. 104).

One of the new types of devices is designed by Garmin. The Garmin devices use a combination of heart rate monitoring and GPS data. While Garmin has several models that will estimate aerobic capacity, the Forerunner 920XT fitness watch is designed for runners, cyclists, and tri-athletes. It currently costs \$450 and up, according to Garmin’s website (www.garmin.com). The cost of a fitness watch is significantly more affordable than an open-circuit spirometry system which would make such a device much more accessible for schools, universities, and training programs desiring to evaluate aerobic capacity. This is especially true as the Garmin Forerunner 230 starts at \$250.

Very little research can be found that evaluates the accuracy of the Garmin fitness watch. Garmin does not make this information readily available on the company website. Several online forums discuss the accuracy; however, none of them provide any real answers. Some individuals posting indicate high levels of accuracy (salesguy) while others are extremely skeptical (ISEEKA; KSB123 Racehouse). Few of these users have completed a laboratory test to evaluate their maximal aerobic capacity. Recently, an article was published where a single individual performed a comparison between a Garmin fitness watch and open-circuit spirometry (Stables, 2016). While the VO_{2peak} data from the two assessments were similar, the data is from only one subject and cannot, on its own, validate the accuracy of the Garmin fitness watch.

The purpose of this study was to evaluate the accuracy of the Garmin Forerunner 920XT fitness watch by comparing the data obtained from the watch to data from a maximal treadmill test completed while using

open-circuit spirometry. Determining the strength of the correlation between the two measurements could allow those needing to know aerobic capacity to invest in a watch rather than in an expensive open-circuit spirometry device. Accurate estimation of aerobic capacity by the Garmin fitness watches could save institutions and fitness facilities thousands of dollars.

2. Methods

This study was approved by the Arkansas Tech University Institutional Review Board.

2.1 Subjects

Subjects were recruited from the Health and Physical Education Department at Arkansas Tech University. There were 16 total subjects (10 male and 6 female). The average age of all subjects was 22.4 (\pm 5.0) years. All subjects completed an informed consent and a PAR-Q form prior to participation in the study. Subjects had to be fit enough for physical activity in order to participate in the study; therefore, any subjects who answered “yes” to any PAR-Q items were excluded from the study.

2.2 Procedures

The study was conducted in 2 sessions which were held between 2 and 5 days apart. This delay was to allow adequate recovery between testing sessions. During session 1, $\text{VO}_{2\text{peak}}$ data from the Garmin Forerunner 920XT fitness watch was obtained while Session 2 consisted of performing the maximal aerobic capacity test with the open-circuit spirometry system. For this study, the Parvomedics TrueOne 2400 Metabolic measurement system was used.

Session 1 began by measuring subjects' height and weight. This data was entered in to the Garmin watch interface. A heart rate strap was connected to the subject and paired with the watch. Subjects were then taken outside for the watch to acquire satellites in order to ensure GPS accuracy. Once satellites were obtained, the watch was placed on the subject's wrist. The watch was placed in running mode, and subjects were instructed to press Enter on the watch to begin recording data. They jogged or ran for 10 minutes around the campus football field. At the completion of the 10 minute run, they pressed enter again to save the data and returned to the lab. The session ended after data was recorded, the watch and heart rate strap were removed, and the subject had recovered adequately to leave the supervision of the lab.

The second session was scheduled 2 to 5 days after session 1. Session 2 began by measuring height and weight and entering the data into the TrueOne Exercise software for the Parvomedics TrueOne 2400 Metabolic Measurement system, the indirect spirometry system.

Subjects were fitted with the HR strap to allow constant monitoring of exercise heart rate. Resting blood pressure measurement was also taken. After connecting the facemask for the indirect spirometry system to the subject, they began the maximal aerobic exercise test on the treadmill following the Bruce

Treadmill Protocol (see Table 1). Blood pressure measurements were taken at the end of each stage and during recovery to monitor health and safety of subjects.

Table 1 Bruce Treadmill Protocol

Stage	Speed (mph)	Grade (%)	Duration (min)
1	1.7	10	3
2	2.5	12	3
3	3.4	14	3
4	4.2	16	3
5	5	18	3
6	5.5	20	3
7	6	22	3

According to the ACSM, the criteria for obtaining maximal aerobic capacity is a leveling off of the subject's oxygen consumption (ACSM's Guidelines for Exercise Testing, 2014, p. 73). While this was the desired test termination point, not all subjects reached such a leveling off of oxygen consumption; therefore, the test was terminated when the subject reached one of the alternate criteria for maximal oxygen consumption. These include obtaining the age predicted heart rate max ($HR_{\max} = 220 - \text{age}$) or having a respiratory exchange ratio greater than 1.15 (McArdle, Katch, Katch, 2015, p. 237). The age predicted HR_{\max} equation has been found to have a standard deviation of ± 10 beats per minute (McKardle, Katch, Katch, 2015, p. 244). Therefore, HR_{\max} was determined to be obtained once heart rate was within ± 10 beats per minute of age predicted heart rate max or subject requested to stop. Additionally, researchers followed the indications for test termination as set forth by the American College of Sports Medicine.

The absolute indications are as follows:

- Drop in systolic BP of ≥ 10 mm Hg with an increase in work rate, or if systolic BP decreases below the value obtained in the same position prior to testing when accompanied by other evidence of ischemia
- Moderately severe angina (defined as 3 on standard scale)
- Increasing nervous system symptoms (e.g., ataxia, dizziness, or near syncope)
- Signs of poor perfusion (cyanosis or pallor)
- Technical difficulties monitoring the ECG or SBP
- Subject's desire to stop (other than V_1 or aVR) (taken directly from ACMS's Guidelines for Exercise Testing, 2014, p. 131).

