

Does age matter? Exploring how Computers Mediate Effective Teaching and Learning among University Millennial Graduate Psychology Students: An Activity Theory Informed Review

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Abstract: The Activity Theory (AT) offers a conceptualisation of the ways in which computers play a pivotal and more importantly, a mediational role between teaching and learning. This literature review articulates the origin of the Activity Theory and goes ahead to conduct a vivid literature review on how the adoption and incorporation of computers (desktop computers, laptop computers, iPad, websites, smart phones and their learning and teaching affordances) based on the Activity Theory as the lens of theory, are assistive in the teaching of graduate university students. In such studies, it is also important to clearly show the gaps that are apparent in the literature review, or else the study is rendered meaningless.

1. Introduction

In Uganda, through the designated Ministry of Education and Sports, the use of computers has been encouraged, both as a subject and a pedagogical tool [1]. Computers as inseparable parts of Information Communication Technologies (ICTs), can give birth to learning that is transformational in nature [2] and learner participation, new routes for cognition, collaborative learning, facility sharing and communicating, among other student attributes [3]. Learning is not only a cognitive activity but a social one too through which content knowledge is constructed [4]. Although the use of computers in teaching and learning has been initiated and used at diverse education levels, its successful implementation has faced serious challenges such as those related to low levels of lecturer proficiency in their effective use [5] and lack of readily available power sources [6]. It has however been noted as far as universities are concerned, that there has been a call on them to make the use of computers part and parcel of teaching and learning, whether this leads to purely e-learning or blended learning.

Due to the fact that computers have now become a pedagogical tool in most universities, the phenomenon of their incorporation into tertiary institutional teaching has caused several studies to be conducted, specifically in Uganda, such as [7, 8 &9] in the application of computers in their different forms in the teaching of History, Literature in English and Mathematics at universities respectively, to mention but a few. Studies such as these have however focused on overall teaching rather than

being geared towards specific interest areas such as the age range (bracket) of the students. The fact that university graduate learners are largely millennials adds another vital and unique twist to the review, hence the need to carry out this literature review with this specific age range in mind as a lens. Computers are hence ICT tools that can be practical and effective in teaching university graduate millennial students at Makerere University and other universities at large. Therefore, using the Activity Theory as a theoretical lens, this literature review aimed at exploring how computers mediate the teaching and learning of university millennial graduate students, before a tangible conclusion can be drawn.

Pedagogical issues in higher institutions of learning such as universities seem to underscore age generations [10]. The gaps that exist are related to the fact that the generation of lecturers is the one that was taught using the pen and paper methods [11]. In fact, the majority of the current university lecturers belong to the generation X [12] that was born between 1965 and 1976 and baby boomers born between 1946 and 1964 [13], groups that are teaching the millennials or generation Y born between 1977 and 1995 [12]. Other writers suggest that millennials were born between 1981 and 1999 [14], a population whose upbringing has been marked by the power to make own decisions [15]. Millennials were born and bred in times of the revolution of computers (16). They are taught by a generation of teachers that teach the way they were taught [11]. The current generation of university students pursuing graduate studies are millennials who may want to dictate what they want to be taught, that is, content and how they want to be taught, that is, pedagogies [17]. This age group's career, educational and social aspects of life are dominated by computers [18] and most importantly, their learning is achieved best through computer utilisation. Characteristically, millennials are purpose-driven and passionate, enthusiastic and determined as they aim at achieving learning purposes. To them, every learning process must be meaningful and applicable to their real life and work life experiences [19]. They are multi-taskers, a trait that sometimes distracts them during learning, blunt in their approach to authority and experts in the use of technology in learning [20].

The majority of millennial learners prefer auditory and visual learning styles [21] but which are dependent on listening as a skill and tagged to computer use as a preferred learning tool. They also learn quicker through memorisation [22] while [23] argue that the difference in learning styles between the millennials and the earlier generations is the presence of media not the act of teaching and learning. Millennials detest reading print material and would rather read e-books. The learning styles of the millennials are also culturally grounded [24], something that the activity theory agrees with. Therefore, for effective learning to be achieved, millennial learners prefer to be taught when the following conditions are apparent; self-drive/autonomy, multi-tasking, e-books, audio visual aids, technology, recognition, flexibility/adaptation, purpose and risk taking.

According to the Activity Theory, there ought to be an interaction between subjects (teachers) and objects (goals/objectives/purposes), and that what students think (cognition) is inseparable from what they do (learning). For most millennial learners as is advocated by the activity theory, learning must have a goal and must foster teacher-learner interaction. Culture and society influence learning [25, 26] largely because they influence cognition. The learner interacts with the world and the subject interacts with the object, hence, the learner's needs/goals/purposes can only be actualised through their interaction with the society. The activity theory provides a zone or space that ranges between dependence on the teacher/not knowing to autonomy from the teacher/knowing. Millennial learners prefer to be independent learners unlike the learners in earlier generations, though through being aided by the teacher towards autonomy. This zone of proximal development [27, 28] is an arena of possibilities in which computer mediation influences learning. Learning is an activity/action/active and a lens through which learning challenges are overcome. The theory with its framework suggests

that in terms of purpose, learning is object-oriented, the subject is the teacher who must possess certain qualities, the computer and its several tools is the mediating artefact, the rules are those policies that guide the use of computers in learning, the community includes the teacher, computer technicians and learners while the division of labour is between the teachers and learners with different but sometimes revolving roles. Indeed, the activity theory and its assertions rhyme perfectly with the way millennials would prefer to learn and be taught.

2. Context: School of Psychology, Makerere University

The School of Psychology is part of the College of Humanities and Social Sciences (CHUSS) at the oldest and largest university in Uganda, that is, Makerere University. As far as this school is concerned, which also houses the unit of Educational Psychology, the use of computers and ICTs is very limited for the school lacks free and permanently available institutional internet services and access, readily available power point projectors, smart phones, computer labs, to mention but a few, for both lecturers and students, unlike in other schools such as the School of Education. Most importantly, the lecturers lack the necessary skills to merge face to face and computer use to achieve blended teaching and learning. Hence, the lecturers lack the age-specific ICT skills to teach millennials. The computers and all related forms that both lecturers and students own are personal and the effort to utilise them to mediate teaching and learning is a result of personal effort too, by virtue of the fact that the learners are millennials who prefer their use to the traditional methods of pen and paper. However, most studies on the use of computers in this generation has not taken on the use of any theory as a framework and lens for practical action [29]. Therefore, there a dire need to conceptualise the ways in which lecturers, university millennial graduate students and computers interact with one another to change the experience of teaching and learning, using the Activity Theory.

