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# Mechanical vs. Logical Memory in the Use of Personal Technology among Nigerian Senior Secondary School Students

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**Abstract:** ***Technology has come to stay. Used well or abused, the effect of technology use and its residual consequences need extra-cautious management by all, in order to maximize its benefit. The use of personal technology can be either learning enhanced or learning inhibited. Learning in this study insinuated classroom instructional learning targeted at providing records of academic achievement. The study explored two delineations of memory in the use of personal technology, namely logical and mechanical. The sample comprised senior secondary (SS) school students. SS students studied (1,325) include those in SS I = 300, those in SS II = 500, and those in SS III = 525. For data collection, the researcher used simple monkey-survey titled Technologimech, a word coined from three shortened terms of technology, logical and mechanical. Data were collected over a period of three months. Mechanical-memory in the use of personal technology is behaviourally auto-shaping, automated, relatively conditioned and used in habit formation. Logical-memory use is persisting, task-oriented, emotional-spent, and used for instructional learning purposes. Students are inclined to rely on either mechanical or logical memory in their use of personal technology for socials and classroom learning purposes. The research revealed that the mean score of survey participants who engage more of their mechanical-memory in use of personal technology reported 83.27; and those who engage more of their logical-memory when using their personal technology reported a mean score of 81.50. Researcher recommends that secondary school teachers engage their students' logical memory in the use of technology for instructional purposes.***

**Keywords:** learning, technologimech, mechanical memory, logical memory, personal technology

## 1. Introduction

The use of technology is undeniably a necessity in today's world of everyday business and competitive cultures. Three categories of technology dominate the daily use of technology for secondary school students, namely graphic apps, letter apps and numeric apps. Sound could combine with any of these three categories such as games. However, sound alone does not necessarily attract students as they describe it as boring. Complete absence of sound, on the other, hand would task the students seriously. Examples include animated still-pictures and scientific calculator. Students tune off after a while if they are required to engage rigorously with critical attention when there is sight alone or sound alone (Udoye, Onukafor & Chukwuma, 2018). Such technologies are seen as not necessary for downloads. Take for instance, teachers giving assignments and homework that require scientific calculator or browsing would have to force students to download these apps or students would be required to visit cybercafé for such assignments.

Technology is a 21st century language that has become a global learning and industrial language, in and out-of the classrooms. Language development is the base for thinking and behaviour. If this premise sustains, then use of technology-language which is scientific should be the base for scientific thinking and behaviour. For any human language, thegenetically acquired device informs the humans for its development as humans interact with their environment (Chomsky, 1957). Students create and develop their *in-thing (ebe ano)* language in the memory engagement as they use their personal technology. Some of these in-thing language usages tend to be more transient, and a few of them inveterate after standing the test of time and fashion. The longer lasting use of technology language may be connected to attaching logical memory particularly when used for classroom learning.

The use of personal technology has the potential to enhance classroom learning or debilitate it. Personal technology can be used for reading, writing, computation, texting, chatting, sharing photos, sharing music, phone calling, blogging, twitting, pooling fans, reading news, e-mailing and watching movies (Ajayi & Ojo, 2010). Personal technology includes devices such as scientific calculators, scientific watches, scientific pens, phone, i-pad, laptop and desktop. Other scientific devices which are there may not be common to the public for use.

Used well or abused, technology has become a central focus of development in the West (Olugbenga & Adebayo, 2010). As a matter of fact, it is the language of sustainable and unsustainable development for the 21st century education, politics, military, communication, economics, commerce and industry. Meanwhile, Aduwa-Ogiegbean and Iyamu, (2005) are of the opinion that African countries are still very low in their use of technology. Akin to that is that technology abuse is higher in African countries.