The relative indications are as follows:

- Drop in systolic BP of ≥ 10 mm Hg with an increase in work rate, or if systolic BP below the same value obtained in the same position prior to testing
- Fatigue, shortness of breath, wheezing, leg cramps, or claudication
- Increasing chest pain

- Hypertensive response (SBP of >250 mm Hg and/or a DBP of >115 mm Hg (taken directly from ACMS's Guidelines for Exercise Testing, 2014, p. 131).

ECG was not monitored during the test, so guidelines relating to ECG were omitted from this list.

Once the test was completed, subjects cooled down by walking at a slow, comfortable speed on the treadmill for three minutes followed by three minutes of sitting. Heart rate and blood pressure continued to be monitored during the cool down. Subjects were not permitted to leave the laboratory until their heart rate dropped below 120 bpm and their blood pressure returned to near normal.

2.2 Statistical Analysis

All statistical analyses were performed with IBM SPSS Statistics 22. A paired samples T-test was used to evaluate the similarity of the VO_{2peak} obtained from the Garmin Forerunner 920XT fitness watch and the VO_{2peak} from open-circuit spirometry. The p-value for statistical significance was set at $p = 0.05$ for a 2-tailed test. Descriptive statistics were evaluated to determine that the data met the assumptions for a paired samples T-test.

3. Results

The data is presented in Table 1. Using the Garmin fitness watch, VO_{2peak} averaged $45.4 (\pm 5.6)$ ml/kg/min. The aerobic capacity results from open-circuit spirometry averaged $45.0 (\pm 8.9)$ ml/kg/min.

Table 2 Aerobic Capacity Data

Subject	Garmin (ml/kg/min)	Open-Circuit Spirometry (ml/kg/min)
1	52.0	52.6
2	38.0	42.5
3	42.0	34.9
4	48.0	53.5
5	41.0	33.0
6	46.0	42.6
7	48.0	51.8
8	52.0	54.1
9	49.0	59.3
10	39.0	39.4
11	56.0	58.3
12	42.0	36.4
13	50.0	47.3
14	39.0	37.3
15	46.0	39.4
16	39.0	38.0
Mean	45.4	45.15

No significant differences were determined between the two means ($t = 0.221$ with $p = 0.828$). The data from the Garmin fitness watch was not significantly different from the data obtained via open-circuit spirometry. In addition, the paired samples T-test revealed a Pearson correlation coefficient of $r = 0.840$ ($p < 0.000$) between the two sets of data. This was adequate to meet the requirements for statistical significance, which was set at $p = 0.05$. The data sets were not significantly different from each other; however, they were significantly correlated.

4. Discussion

No significant differences were discovered between the Garmin Forerunner 920XT aerobic capacity test and the data obtained from open-circuit spirometry. This can be interpreted to mean that the Garmin fitness watch is an appropriate means of evaluating aerobic capacity. In addition, the two data sets were 84% correlated. According to the National Strength and Conditioning Association, a high correlation in the field of exercise and fitness would be between 0.3 and 0.7 (Miller, 2012, p. 8). The correlation coefficient between the Garmin fitness watch and open-circuit spirometry measurement of aerobic capacity was found to be 0.84. This is well above what is considered a strong correlation in the field of exercise and fitness.

This would seem to indicate that a Garmin fitness watch (particularly the Garmin Forerunner 920XT) is a cheaper means of assessing aerobic capacity for individuals or organizations who cannot afford an open-circuit spirometry system. This could be particularly beneficial for smaller academic institutions that do not have a research quality exercise physiology laboratory. Coaches and personal trainers may also find this information very helpful. Smart aerobic training programs are built on aerobic capacity (Haff & Triplett, 2016, p. 563). Being able to assess aerobic capacity more cheaply, ought to be a huge asset to individuals, coaches, and to educational programs.

5. Conclusion

The Garmin Forerunner 920XT fitness watch assessment of aerobic capacity is highly correlated to aerobic capacity measurements obtained via open-circuit spirometry. This may provide a significantly less expensive means of assessing aerobic capacity. Many people could potentially benefit from using a Garmin fitness watch; however, this may be of particular interest to small academic programs, sport coaches, personal trainers, and athletes.

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The Sturm Liouville Problems with a random variable in Boundary Conditions

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Abstract

We discussed the Sturm-Liouville problems with random variable ξ_n involving in bound-ary conditions which represent a support coefficient for elastic rope. We have a conclusion that if the random variable in the boundary condition have convergence property, then the eigenvalues will also have a similar convergence property. We also give an asymptotic formula to approximate the large eigenvalues. This formula give an asymptotic relationship between eigenvalues and the support coefficient ξ_n when the eigenvalues are very large.

1 Introduction

1.1 Background of Sturm Liouville problem with boundary conditions

Sturm-Liouville problem plays an important role in math and physics theory. In past decades, many mathematicians discussed the relationship between the boundary conditions and the eigen-values [1, 2, 4]. In 1996, Kong proved that with separated boundary conditions, the eigenvalue functions of Sturm-Liouville problem would not only be continuous, but also be differentiable [2, 3]. In 2005, Zettle summarized different boundary conditions of Sturm-Liouville problems [4].

In this paper, we are discussing about the Sturm-Liouville problem with separated boundary conditions and study the relationship between the eigenvalue and a stochastic variable in boundary conditions.