Most of the documented research seems to indicate that the majority of empirical studies on millennial's perception of the effectiveness of ICT/computers in learning have been conducted in Europe and America [30]. Also, in matters concerning the mediating role of computers in effective teaching and learning, tackling the availability of ICTs alone is not enough; there is need for capacity and ability for use in order to achieve learning goals. Hence, whereas millennials may have the motivation to use ICTs, they may not be trained adequately on how to use them, the lecturers are themselves low on ICT knowledge due to attitude which influences their perception of their effectiveness in teaching and learning as negative and are continuing to teach the way they were taught. On the other hand, some millennials are also not willing to take e-learning courses and hence lack the relevant skills [16] there are also issues of availability, accessibility and affordability of ICTs, which negatively influences pedagogical styles. Therefore, the review is aimed at exploring the perception of millennial post graduate university students of the mediating role of computers in leading to effective learning.

Whereas [31] seem to focus on tools that are dominantly used for particular subjects such as Mathematics and Literacy, and rarely in Social Sciences disciplines such as Educational Psychology, for particular educational stages such as Primary and Secondary levels, there has been little reference to age-related considerations, particularly those age ranges that university students belong to, such as millennials, and specifically those pursuing post graduate studies in disciplines such as Educational Psychology. Therefore, the age dimension needs equal attention too, since this influences how the learners of different ages can actually transform how they want to learn and how they want to be taught [32].

3. Methodology

The search for and review of literature was achieved through reading peer reviewed journal articles on computers and millennials where the key words used in searching were activity theory and graduate millennials' preference for computers in learning so as to achieve an all-round conceptualisation of how the activity theory can be applied in teaching graduate millennials pursuing humanities disciplines such as Educational Psychology at the mentioned university. This literature was accessed from different search sources such as google scholar. At the beginning of the literature review, about 58 studies were read and reviewed covering activity theory's origin, development and application in pedagogy and millennials' preferences of tools of learning. It should be noted that some articles were not fully available as they were published in non-open or restricted access journals and by the time of the review, I didn't have access to them through Makerere University Library where most of the review happened. About 13 papers were excluded from the review because they were not empiricism-based papers, but rather, theory-based. In all reviewed articles, it was a condition that there had to be a coherence between the objective, research question, methods of analysis, results and most importantly, linkage with the activity theory. Existing gaps within these articles were identified too, which would inform future studies on activity theory, computers and millennials as a special population.

4. Activity Theory

This theory has sometimes been interchangeably used as the Cultural Historical Activity Theory (CHAT) and as its name suggests, it stresses that, any activity that human beings are involved in, such as teaching and learning, is not an isolated one but rather, a joint venture that has several tools that are used together to overcome a particular prevailing challenge, specifically a learning challenge [8, 33]. According to [27], the origin of the activity theory has its roots in learning methods that children use and, the mediational processes should be vital in all teaching and learning processes to give birth to effective learning outputs. These mediational elements may include, among others, the stimulus and response, which must be present if learning is to be claimed. In addition to what Vygotsky suggests, [34] further suggest that there is need for a coordination between those tools, role of community and division of labour. Hence, the gaps in Vygotsky's approached are bridged by Leon'ev. The effort to ensure that division of labour is added into the hierarchical arrangement of the vital components necessary for cognitive development [35], which basically implies that learners as receivers and teachers as stimuli are assigned differing responsibilities as they engage with the different tools, like computers, in order to realise their learning goals. More so, rules and role of community are important in order to achieve tangible learning outcomes [36]. Hence the interplay between these elements, that is, division of labour, subject, rules, tools, community and object [33] form the system around which the activity theory revolves. Hence, according to Hardman, the activity theory is a framework of analysis that can be applied to many other teaching and learning dimensions and attributes, age inclusive.

5. Literature Review

Millennials have transformed how learning takes place [32] and ICTs have changed how teachers teach [16]. Because of the period in which they have grown and experienced education, they are referred to as digital students or net generation [37] and can be differentiated from earlier generations' learners because they multi task and multi process; they process a multiplicity of knowledge facts [38]. They merge online information to gain knowledge and entertain themselves. They can identify tools and utilise them to construct things that they perceive as vital [39]. They are active rather than

theoretical in learning, with fast cognitive functioning. They grasp content faster in the presence of computers. However, the use of computers in mediating effective teaching and learning among millennials comes with challenges. In most African universities such as those in developing countries such as Uganda, computers are not readily available, are expensive, internet access is not limitless and some computer tools need expertise, which they lack.

To millennials, computers have caused a shift in the way teaching and learning are perceived [30]; from teacher-centric to learner-centric learning approaches through personal construction and discovery of knowledge and the use of ICTs; from absorption to navigation of content; from school-based to lifetime learning; from general to specialised learning; from obligatory to fun, engaging and enjoyable learning; and finally, the teacher's role has shifted from being an instructor to an overseer [40]. Learners through the use of ICTs are being prepared for better and more productive ways of becoming better citizens [41]. Millennials are required to be that type of population whose needs will be met through information technology.

Although literature seems to focus on more developed continents and countries such as the USA and Europe [30], there is need to note that in addition to school use, ICTs have been intensively used in other non-school settings such as homes [42]. In universities however, learners own more mobile telephones (which use computer systems) than other scholastic materials. In Europe for example, there is an inverse relationship between laptop usage and a desktop usage, and in terms of age, among the younger generation, such as the millennials, computer ownership is higher than among their older counterparts [43]. In the same geographical areas, unlike in Africa, broadband has successfully replaced narrowband connectivity [44]. While the millennials in the less developed world are being encouraged to use them for academics, their counterparts in the more developed world are using them for entertainment, but all in all, millennials have dominated online events [42,43].