At the dawn of 21st century, Enuka, (2000) particularly believed that Nigeria had not fully incorporated the use of technology in its secondary education. Close to two decades later, one wonders if Nigeria is where the author envisioned. In the meantime, educators and technology authors believe that secondary school is the level where the foundation for nation building should start with the use of technology (Enuka, 2000, Evoh, 2007; Afolabi, 2009; Awolaju,

Akinloye & Ilori, 2010; Woolfolk, 2012).Where does the Nigerian student stand in these equivocal arguments?

Today's secondary school students extensively use personal technology such as cell phones. These have become the handiest personal technology because it can be used to serve any of the purposes that laptops serve.The use of personal technology is like a language which transforms over time. Like any language, the good and evil effects of its use, processed and produced in the memory, constitute the positive and negative components of consequences on human lives and society. The factors of biology, experience and culture facilitate the transformational use of technology language. That is to say, context, situation and environment interact with events and experiences to shape technological behaviour and thinking. The level of society's development determines the level of control to curtail the evil effects of technology use.

Humans and societies have what it takes to either maximize the useful effects or damaging effects of technology.It is a choice that seems parsimonious but actually critical in the practice of its selection because choice of what to do with personal technology needs consciousness, self-regulations and experience. Students seem to pay attention to the damaging effects of technology by paying attention to what Brainerd (2003) terms *wrong information* instead of attending to information that is correct and helpful in the classroom learning.

Use of personal technology always calls for the engagement of either the mechanical or logical memory. There is no such thing as robotic use of technology even if the user may not readily access the employed consciousness. If one imagined that one could use technology without any of the two memories, it would tantamount to reducing humans to mere machines. Even machines are not unthinking because theirs are programmed reasoning. Students' thinking is relational; therefore, technology users follow consequential patterns of changing to suit behaviours and thinking. This calls for switch between mechanical and logical memories. Due to the fact that personal technology engages memory that is either mechanical or logical, there is always, and more or less, some form of learning going on in the use thereof.

Use of personal technology can be either learning enhancing or inhibiting. Learning in this study insinuates classroom instructional learning targeted at providing records of academic achievement. Some scholars believe that use of cell-phone can be incorporated in the classroom instructions for learning enhancement, class participations and sustained learning interests of students (Awolaju, et al, 2010). Classroom learning is supposed to develop abilities and skills. There are certain cognitive abilities believed to be sharpened by the use of technology. These include *concept formation, creativity, theory of mind, understanding symbolic implications of prints* such as language, and *intellectual flexibility*. The question worth asking is whether technology is debilitating these cognitive abilities that should be sharpened by it and computer usage?

For learning to yield its products, memory must be involved in the process. This is because learning has to be encoded either through imaging, imagining, or experiential processes. Udoye, Onukafor and Chukwuma (2018) in their training of students for episodic memory construction used the three encoding paths of sight, sound and tactile registering media for the purposes of producing sound, sight and form of these processes. In other words, memory studies are either in its processes or its products. Two memory products studied in this research are mechanical and logical memories.

Memory is the 'brain'in the processing and producingof instructional learning. A student is credited with learning product when the student has demonstrated that knowledge of such learning has been encoded and retrieved (Phye, 1997). Learning is assessed or evaluated when students' effortful logical memory processes and products are tested or examined.

Goswami, (2004) is of the opinion that memory is not a single phenomenon. It must be understood as a set of domain-specific operations that could present patterns of either logical or mechanical output in its encoding or decoding processes. The author believes that memory development must be understood in terms of its storage capacity, retrieval strategies and metacognitive knowledge bases (Goswami, 2004). Hence, whenever we speak of memory especially in connection to technology use, the mind immediately goes to developing its capacity, processes and products of its operations. All these suggest that memory in the use of technology can be trained for learning enhancement.

Mechanical memories are products of conditioned habituation of behaviours, mostly done unthinking. They are routinized learned/learning habits. Often times, these memories are implicit involving automatic and unconscious recalling of information and experiences. Mechanical memories influence behaviours and thinking without awareness. This memory is very procedural often involving the unconscious in the use of automated skills and habits. When mechanical memory is classically conditioned, it suggests that some visceral have become connected to the behaviour. When it is a component of an operant conditioning, it is a suggestion that consequences determine future antecedents that form behaviours. Use of technology, engaging mechanical or logical memory, which brings satisfaction, is more likely to be strengthened and that which brings dissatisfaction is likely to be weakened (Mayer, 2003).