1.2 Formulation of Sturm Liouville with stochastic boundary conditions

Consider differential equation

$$\varphi''(x) + \lambda\varphi(x) = 0 \quad (1)$$

with boundary conditions

$$\varphi(0) = 0 \quad (2)$$

$$\varphi'(L) + \xi(w)\varphi(L) = 0 \quad (3)$$

Here $x \in [0, L]$. This boundary condition has physics background: A elastic rope is fixed at one endpoint $x = 0$. Whether or not it is also fixed at the other endpoint, that depends on the support coefficient ξ . ($\xi \geq 0$ is a stochastic variable.) When $\xi > 0$, the rope is fixed at $x = L$, When

$\xi = 0$, the rope is not fixed at $x = L$.

Assume equation 1 satisfy one of the following boundary conditions:

$$\varphi'(L) + \xi_1(w)\varphi(L) = 0$$

$$\varphi'(L) + \xi_2(w)\varphi(L) = 0 \quad (4)$$

.....

$$\varphi'(L) + \xi_n(w)\varphi(L) = 0$$

.....

Here $\xi_1(w) \geq 0$, $\xi_2(w) \geq 0, \dots$ $\xi_n(w) \geq 0 \dots$ are stochastic variables for $\forall n \in \mathbb{N}$ the equation 1 together with any of these boundary values conditions will generate a Sturm- Liouville problem. Each $\xi_n(w)$ has infinitely many eigenvalues $\lambda_{ni}(w)$, $i = 1, 2, 3, \dots \infty$.

If $\xi_1(w), \xi_2(w) \dots \xi_n(w)$ convergent to $\xi(w)$ almost everywhere, in other words, the probability that $\lim_{n \rightarrow \infty} \xi_n(w) = \xi(w)$ is equal to 1. Written as

$$P \{w \in \omega : \lim_{n \rightarrow \infty} \xi_n(w) = \xi(w)\} = 1 \quad (5)$$

then

$$P \{w \in \omega : \lim_{n \rightarrow \infty} \lambda_{ni}(w) = \lambda_i(w)\} = 1 \quad (6)$$

In other words, each eigenvalues will have a similar convergence property.

2 Convergence Result of Eigenvalues

For $\forall n \in \mathbb{N}$, any $\xi_n(w) \geq 0$, it is easy to see that for this kind of boundary value problem, only when eigenvalues $\lambda_n > 0$, non-trivial solutions exist. In equation 1, a general solution is given as

$$\varphi_n(x) = A_n \cos(x\sqrt{\lambda_n}) + B_n \sin(x\sqrt{\lambda_n}) \quad (7)$$

Because the 1st boundary condition $\varphi_n(0) = 0$, $\Rightarrow A_n = 0$. Because of the 2nd boundary condition,

$$\varphi'_n(L) + \xi_n\varphi_n(L) = 0$$

So

$$\sqrt{\lambda_n} \cos(L\sqrt{\lambda_n}) + \xi_n \sin(L\sqrt{\lambda_n}) = 0$$

If We get

$$\tan(L\sqrt{\lambda_n}) = -\sqrt{\lambda_n}/\xi_n$$

then

$$\cot(L\sqrt{\lambda_n}) = -\xi_n/\sqrt{\lambda_n} \quad (8)$$

If We let $x_n = L\sqrt{\lambda_n}$, then

$$\cot(x_n) = -L\xi_n/x_n \quad (9)$$

The Figure 1 gives us an illustration of intersection of functions $y = \cot(x)$ and $y = -L\xi_n/x_n$.

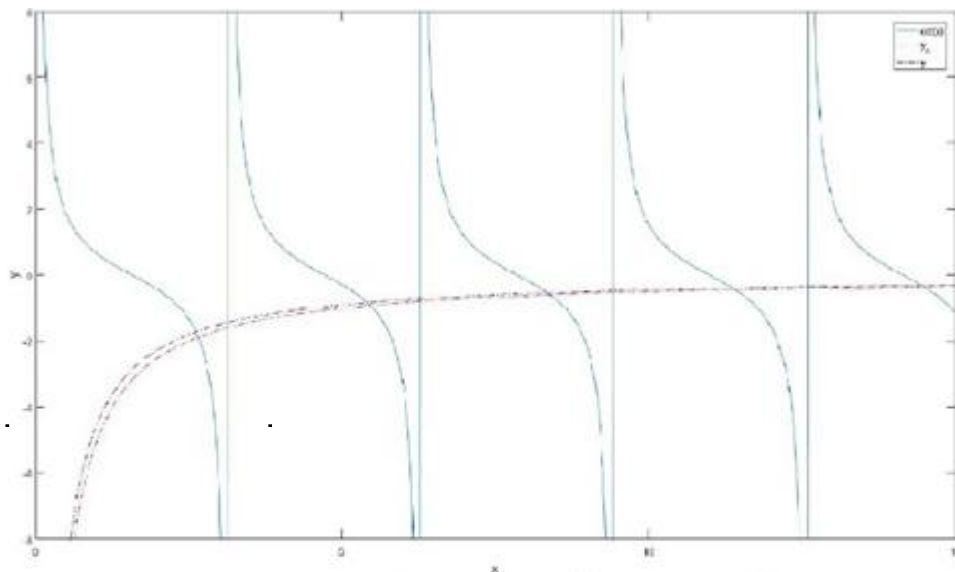


Figure 1: intersection of graph of $\cot(x)$ with $y_n = -\frac{L\xi_n}{x}$ and $y = -\frac{L\xi}{x}$: $\lim_{n \rightarrow \infty} \xi_n = \xi$
 The i -th intersection point of $y_n = -\frac{L\xi_n}{x}$ with $\cot(x)$ is (\bar{x}_i, \bar{y}_i) , corresponding i -th eigenvalue is $\lambda_{ni} = (\frac{\bar{x}_i}{L})^2$. similarly, the i -th intersection point of $y = -\frac{L\xi}{x}$ with $\cot(x)$ is (x_i, y_i) , corresponding i -th eigenvalue is $\lambda_i = (\frac{x_i}{L})^2$. Because of the continuity of $y = -\frac{L\xi}{x}$, when $\lim_{n \rightarrow \infty} \xi_n = \xi$, $\lim_{n \rightarrow \infty} \bar{x}_i = x_i$. So $\lim_{n \rightarrow \infty} \lambda_{ni} = \lambda_i$.