Millennials are confident, liberal, optimistic, open to change, knowledgeable, connected and can express themselves in multiple ways [45]. Such attributes have transformed their idea of learning. However, despite being high technology users, they are not necessarily competent. They need a community to work with, such as schools and more knowledgeable peers [46, 47, 48]. This competence requires them to possess knowledge and skills for tool usage, communication expertise, learning, problem solving and participation [9]. Competence stretches beyond access and utilisation into potential for usage. Millennials use ICTs concurrently and maximally and they prefer to learn through tasks [50].

Whereas university millennials have exposure to virtual education, this is only seen in Europe but scanty in Africa [30] until COVID-19 broke out and there were no other alternatives other than onlinisation of teaching and learning, and these findings lack continental comparisons. Without a doubt, computers mediate learning in tertiary education institutions [51] since they improve academic achievement [52]. This rise in performance is mediated by controls and evaluations. Although millennials have high interest in computers, they do not seem to have particular keenness towards having training in e-learning to boost their capacity, but from the year 2006, the number of millennial students pursuing such courses has been growing [53, 54]. However, the majority do not place value on online courses [55]. Also, where as they may be motivated to use them, institutions may not allow them to do so.

Millennials' expectations' in the use of technology is high since it provides access to huge pieces of learning information, is entertaining and fun [56]. ICTs are a form of communication between students and teachers. Modern researchers hence need to ask themselves how millennials would like to be taught if effective learning is to be achieved. The changes in pedagogy should hinge on the traits

of millennials [32] and instructional styles must be modified to match their learning styles [57]. They employ varied learning styles and use them sequentially [58]. They could use ear phones at one stage, they could write at another stage; while they employ rehearsal at another stage; and as opposed to group learning, they learn better through individual tasks [26]. They learn using ICTs through the utilisation of the internet to boost knowledge and solve learning challenges. Specifically, these sequential learning styles include visual and auditory, among others. There is a significant relationship between auditory learning and academic achievement [59], but they are low on interpersonal skills [60].

The philosophical underpinnings of learning, through digital literacy have shifted from the traditional teacher-controlled approach to online, blended and collaborative approaches which have reduced face to face teacher-learner interaction [61]. But this digital literacy seems to have been experienced among learners alone, and not among the teachers. For computers to have a significant impact on learning, both teachers and learners must perceive them as vital. The 21st century professionals require to be trained accordingly for learners to be prepared for the demands of future career life. Today's millennial learners have grown in the digital era [62] and their cognitive faculties are hyperlinked [61]. It can therefore be argued that integrating technology in teaching and learning has two huge benefits; promoting effective learning and grooming learners for the technology-loaded career life. Learners are recipients of teaching and learning; and establishing their perception on the mediating role of computers in leading to effective learning is of importance to researchers and educational technology policy makers. They exist in a technology-centric environment [61] and have used the internet for out of school purposes too [63] and can learn without necessarily being physically in class. This could easily lead to low teacher monitoring of learning. Technological pedagogies such as blogs and wikis could boost academic discussions and dissemination of content on-line, through both cross sectional and longitudinal approaches [64]. Technology would replace the teacher and its advantages would outweigh its limitations.

For technology to serve its learning purposes, learners must possess a positive attitude [61]. Technology plays a role of catalysing transformations in education, vital in realising productive students in society [65, 66]. Universities should aim at career-driven instruction when dealing with millennials. Pedagogical limitations of technology must however consider drive, teaching art and ability; and attitude [67] in teaching and learning. The millennial learners' perception of ICTs effectiveness in learning may be low due to lack of technology literacy, presence of technology difficulties, lack of EdTech tools and high costs [68], which require training, installation of ICTs in the classroom, skills imparting and funding respectively. ICTs in learning transform learning process from teacher-centric to learner centric, that is, Quadrant A to Quadrant C learning [69].

The commonest form of learning among millennial learners is through phones and text messages [70], email, camera-rich phones, chat groups, blogs and video games [31]. Technology has also enabled millennials to become team leaders and team players, hence collaborative learning [71]. These however cause distraction. The use of technology diverted millennial learners from actual learning to self and social entertainment, hence a decline in academic performance. Teachers should not leave learners alone but continue to guide them as [72] argue that millennial learners prefer group study with similar age group learners. This may not work well in classes that have learners of differing generations that bring in different strengths. Millennials would bring in their technical potential, baby boomers with their team spirit and team work practice and the "we can do it " attitude of the much older generation [72]. Millennials portray creativity to make new things using computers and ICTs and use new creations to collect and disseminate necessary information [73]. They communicate through technology and have zero tolerance for people who find it hard to use technology [74]. These

personality attributes have an impact on learning [75]. Their ability to carry out many tasks at once has an inverse relationship with their attention span, which negatively affects their potential to think critically [74]. But this does not mean that they do not learn quickly. They are confident while using ICT tools, and in fact they are much better than the older generation [76].

Computers mediate effective learning through student interaction [77]. Among millennial university students, devices for social media have gone beyond being mediators of learning into becoming an extension of the self [78]. These include Facebook, WhatsApp, Youtube and Instagram which this age group feels should be provided for personal and learning purposes [79] save for being blamed for poor academic performance due to distraction and decline in attention span [78]. They engage in online videos compared to the other generations [80] but of course this is facilitated by online facilities such as you tube and Instagram. Their academic attitudes are as many as their interests, and are influenced by background [78] but this could also be as a result of exposure to computers. The use of ICTs among millennial learners is however for personal rather than instructional reasons, an attitude that does not exist among millennial learners only but also among the teachers [81]. This attitude among millennial learners is not only positive but negative too [78] and this in addition to being influenced by age and background, is influenced by gender too. It turns out that among millennials, males prefer to use ICTs in learning compared to their female counter parts [82]. Hence, it would correct to assert that generally, millennial learners have a positive attitude towards the use of computers as mediating instruments towards achieving effective learning (83).

Through the use of computers and their respective affordances, millennials learn best through active learning [84] as opposed to the lecture method [85] which has continued to thrive despite the emergence of ICTs [86] because the former is deeper, involving and learner centric. Through active learning, millennial learners are able to engage in activities that produce knowledge; they are active creators rather than mere recipients of learning content [87]. They thoughtfully create things [87, 88] to achieve vital results. Through active learning, millennials achieve through working as individuals, pairs, small groups and cooperative learning groups [89]. Through these, they map, brainstorm, collaborate, role play, cooperate, and peer learn and simulate [89]. These require higher order thinking skills of analysing, synthesising and evaluating [90], fit for millennial post graduate university students [62]. Hence, millennial university students would want to learn through active learning. This has implications on the teacher, who must be willing to teach how the millennials want to be taught. Without doubt, a combination of active learning and ICTs, learning is most likely to come out as effective through the achievement of higher order thinking skills.