Logical memory involves reasoning principles for modules of operations and actions. It is scientific, meaning that it involves thinking that is objectively useful and accessible. Logical memory is needed by students to succeed in the development of reading and mathematical skills (Ricci, 2007; Tomlinson, 2008). It is the memory which is conscious and explicit. This is the memory that aids the remembering of declarative, episodic or semantic information often times from the long-term memory for the working memory. It is the memory that calls for scientific thinking. If science students engage more in mechanical use of technology rather than in the logical use of memory, it could be a run-away from engaging in scientific thinking (Kuhn, 2004).

Retrieval with logical memory is conscious unless it has been trained as, what Sternberg (2000) terms, *automatized*. Logical-memory use is persisting, task-oriented, emotional-spent, and used for instructional learning, problem solving or task accomplishing purposes. One can say that logical memory is a reasoned memory. Nonetheless, Woolfolk (2012) argues that reasoning and memory are two parallel but similar lines in the human mental productions, the perpendicular formation of whose complete sense is made by either the declarative, procedural or self-regulatory knowledge of the person.

The following questions prompted the researcher to go out to the field.

1) How do students engage their memory type in the use of personal technology for classroom instructional learning?
2) Where does the Nigerian child tilt – logical or mechanical – in his/her use of personal technology?

## 2. Method

The design of this study is survey employing a descriptive model. The studied group comprised senior secondary (SS) school students drawn by way of purposive sampling from Aguata, Njikoka, Nnewi and Onitsha Education Zones of Anambra State. Schools and cyber café learning centres were used to locate participating students. SS students studied (1,325) included those in SS I = 300, SS II = 500, and SS III = 525. A monkey-survey instrument titled *Technologimech*, was developed by the researcher for data collection. Technologimech was coined from three shortened terms of technology, logical and mechanical. At the end of the survey, students were asked to write one programme/app that they would use the most frequently. Also, two scales were used to determine how often students engaged themselves in their most frequent app, namely *use of personal technology* = 5+ times daily, and *use of personal technology* = 4- times daily.

The instrument was validated by the researcher, another educational psychologist, and an expert in measurement and evaluation. Reliability index of .8 was generated by a quality-control computation of their inter-rated scores of the pilot data. To enable good sampling of participants' opinion, data were collected over a period of three months so as to ensure adequacy of sampling for the targeted population.

Only completed surveys were counted ($1325_{completed}$ out of $1500_{distributed}$) for data analysis, and uncompleted surveys were later judged to be discounted as unreturned. This decision affected some changes on the earlier computation but did not in any way affect the analytical power or the computation objectivity of the data.

## 3. Result

Analysis revealed that the mean score of survey participants who engage more of their mechanical-memory in use of personal technology reported 83.27; and those who engage more of their logical-memory when using their personal technology reported a mean score of 81.50.

More students said 'YES' ($x$ = 5541) for using personal technology for fun than students that said 'YES' ($x$ = 1483) for using personal technology for work. The programmes/apps written down by student-participants as used to engage their memory were Whatsapp = 994, Facebook = 142, YouTube/movies = 47, BBchat = 39, Dictionary = 24, Bible = 11, Boomplay = 10, Scientific calculator = 7 and *Other* (*blogger, twitter, opera mini, Wikipedia, my-skool-gist, periodi- table* and so on) = 51.

