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## Industrial Engineering

A Comparison with NHANES Dataset

US Population and AURA Strap users

Highlights

Sustainable Ecological Production

Macaraquita from Chepo of Las Minas

Discovering Thoughts, Inventing Future

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## Body Composition Differences between US Population and AURA Strap users: A Comparison with NHANES Dataset

By Dr. Aleksandr Polokhin, Anna Pronina, Andrey Boev & Stas Gorbunov

*Introduction-* AURA users' body composition results are used to provide information regarding the position of individual user's among the population: for example, if he/she has lower or higher body fat ratio or muscle mass than others. The comparison with other users is good for extra motivation since it creates a competitive element of training or/and diet.

1. Can I compare my body composition with AURA users' body composition results?

Brief answer: Yes, you can. In the AURA app we use data based on thousands of AURA Strap measurements conducted by a huge number of our users. All data were processed in order to exclude any incorrect data caused by various factors. As a result the final dataset provides a representation of an actual body composition of AURA users.

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BODY COMPOSITION DIFFERENCES BETWEEN US POPULATION AND AURA STRAP USERS A COMPARISON WITH NHANES DATASET

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# Body Composition Differences between US Population and AURA Strap users: A Comparison with NHANES Dataset

Dr. Aleksandr Polokhin <sup>α</sup>, Anna Pronina <sup>σ</sup>, Andrey Boev <sup>ρ</sup> & Stas Gorbunov <sup>ω</sup>

## I. INTRODUCTION

AURA users' body composition results are used to provide information regarding the position of individual user's among the population: for example, if he/she has lower or higher body fat ratio or muscle mass than others. The comparison with other users is good for extra motivation since it creates a competitive element of training or/and diet.

1. Can I compare my body composition with AURA users' body composition results?

Brief answer: Yes, you can. In the AURA app we use data based on thousands of AURA Strap measurements conducted by a huge number of our users. All data were processed in order to exclude any incorrect data caused by various factors. As a result the final dataset provides a representation of an actual body composition of AURA users.

2. Is the comparison correct?

No doubt, it is really important to know if AURA users body composition data is reliable and how it relates with body composition of other populations of

the US. There were many studies conducted in the US for evaluation of the health status of Americans, including body composition surveys. One of the largest of them is organized by the National Health and Nutrition Examination Survey (NHANES), a program of studies designed to assess the health and nutritional status of adults and children in the United States.

According to the number of participants which took part in the NHANES surveys and its long time duration (body composition servers were conducted for 8 years: from 1999 till 2006), it was chosen as a population sample to compare with AURA users. In the period of the DEXA data collecting, NHANES oversampled Mexican-Americans, African Americans, low-income White and Other Race people, adolescents aged 12-19, and non-Hispanic White and Other Race adults aged 70 and over than in other years of examinations (<https://www.cdc.gov/visionhealth/vehss/data/national-surveys/national-health-and-nutrition-examination-survey.html>) The most NHANES examination centers where DEXA data were collected were located in the south part of USA in general (see the map below):

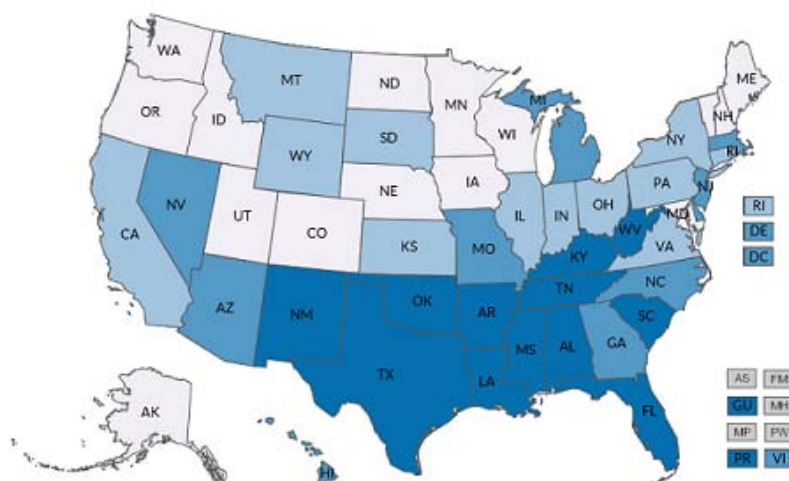


Fig. 1: The map of NHANES study

The analyzed sample consists of 27029 subjects ( $N_{\text{male}} = 14226$ ,  $N_{\text{female}} = 12763$ ) of age 8-85 years and different ethnicity:

- Non-Hispanic White: 10870
- Mexican American: 7179
- Non-Hispanic Black: 6848
- Other Hispanic: 1077
- Other Race - Including Multi-Racial: 1055

Author: e-mail: [md@auradevices.io](mailto:md@auradevices.io)

NHANES body composition data are based on Dual energy X-ray absorptiometry (DEXA) which is regarded as the “gold standard” in body fat assessment. In contrast, AURA Strap users data were determined via bioelectrical impedance analysis (BIA). AURA Strap BIA is based on formulas designed by AURA Devices, Inc. and requires the following parameter: sex, age, body weight, height (anthropometric data) and upper-body impedance. The anthropometric data are self-provided by AURA users while upper-body impedance is measured with AURA Strap.

Since there are sex and aging differences in body composition, the both dataset were divided into 10 subsets: age 18-23, 24-30, 31-40, 41-50 and 51-65 of male and female, respectively. As main parameters to

compare height, weight, and body fat ratio was used because the DEXA based NHANES dataset does not provide reliable information about muscle mass or total body water.

Before the start of any statistical analysis, let us look at sample distributions of selected age groups. As it can be seen on fig. 2, AURA Strap samples for both males and females are notably smaller than NHANES. This can present a challenge for many statistical tests, as they usually assumes that samples have equal variances, and variances are directly affected by sample size. Considering this, we will employ the Welch’s modification of popular Student’s t-test, which does not have an equal variance assumption and thus can provide reliable results for two samples of unequal sizes.