In summary, λ_{ni} , $i \in \mathbb{N}$ are eigenvalues corresponding to boundary condition

$$\varphi(0) = 0 \quad (10)$$

$$\varphi'(L) + \xi_n(w)\varphi(L) = 0 \quad (11)$$

$\lambda_i, i \in \mathbb{N}$ are eigenvalues corresponding to boundary condition

$$\varphi(0) = 0 \quad (12)$$

$$\varphi'(L) + \xi(w)\varphi(L) = 0 \quad (13)$$

If

$$P \{w \in \omega : \lim_{n \rightarrow \infty} \xi_n(w) = \xi(w)\} = 1$$

then

$$P \{w \in \omega : \lim_{n \rightarrow \infty} \lambda_{ni}(w) = \lambda_i(w)\} = 1$$

3 Asymptotic Analysis of large eigenvalues

By observation, we are able to make a more detailed asymptotic analysis of eigenvalues λ_{nk} when $k \rightarrow \infty$.

$$\pi/2 < L\sqrt{\lambda_{n1}} < \pi, 3\pi/2 < L\sqrt{\lambda_{n2}} < 2\pi \text{ Here } L\sqrt{\lambda_{nk}} - (k - 1/2)\pi \rightarrow 0 \text{ as } k \rightarrow \infty.$$

When k is large, we assume that

$$L\sqrt{\lambda_{nk}} = (k - 1/2)\pi + e(k) \quad (14)$$

$e(k) > 0$ is an error term that $\lim_{k \rightarrow \infty} e(k) = 0$.

Apply Taylor expansion of $\cot(x)$ around $x = (k - 1/2)\pi$ we get

$$\cot((k - 1/2)\pi + e(k)) = -e(k) + O(e(k)^3) \quad (15)$$

then as $e(k) \rightarrow 0$, substituting (14), (15) into (9):

$$-e(k) + O(e(k)^3) = -L \xi_n / ((k - 1/2) \pi + e(k)) \quad (16)$$

From (16) we derived that the error

$$-e(k) = -L \xi_n / k \pi + O(1/k^2) \text{ as } k \rightarrow \infty. \quad (17)$$

So we have derived the following asymptotic formula

$$L \sqrt{\lambda_{nk}} = (k - 1/2) \pi + L \xi_n / k \pi + O(1/k^2) \text{ as } k \rightarrow \infty. \quad (18)$$

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Image Quality Assessment and Radiation exposure in Intra Oral Dental Radiography

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Abstract

In this study, an intra oral dental unit (Siemens-70) at King Abdul Aziz University (KAU) Dental Hospital was selected and investigated for visual image quality assessment and radiation protection purposes. Radiation dosimetry for determining the optimum image quality with the lowest radiation exposure to the patient was carried out. A DXTTR dental radiography trainer phantom head and neck, portable survey meter Model RAD EYE-B20, and radiation dosimetry system RADCAL Accu-pro were used in this study. RADCAL Accu-pro is a non-invasive kV system, reliable instruments to measure and diagnose all X-ray machines including dental units. The radiation exposure to patients in (mGy) was measured using RADCAL ionization chamber Model 10×6-6. The best image quality with the lowest exposure dose was assessed for conventional intraoral X-ray film (Kodak type E) and the digital processing sensor (RVG 5200). Radiation survey level was done during this study for safety and protection purposes.

Key Words: Dental radiography Radiation Exposure, Quality control, Image Quality Assessment

1. Introduction

Dental radiography especially intra oral radiography (I/O) represents one of the most common types of diagnostic examinations performed recently based on the reports published by United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2000. These reports show that, the radiation absorbed dose from all diagnostic examinations including dental radiography contribute with 80-90% from the total absorbed dose arising from man-made radiation sources [1-7]. Radiation protection in dental practice is focused on three basic principles: justification, optimization and dose limitation. These principles imply the definition of selection criteria, methods to reduce radiation dose and education [8]. Dental radiography has relatively low exposure, although the radiation exposure to patient from intraoral dental units is relatively low exposure, there is a need to optimize all exposure parameters in intraoral radiography to minimize the radiation risk to a certain value as mentioned in ALARA principle (As Low As Reasonably Achievable) [2,5,7,9-10]. The majority of dental radiography under investigations is performed in dental clinic in the absence of routine quality assurance and quality control procedures program, also no effective training program was given to the operator. Patients may be subjected to unnecessarily relatively high doses due to lack of maintenance of the used equipment or insufficient