6. How the Activity Theory is applicable in an Educational Psychology Graduate Classroom

The teaching of Educational Psychology and its sub sets is like the teaching of any other humanities and social science subject but nevertheless, the elements of the activity theory are very applicable to its teaching and its learning. Without a doubt the teaching and learning of Psychology in part and part and parcel of studies in humanities and social sciences mainly because they are an integral part of each other with the same expected and actual learning outcomes. The six dimensions of pedagogy as suggested by the activity theory, that is, the object, subject, community, mediating artefacts, division of labour and rules in teaching Psychology are addressed and explored.

6.1 The Subject

The subject as the person or collection of persons who are participants in the activity [91]. This is the teacher [92, 93] while it can be the in addition to the teacher, the learner, actions and activities

happening in the learning and teaching process [94]. The latter definition requires any reader to note that as much as the learners are human subjects, the actions and activities lack the human element. Hence, it would be safe to argue that subjects take both the human and non-human form. In other studies, too, like those conducted by [95], the subject is the teacher, in this case, the psychology lecturer whose role is to educate and mentor educational psychology graduate students using digital methods. In light of the activity theory therefore, the subjects are the lecturer, graduate students and other stakeholders whose goal is to disseminate and exchange educational psychological knowledge. It should be noted too that lecturers as subjects, influence which tools will be used by the millennial graduate students for example, computers and their tools/applications/affordances.

6.2 The Object

This according to [96] if the subject is to effectively participate in any learning activity, an object or a motivation must be present. Sometimes, the lecturer's practices of teaching and instruction are the object [93] who further assert that a group of educational psychology graduate students in this scenario may become the object and this is mainly because they cause a shift in the pedagogical practices that the lecturer uses, although it is not clear how they cause this shift. Teaching graduate educational psychology students necessitates teaching them beyond knowledge to teaching them the application of concepts in their teachers' socio-cultural settings as this is what is examined too in the summative examinations at the end of each academic year. Hence this necessitates teaching and examinations to go beyond knowledge into application of acquired knowledge, a pedagogical need that every millennial student desires to achieve at the end of every teaching and learning process. Through teaching and learning, graduate educational psychologists should be able to know (acquire knowledge), probe (ask questions), analyse (think beyond basics) and apply acquired psychology content to fit their own personal and professional realities [96].

6.3 The Community

Subjects are part and parcel of a cultural and bigger social entity, guided by clearly stipulated norms that control conduct and behaviour (Cole & Engestrom, 1993). Majority of literature read and reviewed seems to indicate that the community comprises of students and teachers/lecturers for example in a study conducted by [93], the community is a battery of active teachers but also includes other school occupants such as school managers, psycho therapists, learners and support employees, yet [92] insists that the community includes just learners and their teachers, which seems so limited when applied to a university context. Parents have been added to the list of components of the community who in this case would be guardians and parental figures for the graduate students [95]. On the other hand, it is asserted that as long as people possess similar values and goals, they form what the activity theory calls the community [97]. Graduate learners pursuing educational psychology are teachers carrying out academic upgrade, with the uniform goal of becoming teachers of educational psychology in higher institutions of learning such as teacher colleges and universities. Hence they have a uniform background and professional purpose. Accordingly, a look at the community from a wider perspective consists of factors that impact on the students' interaction with subject content [98] which is a significant contradiction with what a community is presented to be, that is, as the collection of people who are working collectively on an object [99]. These views seem to ignore what the student brings to the scene and focus on mainly teachers and study rules.

6.4 The outcome

Every teaching and learning process is aimed at a worthwhile result that is related to the instructional objectives and the learners' content knowledge [93] which is achieved through tests, assignments, examinations and research dissertation completion in the case of the graduate educational psychology students. As long as graduate students turn out psychologically proficient at the end of the course, that is considered a worthwhile learning outcome as [99] argues that learning outcomes are positively related to subject proficiency. Learning outcomes are learning results [94]. However, Trust [97]'s definition of outcome seems to divert from the previous one as he argues that for example, a lecturer teaching graduate students of educational psychology aims at a worthwhile learning outcome if he/she aims at causing growth and improvement of how the learners engage professionally.

6.5 Division of labour

The learning process is a participatory project where different categories of people, events and objects are active players in the teaching and learning process [35]. Lecturers must appreciate that graduate learners and the learner contexts play differing roles in the lecture/classroom [98]. The learning context might include the home background and setting of the student and the learning/classroom environment. What students learn at home and church does not vanish once that student is in a classroom or school or university setting. There are no clear demarcations between these learning contexts and definitions [98]. Indirectly, the division of labour is the community at the same time [8] who goes on to argue that the community stretches beyond the classroom into the social and cultural experiences brought to the classroom by the students. Learners' interests must be taken into account too. Students might have similar goals but different interests which every lecturer must take into account and support, a task that is difficult to achieve but worth delving into. Division of labour could also be how responsibilities and tasks are shared between the players in an activity, that is, who does what [91]. In a university setting where graduate students take on further studies, roles of lecturers/teachers must be streamlined and how power flows from top to bottom must be clear [93]. In this particular setting, the role of the lecturer may include but may not be limited to assisting graduate students set learning goals that emanate from teaching goals, suggest the learning activities, decide measures of performance and select the overt manifestation standards. The graduate student in this case is the receiver or respondent while the lecturer is the mediator [99]. Other authors such as [94] are general rather than specific in defining division of labour as the different roles played by different players in the teaching and learning activity.