**Table 1:** Frequency Distribution of Secondary School Students' Engagement of Memory Type in the Use of Personal Technology

Mem-Type$_{(Personal\ tech=WORK\ or\ FUN)}$

| | Item Description | Yes | No |
|---|---|---|---|
| Logical | My phone is my best companion when I study for examinations | 89 | 1236 |
| | I use my personal tech such as phone for class instructional learning and assignments | 270 | 1055 |
| | I use my personal tech such as scientific calculator for class instructional learning | 299 | 1026 |
| | My scientific calculator is my second nature is solving Maths problems | 274 | 1051 |
| | Our Maths teacher uses scientific calculator during Maths class instruction | 128 | 1197 |
| | I use my personal technology such as phone for studying English Language | 423 | 902 |
| | **TOTAL** | **1483** | **6467** |
| Mechanical | Technology should be fun not work | 1001 | 324 |
| | I hate to invest energy when using personal technology such as phone | 987 | 338 |
| | Personal technology such as phone should be used for socials, not for instruction | 979 | 346 |
| | I use my personal technology such as phone for entertainment | 1020 | 305 |
| | I use my personal technology, such as phone, automatically without thinking | 653 | 672 |
| | I use my personal phone for keeping up with friends in social media arena | 901 | 424 |
| | **TOTAL** | 5541 | 2409 |

In answer to research question two, the researcher discovered that Nigerian child tilts toward mechanical memory more than the logical memory in the use of personal technology.

**Table 2:** SSI and SSII Students Compared in Their Use of Memory Technologimech

| | SnrSec Level | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Techno Mechanical | SSOne | 300 | 29.2767 | 6.73533 | .38886 |
| | SSTwo | 500 | 25.6960 | 5.02016 | .22451 |
| Techno Logical | SSOne | 300 | 26.4700 | 5.18769 | .29951 |
| | SSTwo | 500 | 26.5320 | 6.41524 | .28690 |

SSI students showed higher engagement of mechanical memory than SSII students, while the two groups come close in their mean score of how they engage logical memory in the use of personal technology. However, the SD of the SSII student proves higher than that of SSI in the logical memory use of technology, suggesting more variance in dispersion for SSII.

**Table 3:** SSII and SSIII Students Compared in Their Use of Memory Technologimech

| | SnrSec Level | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Techno Mechanical | SSTwo | 500 | 25.6960 | 5.02016 | .22451 |
| | SSThree | 525 | 28.2914 | 6.73410 | .29390 |
| Techno Logical | SSTwo | 500 | 26.5320 | 6.41524 | .28690 |
| | SSThree | 525 | 28.5010 | 6.18099 | .26976 |

SSIII students are higher than the SSII students in their engagement of either mechanical or logical memory in the use of personal technology.

**Table 4:** SSI and SSIII Students Compared in Their Use of Memory Technologimech

| | SnrSec Level | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Techno Mechanical | SSOne | 300 | 29.2767 | 6.73533 | .38886 |
| | SSThree | 525 | 28.2914 | 6.73410 | .29390 |
| Techno Logical | SSOne | 300 | 26.4700 | 5.18769 | .29951 |
| | SSThree | 525 | 28.5010 | 6.18099 | .26976 |

SSIII students top SSI students in their engagement of logical memory when using personal technology, insinuating that SSIII students engage more of their logical memory in their use of personal technology for classroom learning than SSI and SSII students do.