techniques where no quality control protocol was not applied [7,11]. Establishing good plan for applying quality control programs including regular checks for all exposure parameters such as dental films processing condition, expiration date for the used chemicals and films, darkroom lighting condition, X-ray unit's constancy, and reproducibility can help keep up high level of radiographic quality and lower exposure to the patient. Quality control test is recommended to achieve on a regular basis to make sure that the radiation exposure to patient is below the international recommended levels. In addition, the image quality as well as the physical exposure parameters were essential for optimization in diagnostic examinations [4,9,12]. These diagnostic examinations must perform under standard protocol to achieve sufficient image quality with the lowest possible absorbed dose to the patient. The important factors that affect the absorbed dose to the patient is the exposure time and the tube voltage [13-14]. The main target is to get an optimal condition between the dose delivered to the patient and the diagnostic physical exposure parameters accuracy and reproducibility with an analogue film technique at certain tube potential and time. The absorbed dose to the patient in dental intraoral units can control by adjusting the exposure time and the tube potential [13]. Significant decreases in radiation dose of dental radiography occur with the use of faster image receptors, intra-oral film holders, rectangular collimation for bitewing radiography, and also use of long, rectangular position indicating devices. Moreover, some radiation protection tools must be used such as leaded aprons and thyroid collars shield to decrease the exposure to different parts of the body [4,9]. Introduction of double-sided emulsion in 1924 and progressive increases in film speed over the years have resulted in lower radiation doses while maintaining image quality at an acceptable level. The film remains still a cheap and reliable method of recording images in dental radiography. The radiation absorbed dose to the patient can be reduced by using the preferred faster films type such as E or F-speed dental film. E-speed film has twice the sensitivity of D-speed film by a percentage value of 40% [15]. The aim of the present study was to assess the best image quality in conventional intraoral X-ray film and digital dental radiography with the lowest radiation exposure to patient for dental intraoral premolar and bitewing projection for Siemens-70 dental unit at KAU dental hospital.

2. Materials and methods

The study performed to assess, the best image quality with the lowest radiation exposure for dental radiography unit at KAU dental hospital. A 70 kVp, 7 mA Siemens intra oral unit, dental phantom (DXTRR phantom) as a substitute for the patient, Dental X-ray film (Kodak type E), RVG 5200 digital imaging sensor, Radcal Accu pro radiation measurements dosimetry system, and a radiation survey meter Model RAD EYE B20 were used in this study. The experimental set up and the used devices were shown in Figure 1(A-F). The measurements of the physical parameters such as kVp, exposure time, output radiation exposure in mGy were performed using Radcal Accu Pro radiation measurements system manufactured by Radcal Corporation USA as shown in Figure 1-A. Radcal Accu Pro has both kVp divider and ionization chamber Model 10×6-6 connected with an electrometer as shown in Figure 1B. The radiation levels in $\mu\text{Sv/hr}$ were measured using a survey meter Model RAD-EYE B20 as shown in Figure 1C. To determine the optimum radiation dose for acceptable image quality in two dental examinations (premolar and bitewing), an adult DXTRR phantom dental X-ray trainer was used with the conventional intraoral X-ray

film and RVG 5200 digital imaging sensor. For conventional intraoral X-ray film processing (manual processing) dental film type E, the positioning of the film was done using a film holder as shown in Figure 1D. The dental films were developed at the dark room of the university dental hospital training unit. All exposure settings are done at constant tube voltage and tube current (70 kV and 7mA) respectively, with varying exposure time and source to image distance settings (SID). Due to the variation in choosing the exposure parameters from the technicians especially the exposure time and the SID, This work concentrated on varying the exposure time and the source to image distance at constant tube potential and tube current as a trial and error method to get high-quality radiograph with lowest radiation exposure. Several exposures (about 25) conventional intraoral X-ray dental film type E were analyzed and investigated statistically by the author and visually by the technician to get the best image quality with the optimum radiation dose. Also, For digital imaging process, an RVG 5200 digital imaging sensor was used as shown in Figure 1-F. About 20 digital imaging radiography films were taken and investigated by the author and the technician to get the best image with the lowest radiation dose. The radiation safety policy and the radiation protection rules instructions considered in this study according to the university safety and radiation protection policy. The policy recommends using a TLD badge for measuring the personal dose equivalent during this work and found a background level.



A



B



C



D

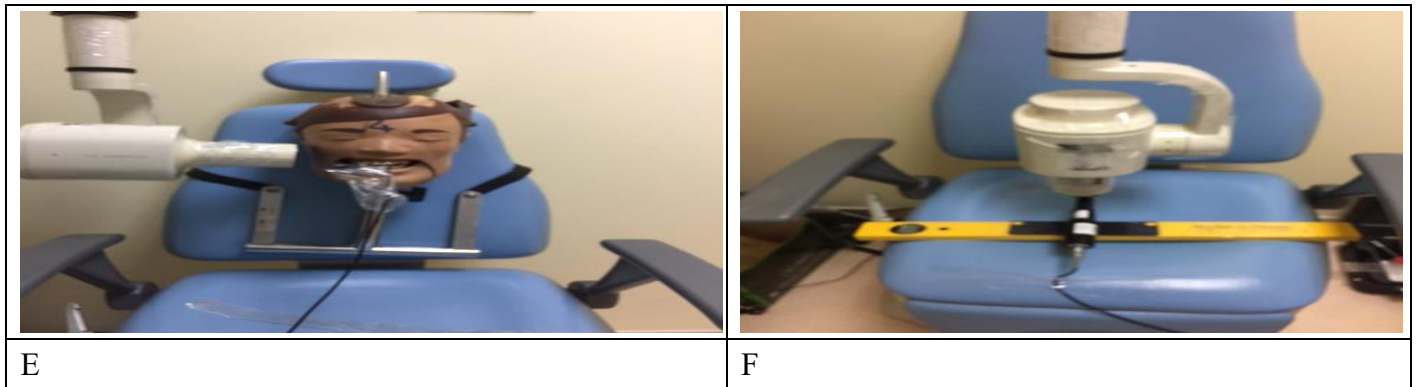


Figure 1: photograph of the quality control test tools and phantom used to measure radiation exposure and image quality; X-ray test device Radcal-Acuu-pro (A); Intra oral dental unit (Siemens) with Radcal ion chamber (B); Radiation survey meter Model RAD EYE-B20 (C); Film positioning holder in DXTRR phantom (D). Positioning of RVG 5200 digital imaging sensor (E); Set up for Radcal ion chamber for measuring entrance surface exposure at different SID (F).