6.6 Mediating Artifacts

These are also called tools that psychologically and physically mediate between the object and the subject [91]. Different subjects/courses/ disciplines require different artifacts. Sometimes, certain resources can be of great assistance to the lecturer/teacher to ponder on their teaching approaches for purposes of improvement [93] especially as far as skills are concerned. Such artifacts may include computers and their modern derivatives, chalkboards, books (e-books, exercise and text forms), lecturer teaching techniques and behaviour modification strategies, to mention but a few. These are subject-specific, for example the artifacts required in a humanities course such as educational psychology may differ from those required in a science and lab based discipline such as Mathematics and Biology respectively. Handouts, text books, signs and symbols are some of such visual and non-visual tools [94] though it is well known that millennial students prefer audio visual options. However, it is also argued that they must be only visual in nature and appeal to only the vision sense

such as colour, gestures, chalkboards and diagrams [95]. The lecturer's ability to use as many relevant mediating artifacts as possible exposes his/her level of creativity in formulating tools to promote learning in educational psychology.

6.7 Rules

This in a way may involve graduate students taking turns and is related to division of labour. They are regulations [94]. The lecturer is the commander of these rules hence there is a relationship between rules and the subject [78]. These rules that the lecturer sets flow from the institutional/university rules. In both individual and group project presentation methods, which are the commonest methods used in teaching graduate students of educational psychology, certain rules must be put in place that stipulate the responsibilities of the lecturer, individual and group/joint graduate students [100]. The role and responsibility of the lecturer is that of regulation on one hand and promotion of group cooperation. For example, group work must not ignore individual contribution to the subject matter's final product for learning to be referred to as engaging and collaborative. University students using a group work approach must for instance participate fully through presentation of findings, posing questions, elaborating on the presentations and responding to questions. This approach is very applicable to a graduate setting where learner-centred cognitive centred approaches to graduate teaching is encouraged where the lecturer is just an overseer. This has also been possible with social media applications such as WhatsApp groups which have been very practical in group work teaching and learning.

7. Implications to Graduate Teaching at Makerere University

Without a doubt, computers effectively mediate teaching and learning especially for graduate millennial students amidst this COVID-19 scenario where physical lectures have been temporarily limited in favour of both blended and on-line teaching and learning. Emerging technologies in this era of technological growth in Uganda are a worthwhile alternative to teaching/lecturing and learning. What the literature reviewed sends to lecturers of graduate students as a message is that the stage must be set rightly to enable the use of these emerging technologies to achieve effective teaching and learning. The conditions conducive for use of computers in teaching and learning must be put in place and one major dynamic must be a switch to learner-centred but supervised teaching and learning. Millennial graduate students are self-driven and prefer taking the lead in everything they do, hence learner/cognitive centred learning. Whatever is done in the use of computers to mediate graduate teaching and learning must promote learner engagement, collaboration and interaction at different levels and stages of teaching and learning. Even with computers as mediators, the lecturer must "present."

Emerging technologies come in many varieties and levels of availability and affordability and in their own unique ways, each causes change in learning in a positive way. If teaching, teaching method and teaching tools do not cause change in a learner, then learning has not happened. These computers in their different varieties come with several affordances but also with limitations as far as what millennial graduate students needs from them. Some of the computer affordances are effective for content knowledge but limiting in some academic areas such as research supervision since some research needs require elaborative discussions that may need to be physical in nature. This is indicative of the need for a blended approach to some of these learning needs among graduate students. Each teaching and learning experience at the university must also be guided by rules and division of labour, for example, what is expected of a research supervisor, research students, how much content is expected to be sourced from the two categories of stakeholders at graduate level, to

mention but a few. This helps to limit learner expectations, reduce lecturer work load and promote self-drive. Graduate learners must also be allowed to make errors and learn from them so as to rise up above them as creators and contributors to the existing and emerging educational psychological knowledge.

In all teaching and learning situations, it is true that learner knowledge input is a source of further learning. Judging from the fact that the younger generations such as millennials, knowledge due to wider exposure to new knowledge, skills and resources, learners happen to be more knowledgeable than their instructors/lecturers hence the latter are required to have an open mind to knowledge sharing and learning from their learners. Lecturers need to be open to being inspired and even challenged by their graduate learners in order to broaden their thinking. For example, in some scenarios, graduate learners will have more knowledge on computer use, applications and affordances than their lecturers, a fact that might inspire the latter and the wider university fraternity to accept and embrace training in computer use in teaching as the new normal way of teaching to satisfy the learning needs of millennial and future generation of learners. Pursuance of further post graduate diplomas in educational technology for all university academic staff would be mandatory to assist in the teaching of millennial and future generation graduate and undergraduate students.

Academic staff at the university may also need to undergo training in a post graduate diploma in education, with the hope of learning to prepare and practice lesson preparation plans and schemes of work that portray consideration of the activity theory and its components. Through the respective lecture plans, they would be expected to clearly showcase what the artifacts, community, objects, subjects, division of labour and rules would be as far as their lectures are concerned and their interrelationships for effective teaching and learning. These and other benefits can only be achieved through basic teacher training for academic staff retained by the university as lecturers, for its not enough to excel in one's discipline to render him/her a lecturer without the necessary and required pedagogical training.

It would be right and fitting pedagogically to involve graduate learners' views in subject topic formulation and re construction especially during graduate course reviews so that there is a consideration of what content they deem vital to them. Knowledge that is taught to graduate millennial students at university must be relevant and applicable. It would be important too if their teaching and learning took audio and visual methods into consideration through on-line lecturer-learner interaction through methods like zoom lectures since millennials detest print material channels of learning. Teaching of graduate millennial students requires methods that promote learners' autonomy and multi-tasking as they transition from the place of not knowing to one of knowing (zone of proximal development). Computer training should be encouraged because as much as the graduate millennial students prefer use of computers, they lack training in their usage, and lecturers too must undergo such training as most lack it. Teaching styles at the university must also be revised to fit cognitive and task oriented options since millennial students possess fast cognitive functioning which might require the lecturer to play the role of a mere overseer in the teaching and learning process. University policies on graduate studies must also stress e-learning, provision and mandatory use of graduate computer laboratories and necessity of computers as part of admission requirements into graduate programmes at the university, backed by availability of internet connectivity as a key responsibility of the university towards the graduate learners.