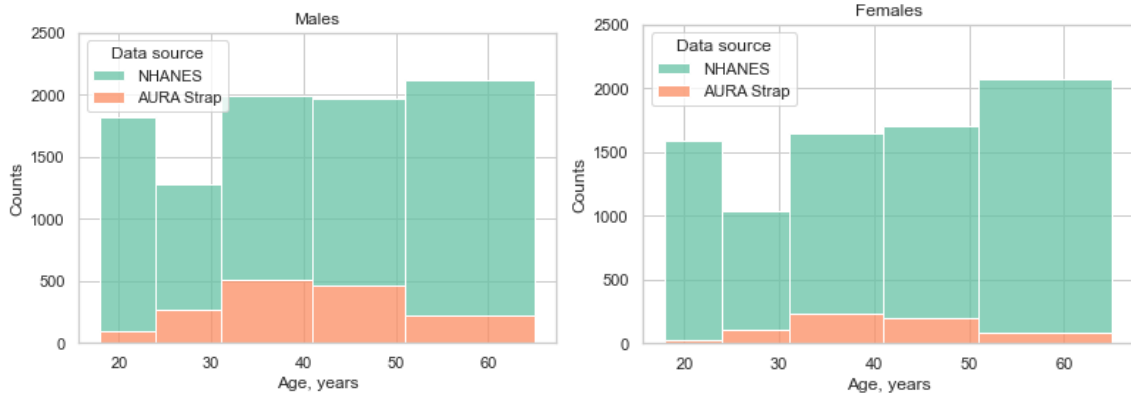


Fig. 2: Histogram of age distributions of NHANES and AURA Strap samples

a) Comparing Heights

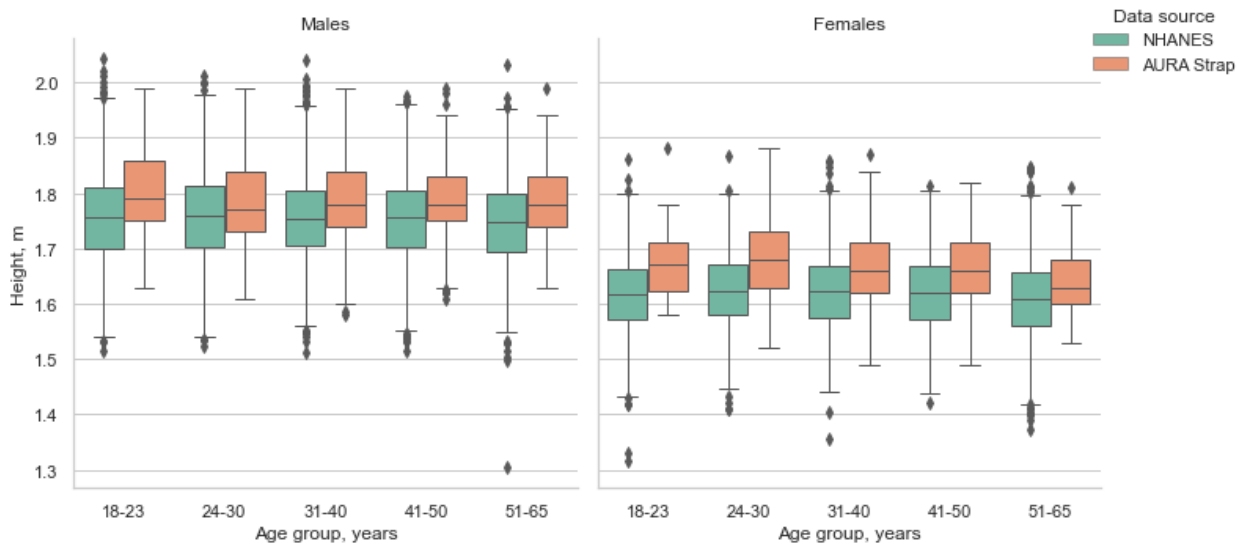


Fig. 3: Comparison of height in different age groups of males and females of NHANES and AURA Strap populations

Table 1: Height mean and standard deviation in different age groups of males and females of NHANES and AURA Strap populations

	NHANES					AURA Strap				
Males	18-23	24-30	31-40	41-50	51-65	18-23	24-30	31-40	41-50	51-65
Mean	1.76	1.76	1.76	1.75	1.75	1.79	1.78	1.79	1.79	1.78
SD	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.08	0.08	0.07
Females	18-23	24-30	31-40	41-50	51-65	18-23	24-30	31-40	41-50	51-65
Mean	1.62	1.62	1.62	1.62	1.61	1.68	1.68	1.66	1.66	1.64
SD	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06

While comparing samples heights, one can note, that heights of AURA Strap sample subjects are both higher and more variable between age groups, than NHANES (fig. 3, table 1). Welch t-test confirms, that AURA Strap users, both males and females, are significantly taller than NHANES study subjects ( $p < 0.001$  in all cases,  $\alpha = 0.05$ ). This can be a result of US

population generally becoming taller with time (see Fogel RW, Grotte N. Major Findings from The Changing Body: Health, Nutrition, and Human Development in the Western World since 1700. J Econ Asymmetries. 2011. 8(2):1-9), as the AURA Strap data was collected at 2020 – 2022, while the majority of NHANES measurements were taken a few decades ago.