3. Results and Discussions

3.1. Radiation Survey level

The radiation leakage from the X-ray machine was checked during the production of the X-ray beam. A radiological survey was done outside the X-ray room at the operator control panel position. The radiation survey levels ranged from 0.06 to 1.49 $\mu\text{Sv/hr}$ with an average value of 0.13 $\mu\text{Sv/hr}$ and show an acceptable value of background level. The obtained results for all processed dental radiography (conventional X-ray film and digital processing using RVG 5200 sensor) for the radiation level were found below the recommended dose limit. The international recommended dose limit for operators in the field of dental and diagnostic radiology is 10 $\mu\text{Sv/hr}$ as mentioned in International Atomic Energy Agency (IAEA) standard guides: IAEA Safety Series No.115 [16].

3.2. Accuracy measurements in exposure time

The relation between the nominal exposure time and the measured value listed in Tables 1-3. The value of the selected exposure time covered the clinical value by which the patient undergoes radiography. The exposure time range from the lowest value of 0.08 sec to the highest value of 0.64 sec. The measured value for the exposure at different station from the nominal value show acceptable deviation not exceed 1.75%. The acceptability limit for exposure time is 10% deviation from the nominal value.

3.3. Variation in measuring output radiation exposure

Figure 2 and Table 1 show that the relation between the values of the output radiation exposure in mGy with the exposure time in sec. A linear relation was found between the measured exposure time and the measured output exposure with very strong linear correlation coefficient of 1. Considerable variations were found in measuring the output radiation exposure with respect to SID where the SID varies from 40 to 60 cm. The output radiation exposure ranged from the lowest value 0.532 mGy to the highest value 3.46 mGy. Table 2 show the relation between the measured output exposures with the exposure time at distance 50 cm

from the surface of the patient. Tables 3 show the same relation at different distance (60 cm). The measured output radiation exposure ranged from 0.24 mGy to 0.98 mGy although for increasing the SID the output radiation exposure decreases according to the inverse square law and of course the resolution of the image quality decreases. The results show that the best distance at which the patient undergoes dental radiography about 50 cm based on the clinical choice for the physical parameters from the technician.

3.4. Image quality assessment

The output radiation exposure and the exposure time was measured and registered for each film at the different setting of exposure time including the clinical settings. The reading was repeated at different value of SID. The image quality assessed based on the criteria (pass/fail) from the opinion of the author and the technician. Figure 3 and 4 shows the developed dental film in case of manual processing and digital processing radiography.

All the developed intra-oral conventional dental films were investigated and assessed visually by arranging these films on a light source view box. Also the same analyses were done for the digital radiography images using computer software. The author and the technician commented on these developed films and on the digital constructed dental films and made conclusion based on the visual assessment of the image quality and the value of the output radiation exposure to get the best image quality in both cases. After evaluation and interpretation of the results, the best image quality was determined (arrow in Figure 2) for manual processing at 0.2 sec, 50 SID, and the registered corresponding radiation exposure is 1.08 mGy. For digital processing radiography, the best image was assessed and recorded for 0.16 sec exposure time at source to skin distance of 50 cm and the corresponding output radiation exposure is 0.86 mGy as shown in Figure 4 (film number 16).

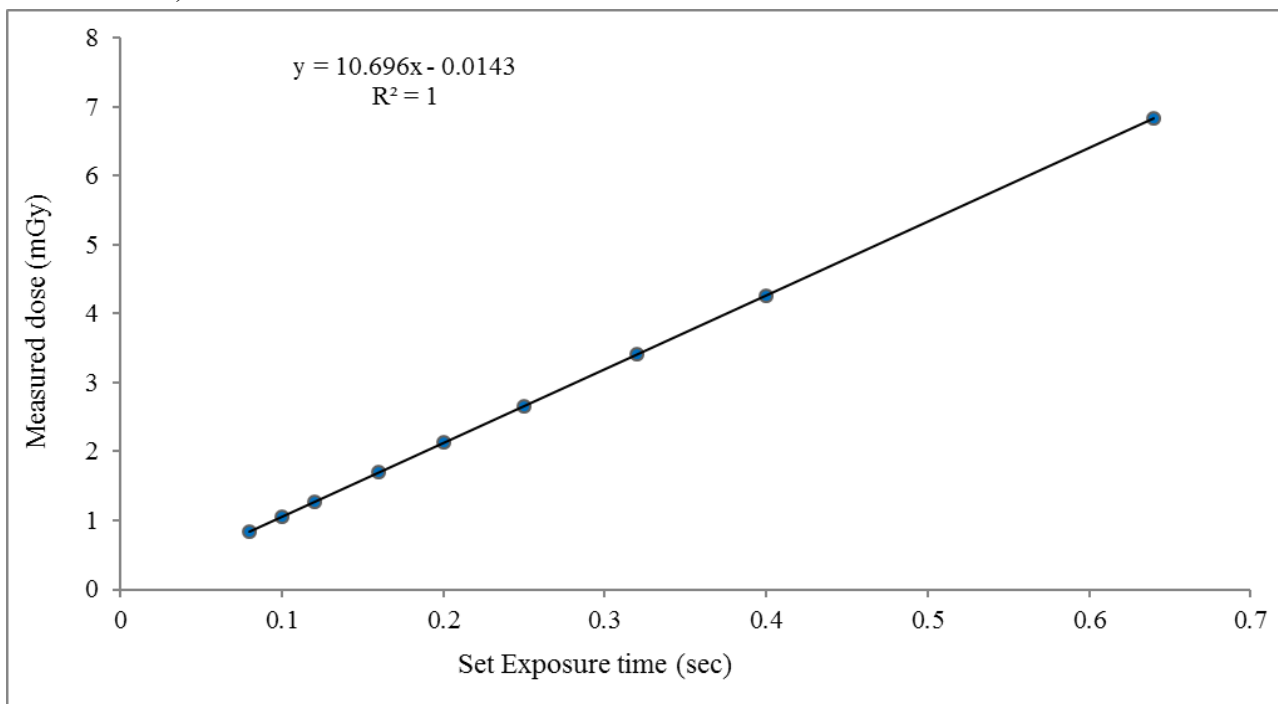


Figure 2. Measured dose with the exposure time at constant 70 kVp ,7mA and 40 SID.