8. Conclusion

Through the literature review, the mediating role of computers in effective teaching and learning has not considered millennials' perception as influenced by their peculiar traits. The Africa/developing world has no such studies, and isolated cases have been observed in tertiary education institutions such as universities, but not among post graduate millennial learners pursuing studies in humanities, rather than Science, Mathematics and Language studies. Therefore, most of the disciplines in which such studies have been conducted revolve around Mathematics and Language education not in humanities. Most importantly, the theories guiding most studies, such as the Social Cognitive Theory, are not in favour of active learning yet computers necessitate learning by doing, especially among millennials. Because of these gaps, the review focused on the perception of the importance of computers in the teaching and learning among millennial learners and the hindrances that make this mediation unachievable, in a Ugandan context, specifically in the field of Educational Psychology and used the activity theory to explain this mediation where subjects, objects, rules, tools/mediating artifacts, division of labour and community interact to lead to effective teaching and learning through active learning.

Indeed, although there is sufficient research on how computers mediate teaching and learning generally, there is almost no study addressing this mediation in the teaching and learning of Psychology, unless it is categorised as just any other humanities discipline, which is academically unfair to clamp it together with the rest of the subjects yet it is a unique discipline that attracts specific students that have unique career goals. Even the application of the CHAT approach and activity theory in teaching and learning Educational Psychology is non-existent, hence a rich area for further research in future.

References

- [1] Ndawula, S. (2016). *Information and communication technology in secondary schools of Uganda: Examining the trends and hurdles*. Retrieved March 19, 2018, from <http://home.hiroshima-u.ac.jp/cice/wp-content/uploads/Seminar/HandOut/135>
- [2] Ng'ambi, D., Gachago, D., Ivala, E., Bozalek, V., & Watters, K. (2014). *Emerging technologies in South African Higher Education Institutions: Towards a teaching and learning practice* <https://vula.uct.ac.za/access/content/group/8ff4f1d3-4a8> Accessed, 18 Dec 2021
- [3] Brown, C., & Gachago, D. (2013). *Emerging technologies in higher education. A guide for higher education practitioners*. In *Innovating Pedagogy 2016: Open University innovation report 5*. Milton Keynes: The Open University.
- [4] Veletsianos, G. (2011). *Designing opportunities for transformation with emerging technologies*. *Educational Technology*, 51(2), 41–46.
- [5] Kintu, M.J & Zulu, C. (2015). *Computer competences among academic staff and students in relation to the use of blended learning; The case of Mountains of the Moon University in Western Uganda*. *South African International Conference on Educational Technologies*. Pretoria
- [6] Ndawula, S., Kahumba, B.J., Mwebembezi, J., & Masagazi, J. Y. (2013). *Getting schools ready for integration of pedagogical ICT: the experience of secondary schools in Uganda*. Retrieved June 1, 2018, from <https://www.researchgate.net/publication/259178959>
- [7] Sebowa, D, K. Ng'ambi, D., & Brown, C. (2014). *Using Wikis to teach History Education to 21st Century Learners: A Hermeneutic perspective*, *Critical Studies in Teaching and Learning*, 2(2), 24-48.
- [8] Nambi, R. (2018). *Using Activity Theory to Explore the Possibilities of Intergrating ICT in the Training of Literature in English Teachers at Makerere University: A Literature Review*, *International Journal of Learning, Teaching and Educational Research*, 17(12), 135-148
- [9] Batibwe, M.S.K (2019). *Using Cultural Historical Activity Theory to understand how emerging technologies can mediate teaching and learning in a mathematics classroom: a review of literature*. *Research and Practice in Technology Enhanced Learning*, 14 (1), 1-20
- [10] Scott, C.L. (2015). *The future of learning 3. What kind of pedagogies for the 21st century*, *UNESCO Digital Library*
- [11] Black, A. (2010). *Gen Y: Who they are and how they learn*. *Educational Horizons*, 88