b) Comparing Weights

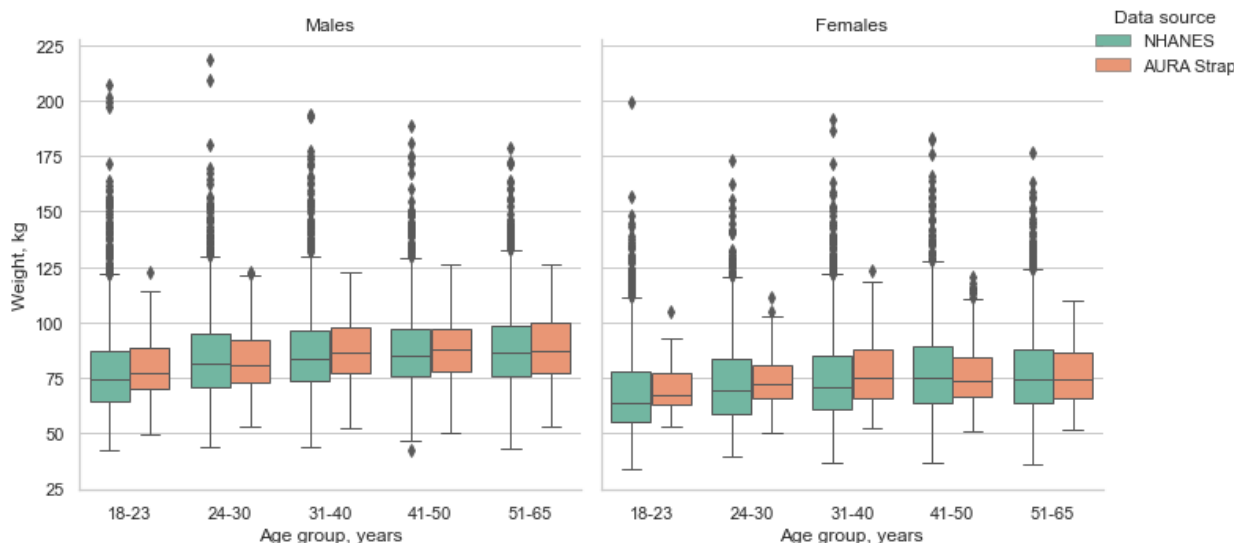


Fig. 4: Comparison of weight in different age groups of males and females of NHANES and AURA Strap populations

Table 2: Weight mean and standard deviation in different age groups of males and females of NHANES and AURA Strap populations

	NHANES					AURA Strap				
Males	18-23	24-30	31-40	41-50	51-65	18-23	24-30	31-40	41-50	51-65
Mean	78.64	85.08	87.26	87.83	88.53	79.87	82.01	87.07	87.73	88.36
SD	20.45	20.77	20.01	18.34	18.66	13.60	13.22	14.55	14.25	15.33
Females	18-23	24-30	31-40	41-50	51-65	18-23	24-30	31-40	41-50	51-65
Mean	68.78	73.24	75.58	78.62	77.66	71.42	74.06	77.44	76.84	76.68
SD	19.12	20.00	20.69	20.50	19.38	12.51	13.00	14.97	15.06	14.06

As it can be seen on Fig. 4 and in table 2, NHANES weight data have a long-tailed distribution with a considerable amount of outliers for both genders in all age groups. These outliers, however, have no specific effect on Welch test results, which in most cases reveals no significant difference between NHANES and AURA

Strap samples. The only exception are males of 24-30 years, who are slightly heavier in NHANES data ( $p = 0.003$ ,  $\alpha = 0.05$ ).

c) Comparing Body Fat Ratio

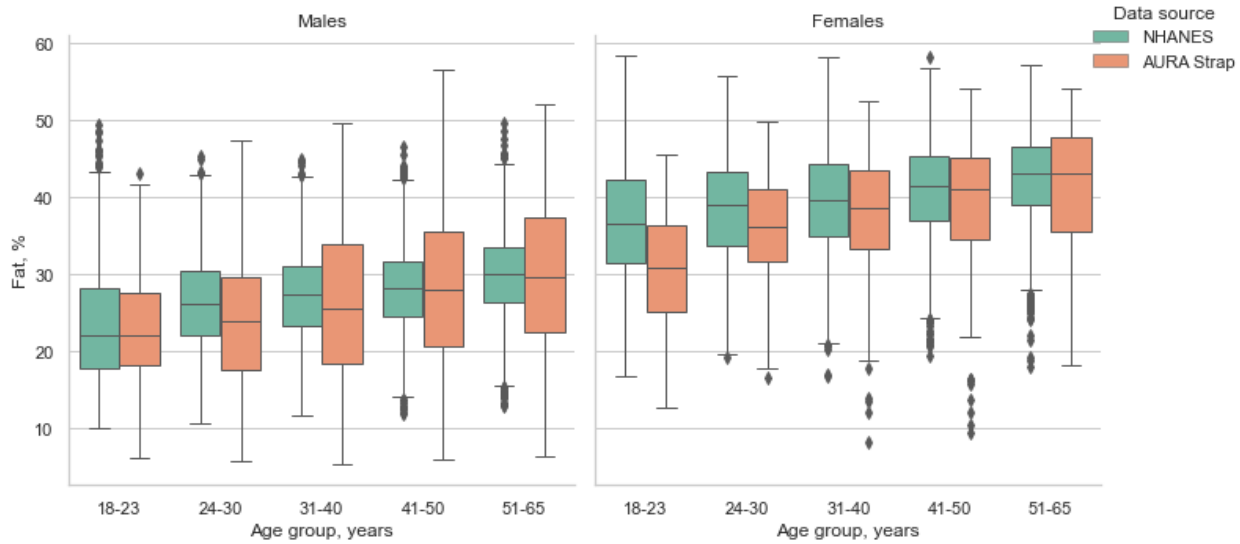


Fig. 5: Comparison of fat ratio in different age groups of males and females of NHANES and AURA Strap populations