Table 1. Radiation absorbed dose, nominal exposure time and the measured value of exposure time at 40 cm SID.

Film No.	Radiation Dose (mGy)	Set Exposure Time (sec)	Measured Exposure Time (sec)	deviation%
1	0.8394	0.08	0.0802	0.25
2	1.0708	0.10	0.0991	0.90
3	1.2680	0.12	0.1190	0.83
4	1.6950	0.16	0.1590	0.60
5	2.1250	0.20	0.1990	0.50
6	2.6610	0.25	0.2490	0.40
7	3.4090	0.32	0.3190	0.30
8	4.2600	0.40	0.3990	0.25
9	6.8330	0.64	0.6390	0.16

Exposure parameter: 70 kVp, 7 mA, and 40 cm SID: Source to image distance

Table 2. Radiation absorbed dose, nominal exposure time and the measured value of exposure time at 50 cm SID.

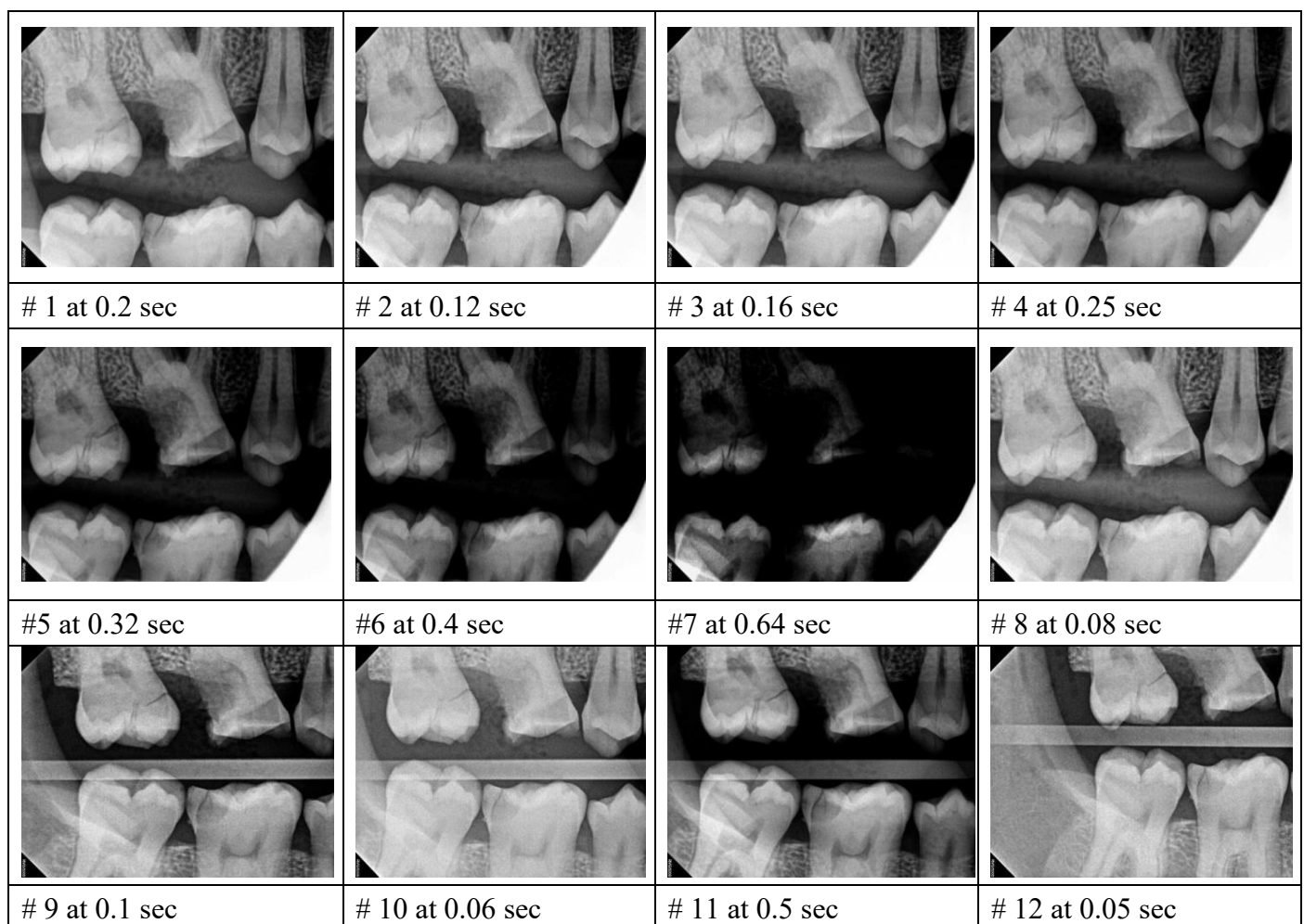
Film No.	Radiation Dose (mGy)	Set Exposure Time (sec)	Measured Exposure Time (sec)	deviation%
1	0.4225	0.08	0.0796	0.50
2	0.5316	0.10	0.0998	0.20
3	0.6412	0.12	0.1190	0.83
4	0.8569	0.16	0.1590	0.63
5	1.0750	0.20	0.2000	0
6	1.3470	0.25	0.2490	0.40
7	1.7260	0.32	0.3190	0.31
8	2.1610	0.40	0.4000	0
9	3.4570	0.64	0.6390	0.16

Exposure parameter: 70 kVp, 7 mA, and 50 cm SID: Source to image distance

Table 3. Radiation absorbed dose, nominal exposure time and the measured value of exposure time at 60 cm SID.