- [12] Gibson, L. (2009). *Enhancing inter-generational communication in the classroom: Recommendations for successful teacher-student relationships*. *Nursing Education Perspectives*, 30(1), 37-39.
- [13] Mangold, K. (2007). *Educating a new generation X employee*. *The Journal of Nursing Administration*, 28(12), 36-43.
- [14] Lancaster, L.C., & Stillman, D. (2002). *When generations Collide*. New York. HarperCollins Publishers Inc.
- [15] Coomes, M.D., & DeBard, R. (2004). *Serving the Millennial Generation*. San Francisco. Jossey-Bass.
- [16] Gibson, L & Sodeman, W.A. (2014). *Millennials and Technology: Addressing the communication gap in Education and Practice*. *Organisational Development Journal*, 32(4), 63-75.
- [17] Kirkwood, A & Price, L. (2005). *Learners and Learning in the Twenty-first Century: What do we know about students' attitudes towards and experiences of information and communication technologies that will help us design courses*, *Studies in Higher Education*, 30 (3), 257-274.
- [18] Chelliah, J & Clarke, E. (2009). *Collaborative teaching and learning: Overcoming the digital divide?*
- [19] Djiwandono, P. (2017). *The Learning Styles of Millennial Generation in University: A study in the Indonesian Context*. *International Journal of Education*, 10, 12.
- [20] Prensky, M. (2015/2016). *Listen to the Natives*. *Educational Leadership*, 63(4), 8-13
- [21] Abidin, M.J.Z., Rezzaee, A.A., Abdullah, H.N., and Singh, K.K.B. (2011). *Learning styles and overall academic achievement in a specific educational system*. *International Journal of Humanities and Social Science*, 1(10), 143-152.
- [22] Almutairi, N.H. (2007). *The influence of educational and socio cultural factors on the learning styles and strategies of female students in Saudi Arabia*. Unpublished dissertation. School of Education, University of Leichester.
- [23] Chan, L. K & Pawlina, W. (2015). *Teaching Anatomy: A practical guide*. Springer. London.
- [24] Sikkema, S. E & Sauerwein, J.A. (2015). *Exploring culture-specific learning styles in accounting education*. *Journal of International education in Business*, 8(2), 78-91.
- [25] Cornu. B. (1995). *New Technologies: Integration into Education*, in D. Watson & D. Tinsley (Eds). *Integrating Information Technology into Education*. London: Chapman & Hall. *On the Horizon*, 19(4), 276-285.
- [26] Li, C. (2012). *An investigation of Chinese students' learning styles in an English medium university in Mainland China*, *Theory and Practice in Language Studies*, 2 (1), 6-13.
- [27] Vygotsky, L.S. (1997). *The Historical meaning of the Crisis in Psychology: A methodological Investigation*. In *The Collected Works of L. S. Vygotsky. Vol.3. Problems of the Theory and History of Psychology* (pp.233-344). R.W. Rieber & J. Wollok (Eds.). New York: Plenum.
- [28] Roosevelt, F.D. (2008). *"Zone of Proximal Development."* *Encyclopaedia of Educational Psychology*. SAGE publication
- [29] Bakkabulindi, F.E. (2011). *Individual Characteristics as Correlates of Use of ICT in Makerere University*. *International Journal of Computing and ICT Research*, 5(2), 38-45
- [30] Zickuhr, K. (2011). *Generations and their gadgets*. *Pew and American Life Survey*, 2010
- [31] Web, M & Cox, M. (2004). *A Review of Pedagogy Related to Information and Communication Technology*. *Technology, Pedagogy and Education*, 13 (3), 235-286.
- [32] Noguera, I. (2014) *How Millennials are changing the way we learn: the state of ICTS integration in education*. *RIED*, 18.10.5944RIED.18.1.13800.
- [33] Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit <http://lhc.ucsd.edu/MCA/Paper/Engestrom/expanding/toc.htm>. Accessed 4 December, 2021.
- [34] Leont'ev, A. N. (1978). *Activity, consciousness, and personality*. Englewood-Cliffs: Prentice-Hall
- [35] Hardman, J. & Amory, A. (2015). *Introduction to cultural-historical activity theory and tool mediation*. In V. Bozalek., D. Ngambi., D. Wood., J. Herrington., J. Hardman., A. Amory (Eds.). *Activity Theory, Authentic Learning* (pp. 1-21). Oxon: Routledge
- [36] Hardman, J. (2008). *Researching pedagogy: An Activity theory approach*. *Journal of Education*, 45(1), 65-95.
- [37] Pedro, F. (2006). *The new Millennium learners: Challenging our views on ICT and Learning*, France, OECD.
- [38] Hofstetter, F. (2000). *Multimedia Literacy Textbook*. New York, McGraw-Hill Education.
- [39] Brown, J.S. (2000). *Growing up digitally. How the web changes work, education and the way people learn*, *Change*, 32(2), 10-20
- [40] Tapscott, D. (1999). *Educating the Net Generation*, *Educational Leadership*, 56(6), 10-20.
- [41] Kozma, R. (2003). *ICT and Educational Change. A global phenomenon*. In. Kozma, R (Ed.). *Technology, Innovation and Educational change: a global perspective*. Eugene, OR, International Society for Educational Technology.
- [42] Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). *Social media and mobile internet use among teens and young adults*. *Pew Internet and American Life Project*, 1-51.
- [43] Horrigan, J.B. (2007). *A Typology of Information and Communication Technology Users*. Washington DC, Pew Internet & American Life Project.
- [44] Smith, A., Rainie, L., & Zickuhr, K. (2011). *College students and technology*. Retrieved from <http://goo.gl/G1pFm>.
- [45] Pew Research Center (2010). *Millennials: A Portrait of Generation Next*.

- [46] Eynon, R. (2009). *Mapping young people's uses of technology in their own contexts. A nationally representative survey.* Coventry. Becta.
- [47] Hardman, J. (2005). *An exploration case study of computer use in a primary school mathematics classroom: New Technology, new pedagogy? Perspectives in Education*, 23(4), 1-13.
- [48] Kaptelinin, V. (2013). *Activity Theory.*In: Soegaard and Dam, Rikke Friis (eds). "The Encyclopaedia of Human-Computer Interaction, 2nd Ed." Aarhus, Denmark.
- [49] Ala-Mutka, K. (2011). *Mapping digital competence: Towards a conceptual understanding.* Seville Institute of Prospective Technologies.
- [50] Redecker, C. (2009). *Review of learning 2.0 practices: study on the impact of web 2.0 innovations on education and training in Europe.* JRC Scientific and Technical Report.
- [51] Glenn, M. (2008). *The future of higher education. How technology will shape learning.* Economist Intelligence Unit. New Media Consortium.
- [52] Means, B. M., Toyama, Y., Murphy, R., & Bakia, M. (2010). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies, Structure*, 115(3).
- [53] Punie, Y., Zinnbauer, D., & Cabrera, M. (2006). *A review of the impact of ICT on learning.* Institute for prospective technological practices, JRC, European Commission.
- [54] Allen, I.E & Seaman, J. (2013). *Changing course: Ten years of tracking online education in the United States.* Newburyport, MA.
- [55] Taylor, P., Parker, K., Lenhart, A & Patten, E. (2011). *The digital revolution and Higher education.* Washington DC. Pew Research Center.
- [56] Gardner, S.F. (2006). *Preparing for the Nexters.* American Journal of Pharmaceutical Education, 70(4), 87-87.
- [57] Felders, R. M & Henriques, E.R. (1995). *Learning and teaching styles in foreign and second language education.* Foreign Language Annals, 28(1), 21-31.
- [58] Dywando, P.I. (2017) *Learning styles of Millennial Generation in Universities.* International Journal of Education, 10(1), 12-19.
- [59] Jaish, M.A. (2010). *The relationship among learning styles, language learning strategies and academic achievement among English majors at Al-Aqsa University.* Unpublished Masters' Thesis. The Islamic University Deanery of Graduate Studies, College of Education.
- [60] Lower, J. (2007). *Brace Yourself: Here comes Generation Y.* Critical Care Nurse, 28(5), 80-85.
- [61] Liton, H. A. (2015). *Examining Students' Perception and Efficacy of using Technology in Teaching English.* International Journal of Education and Information Technology, 1(1), 11-19.
- [62] Prensky, M. (2001). *Digital Natives, Digital Immigrants.* On the Horizon, 1-6.
- [63] Windham, C. (2005). *The students' perspective.* In D.G. Oblinger, & J.L. Oblinger (Eds.), *Educating the next generation* (pp. 5.1-5.15). Washington, DC: Educause.
- [64] Bonk, C.J. (2011). *The World is Open: How Web Technology is Revolutionising Education.* San Francisco, Wiley.
- [65] Borden, J. (2011). *The future of online learning.* ELearn Magazine. Retrieved from <http://elearnmag.acm.org/featured.cfm?aid=2024704>.
- [66] Gozenbach, N.M & Davis, D.C. (1999). *Business employees' perceptions of content areas to be included in an information systems technology curriculum.* NABTE Review, 62-85.
- [67] Alipanahi, F & Iran, A.T. (2013). *The relation between Iranian EFL teachers' attitude towards ICT and their perception of ICT attributes cultural perception of ICT, and computer competence.* International Journal of Instructional Technology and Distance Learning, 10(2), 23-34.
- [68] Hall, M & Elliot, K.M. (2003). *Diffusion of technology into the teaching process: Strategies to encourage faculty members to embrace the laptop environment.* Journal of Education for Business, 78(6), 30-307.
- [69] Tarling, I & Ngambi, D. (2016). *Teachers' Pedagogical Change Framework: a diagnostic tool for changing teachers' use of emerging technologies.* British Journal of Educational Technology, 47(3), 554-572.
- [70] MaCasland, M. (2005). *Mobile marketing to millennials, Young Consumers*, 2, 8-15.
- [71] Howe, N., & Strauss, W. (2009). *Millennials Rising: The Next Great Generation.* Knopf Doubleday Publishing Group.
- [72] Lancaster, L.C. and Stillman, D. (2002). *When Generations Collide Who They Are. Why They Clash. How to Solve the Generational Puzzle at Work.* New York: Harper Business.
- [73] Martson, C. (2005). *Motivating the "what is in it for me?" workforce: managing across the generation divide.* Cam Martson.
- [74] Murray, J.P. (2004). *Nursing: The next generation.* Nursing Education Perspectives, 25 (3), 106.
- [75] Nicholas, A. (2008). *Preferred learning methods of the millennial generation.* Faculty and Staff Publications. 15.10.18848/1447-9494/CGP/v15i06/45805.
- [76] Trei, L. (2006). *Researchers study how technology shapes the ways in which students learn.* Stanford Report. Retrieved May, 2019 <http://news-service.stanford.edu/news/2009/may10/barron-111506.html>