Table 3: Fat ratio mean and standard deviation in different age groups of males and females of NHANES and AURA Strap populations

	NHANES					AURA Strap				
<b>Males</b>	<b>18-23</b>	<b>24-30</b>	<b>31-40</b>	<b>41-50</b>	<b>51-65</b>	<b>18-23</b>	<b>24-30</b>	<b>31-40</b>	<b>41-50</b>	<b>51-65</b>
Mean	23.54	26.33	27.20	28.07	29.79	22.45	23.99	25.99	28.11	29.57
SD	7.35	6.41	5.98	5.68	5.70	7.54	8.91	10.00	10.35	10.46
<b>Females</b>	<b>18-23</b>	<b>24-30</b>	<b>31-40</b>	<b>41-50</b>	<b>51-65</b>	<b>18-23</b>	<b>24-30</b>	<b>31-40</b>	<b>41-50</b>	<b>51-65</b>
Mean	36.89	38.35	39.43	40.88	42.53	30.66	35.51	37.73	38.87	41.58
SD	7.26	6.98	6.79	6.48	5.86	8.94	7.32	8.24	8.87	8.82

For body fat ratio, the samples are not statistically different in following cases: males of 18-23 years, males of 41-50 years, both males and females of 51-65 years. In all other cases, one can assume that AURA Strap users and NHANES subjects significantly differs in body fat ratio (males:  $p < 0.001$  for 24-30 years group,  $p = 0.01$  for 31-40 years; females:  $p = 0.002$  for 18-23 years,  $p = 0.003$  for 24-30 years,  $p = 0.003$  for 31-40 years, and  $p = 0.002$  for 41-50 years;  $\alpha = 0.05$  in all cases). Summarizing that, AURA Strap users are either have the same or lesser body fat ratio than NHANES subjects. It can also be noted, that the variability of AURA Strap data is rather high – and it is most probably the effect of different measurement technique: AURA Strap uses BIA for body fat estimation, which is much more sensitive for various environmental and internal conditions than DEXA.

methodology, lifestyle differences, or even population change with time.

## II. CONCLUSION

Our comparison study demonstrates that AURA strap users body composition is indeed have many similarities with NHANES study participants. The observed differences originated in either data collecting



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# Physical Contradictions Ruling out Photonic Quantum Nonlocality

By Andre Vatarescu

*Abstract-* A series of physical contradictions can be identified in an opinion article published in December 2015 (A. Aspect, "Closing the Door on Einstein and Bohr's Quantum Debate," Physics 8, 123, 2015) claiming definitive proof of quantum nonlocality based on entangled pairs of photons. For example, experimental results published simultaneously in Physical Review Letters (250401 and 250402, 2015) were theoretically fitted with distributions containing a dominant unentangled component, contradicting the need for maximally entangled states underpinning quantum nonlocality. Such contradictions were ignored by the 2022 Nobel Prize Committee raising doubts about the validity of their decision.

*GJRE-G Classification: DDC Code: 530.12 LCC Code: QC174.12*



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# Physical Contradictions Ruling out Photonic Quantum Nonlocality

Andre Vatarescu

**Abstract-** A series of physical contradictions can be identified in an opinion article published in December 2015 (A. Aspect, "Closing the Door on Einstein and Bohr's Quantum Debate," *Physics* 8, 123, 2015) claiming definitive proof of quantum nonlocality based on entangled pairs of photons. For example, experimental results published simultaneously in *Physical Review Letters* (250401 and 250402, 2015) were theoretically fitted with distributions containing a dominant unentangled component, contradicting the need for maximally entangled states underpinning quantum nonlocality. Such contradictions were ignored by the 2022 Nobel Prize Committee raising doubts about the validity of their decision.