Film No.	Radiation Dose (mGy)	Set Exposure Time (sec)	Measured Exposure Time (sec)	deviation%
1	0.2410	0.08	0.0786	1.75
2	0.3031	0.10	0.0992	0.80
3	0.3654	0.12	0.119	0.83
4	0.4893	0.16	0.159	0.63
5	0.6135	0.20	0.198	1.00
6	0.7663	0.25	0.249	0.40
7	0.9835	0.32	0.319	0.31
8	1.232	0.40	0.400	0
9	1.975	0.64	0.639	0.16

Exposure parameter: 70 kVp, 7 mA, and 60 cm SID: Source to image distance

**Figure 3. Image quality assessment has taken at different exposure time's and 40 cm SID using RVG 5200 sensor for bitewing projection.**

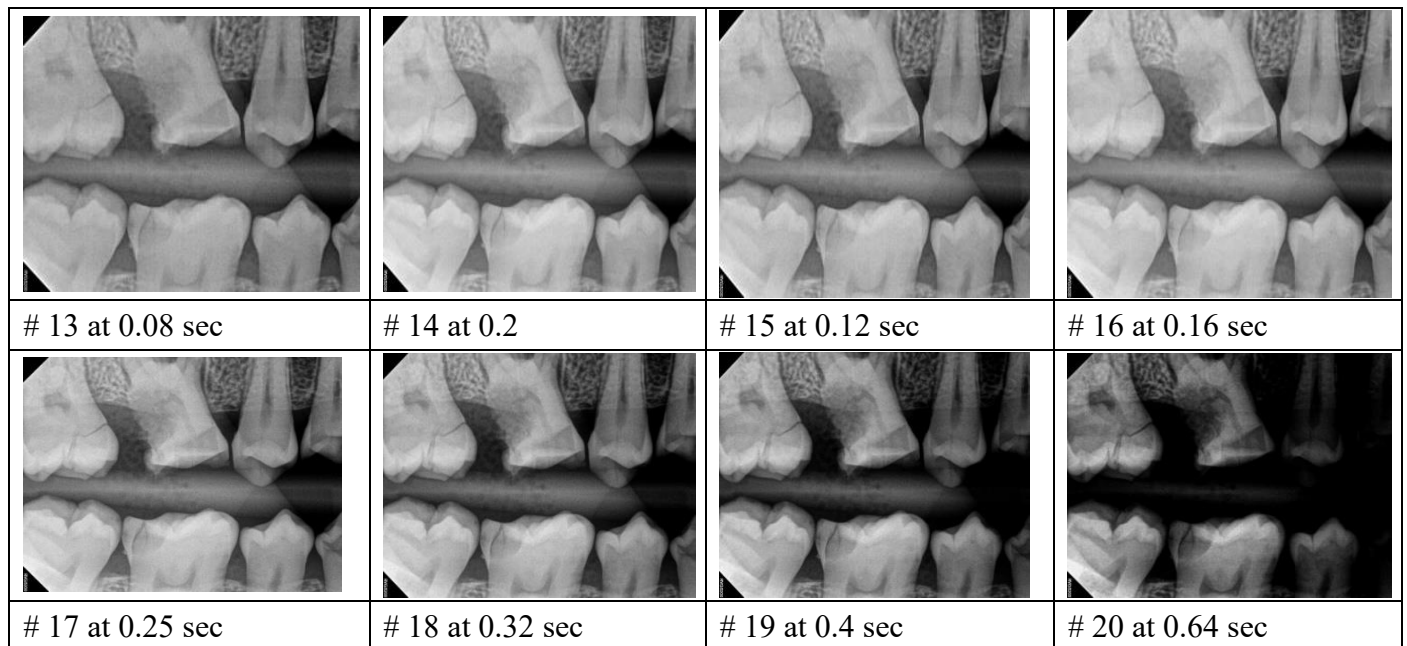


Figure 4. Image quality assessment has taken at different exposure time's and 50 cm SID using RVG 5200 sensor for bitewing projection.

From the obtained results the majority of the registered digital processing films gave acceptable image quality for diagnostic purposes and the main factor for choice the best image quality is the value of the absorbed dose given to the patient. For conventional dental film (manual processing) the best image recorded by the arrow shows that in Figure 2. It seems that the manual processing of the dental film cannot be used in the assessment process due to many factors found in this study such as the variation in choosing the physical parameters by the technicians especially for the exposure time and the distance between the collimator of the dental tube and the patient, film sensitivity, the dark room condition, condition of chemical solution such as fixer and developer and finally the handling and skills of the technician about the variation in the time for developing the dental film.



Figure 5: Photograph showing the best image quality assessed (arrow shape) in conventional X-ray film processing for premolar projection.

4. Conclusion

- 1) The image quality is essential for the diagnostic process; there are considerable variations between conventional and digital processing about radiation exposure and exposure time.
- 2) There are many factors that affect on the conventional processing such as human handling and skills, quality of chemicals, the film sensitivity, and repeat film rate.
- 3) The radiation survey shows background level and the radiation protection rules applied correctly at the hospital.
- 4) The exposure time represents the most important physical parameter that affects patient exposure and image quality in digital processing. The measured exposure time was found accurate for the examined dental unit.
- 5) The Entrance surface exposure depended on the exposure time and found linear at all examined station of exposure time.

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