- [77] Resta, P & Laferriere, T. (2007). *Technology in support of collaborative learning*. *Educ Psychol Rev*, 19, 65-83.
- [78] Ugwu, F., Ezeani, C.N., & Azikiwe, N. (2012). *Evaluation of Entrepreneurship awareness and skills among LIS students in universities in South East Nigeria*. *Library Philosophy and Practice*.
- [79] William, J.C. (2013). *Generational Perspectives of online higher education student learning styles*. Unpublished PhD dissertation. Montana. The University of Montana.
- [80] Birch, J., (2014). *Are Millennials too attached to their mobile devices?* Retrieved May, 13, 2019 from afterthemillennials.com
- [81] Onwuagboke, B.B.C & Singh, T.K.R (2016). *Faculty Attitude and Use of ICT in Instructional Delivery in Tertiary Institutions in a Developing Nation*. *International Journal of Research Studies in Educational Technology*, 5(10), 77-88.
- [82] Morahan, J.M. (1998). *The Gender Gap in Internet Use: Why Men Use the Internet More Than Women: A Literature Review*. *CyberPsychology & Behavior*, 1, 3-10.
- [83] Anyawu, E.U., Ossai-Onah, V.O & Iroeze, P. (2013). *Use of Social Media Tools among Nigerian Undergraduates in Three Selected Tertiary Institutions in Imo State, Nigeria*. *Journal of Information and Knowledge Management*, 4(2), 46-52.
- [84] Roehl, A.S.L & Shannon, G. J. (2013). *The Flipped Classroom: An Opportunity to Engage Millennial Students through Active Learning Strategies*. *Journal of Consumer Sciences*, 105(2), 44-49.
- [85] Barr, R. B & Tagg, J. (1995). *From teaching to learning: a new paradigm for undergraduate education*. *Change*, 27(6), 12-25.
- [86] Bligh, D. A. (2000). *What is the use of lectures?* San Francisco, CA: Jossey-Bass.
- [87] Prince, M. (2004). *Does active learning work? A review of the research*. *Journal of Engineering Education*, 93(3), 223-231.
- [88] Bonwell, C.C & Eison, J.A. (1991). *Active learning: Creating excitement in the classroom*. Washington DC. George Washington University.
- [89] Zayapragassarazan, Z & Kumar, S. (2012). *Active learning methods*. *NTTC Bulletin*, 19(1), 3-5.
- [90] Bonwell, C.C & Eison, J.A. (1991). *Active Learning: Creating excitement in the classroom*. *Higher Education Reports*
- [91] Cole, M., & Engeström, Y. (1993). *A cultural historical approach to distributed cognition*. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations* (pp.1-46). Cambridge: Cambridge University Press.
- [92] Hardman, J. (2015). *Pedagogical variation with computers in mathematics classrooms: A cultural historical activity theory analysis*. *Psychology in Society*, 48, 47-76.
- [93] Beatty, I. D., & Feldman, A. (2012). *Viewing teacher transformation through the lens of cultural-historical activity system*. *Education as Change*, 16(2), 283-300.
- [94] Huang, C. H., & Lin, F. (2013). *Using activity theory to model the Taiwan Atayal students' classroom mathematical activity*. *International Journal of Science and Mathematics Education*, 11, 213-236.
- [95] Naidoo, J. (2017). *Exploring the use of activity theory as a framework for the teaching and learning of mathematics*. *Pythagoras*, 33(1), 1-9.
- [96] Engestrom, Y., & Sannino, A. (2016). *Expansive learning on the move: insights from ongoing research*. *Journal for the Study of Education and Development*, 39(3), 401-435. <https://doi.org/10.1080/02103702.2016.1189119>
- [97] Trust, T. (2017). *Using cultural historical activity theory to examine how teachers seek and share knowledge in a peer-to-peer professional development network*. *Australasian Journal of Educational Technology*, 33(1), 98-113.
- [98] Moje, E.B., Dillon, D & O'Brien, D. (2000). *Re-examining the roles of learner, text, and context in secondary literacy*. *The Journal of Educational Research*, 93 (3), 165-180
- [99] Hardman, J. (2007). *An activity theory approach to surfacing the pedagogical object in a primary school mathematics classroom*. *Critical Social Studies*, 1, 53-69.
- [100] Littleton, K., & Mercer, N. (2013). *Interthinking: putting talk to work*. London. Routledge.