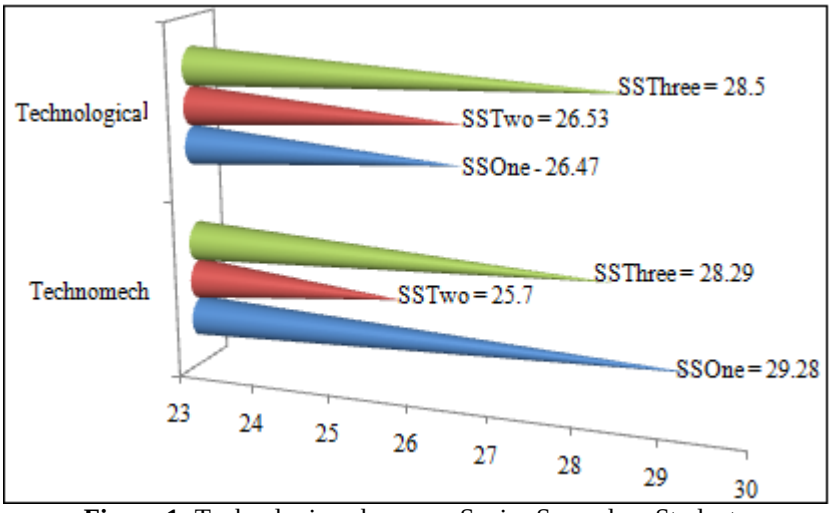


**Figure 1:** Technologimech among Senior Secondary Students

## 4. Discussion

Personal technology is the *in-thing* language of today's learners, and environment and situation provide the template for personal technology language to be used logically or mechanically. 21st century students seem to have what Chomsky (1957) described as built-in regulations and constraints that help for language mastery as it is being encoded in the memory. For the Nigerian students, technology is a language inside their existing multi-linguistic culture. Hence, the language of technology is part and parcel of their memory training, logically or mechanically.

Nigerian students' memory training in the use of either mechanical or logical technology depends on the extent of their development in self-regulation and self-containment. This is because the mechanical memory engagement of technology-use seems to be irresistibly infectious and contagious among secondary and higher education students. They seem to have automatized their memory use of technology so that what ordinarily would have required conscious effortful process for retrieval would now require a fewer less-effortful and unconscious time. The result is that techno-mechanical memory is preferably trained instead of techno-logical memory that can be useful for achievement studies and learning. It is feasible for students to train their techno-logical memory for learning tasks as well as relational intelligences if they shift interest to *right* things.

When a student identifies information as important and makes decision that such information is worthy of study, the student is likely to use techno-logical memory rehearsal strategy to hold the information until elaborated enough to be mapped in the cognitive structures (Phye, 1997). Mathematical and reading skills can be trained faster and more efficiently with the use of technology if personal technology is used at the onset in training these skills. Also, the prevalent use of technology by Nigerian secondary school students could suggest that many of this nation's students are scientific thinkers, although this thinking style is seemingly thwarted as the study revealed.

The study revealed that SSIII students scored highest in their engagement of techno-logical memory while SSI students scored highest in their engagement of techno-mechanical memory. Standardized tests such as West African School Certificate (WASC) and Joint Admission and Matriculation Board (JAMB) examinations may be constraining the SSIII students to train their techno-logical memory. SSI students do not have to wait until they are close to writing these tests before they begin to train their techno-logical memory, and

classrooms are the places where these training could be more effectively done.

## 5. Conclusion

Mechanical-memory in the use of personal technology is found to be behaviourally auto-shaping, automated, relatively conditioned and used in habit formation. Students are inclined to rely on their mechanical memory more than their logical memory in their use of personal technology for socials more than their classroom learning respectively. This study showed that Nigerian secondary school students invest greater energy and emotional time on the engagement of their mechanical memory for the use of personal technology. In this way, students tend to reverse the energy and time expenditure in their memory engagement when they use their personal technology.

Self-regulatory learning is important for the use of technologimech memory. A student is judged to have developed his/her knowledge of self-regulation if such a student knows *how*, *where*, and *when* to use procedural and declarative knowledge. Students' memory could be trained with technology by classroom teachers' use of audio-visual instructional materials. When students learn to code their memory in visual and verbal ways, personal technology will become a continuation of classroom learning for Nigerian students.

## 6. Recommendation

From the study, the researcher makes the following recommendations.

1) Secondary school teachers should engage their students' logical memory in the use of technology for instructional purposes by providing learning tasks that call for engagement of such memory.
2) Technologies that contain visual and verbal components should be used by school teachers as instructional materials so that students become adapt to use of technology for learning purposes.
3) Training for logical memory engagement in the use of personal technology is chiefly reliant on the students themselves. Secondary school students should be engaged at SSI level with interesting but challenging learning tasks so that adaptation becomes natural as they move on in the levels of their studies.

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