## I. INTRODUCTION

Over the last two decades, large amounts of resources have been invested in the research and development of quantum computing based on the concept of quantum nonlocality. Yet, no such functional or operational device is expected in the near future. Nevertheless, photonic quantum nonlocality – despite being substantially rebutted in the professional literature (see references 1-8 below for a short list) – has been the subject of the 2022 Nobel Prize Committee. This approach may actually lead to a dead end.

While the three physicists deserve credit for performing experiments with entangled photons, their interpretations of the experiments do **not** stand up to physical scrutiny in so far as the following four aspects are concerned.

1. *Entangled Pairs of Photons*– Quantum entanglement of states or photons is the consequence of a common past interaction between states or photons and those properties generated in the common interaction can be carried away from the position and time of that interaction. A single photon cannot propagate in a straight-line inside a dielectric medium because of the quantum Rayleigh scattering associated with photon-dipole interactions. Groups of photons are created through parametric amplification in the nonlinear crystal in which spontaneous emissions first occur. Such a group of photons will maintain a straight line of propagation by recapturing an absorbed photon through stimulated Rayleigh emission – see references 7 and 9.

The assumption that spontaneously emitted, parametrically down-converted individual photons cannot be amplified in the originating crystal because of a low level of pump power would, in fact, prevent any sustained emission in the direction of phase-matching condition because of the Rayleigh spontaneous scattering. For details, see references 7 and 9.

2. *Quantum Nonlocality upon Sequential Measurements*– Quantum nonlocality is claimed to influence the measurement of the polarization state of one photon at location B, which is paired with another photon measured at location A. The two photons are said to be components of the same entangled state. Maximally entangled states, represented in the same frame of coordinates of horizontal and vertical polarizations, would deliver the strongest correlation values between separate measurements of polarization states recorded at the two locations A and B.

If a collapse of the wave function is to take place for entangled photons upon detection of a photon at either location, then the two separate measurements do not coincide. In this case, a local measurement vanishes for the maximally entangled Bell states– see Appendix A below. This leads to a physical contradiction as local experimental outcomes determine the state of polarization to be compared with its pair quantum state. This overlooked feature of maximally entangled Bell states renders them incompatible with the polarimetric measurements carried out to determine the state of polarization of photons, thereby explaining the experimental results of reference 10 which were obtained with independent photons. The wave function collapse brings about a product state as part of a time-dependent partial ensemble of measurements.

As already mentioned above, the rebuttal of the concept of quantum nonlocality has seen a growing body of analytic work which the legacy journals have chosen to ignore, e.g. references 1-8. In references 11 and 12, the optimal experimental states identified in their equations (2) contain a large unentangled component which provides the non-zero values for the correlation function – see Appendix B for details. In reference 11, all probabilities of detecting an event is lower than  $10^{-3}$ . With such a small probability (<<1%) it is not justified to classify the random events as a quantum physical process that is a resource for quantum computing.

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3. *Correlation Functions*– Maximally entangled states, represented in the same frame of coordinates of horizontal and vertical polarizations, would deliver the strongest correlation values of the correlation function  $E_c = \cos [2 (\theta_A - \theta_B)]$ , for identical inputs to the two separate apparatuses, with the polarization filters rotated by an angle  $\theta_A$  or  $\theta_B$ , respectively, from the horizontal axis. However, quantum-strong correlations with independent photons have been demonstrated experimentally (see reference 10) but ignored by legacy journals because they did not fit in with the theory of quantum nonlocality. The same correlation function  $E_c = \cos [2 (\theta_A - \theta_B)]$  is obtained ‘classically’, as a result of the overlap of two polarization Stokes vectors of the polarization filters on the Poincaré sphere– see Appendix B for details. The Stokes parameters correspond to the expectation values of the Pauli spin operators– see reference 8.

Polarimetric measurements made in the quantum regime are based on the Pauli spin operators whose expectation values are displayed on the Poincaré sphere. However, these operators act on the state of polarization regardless of the number of photons carried by the radiation mode, instantaneously. The correlation functions needed to evaluate various Bell-type inequalities take the same form in both the quantum and classical regimes, and correspond to the overlap of the polarization states in the Stokes representation – see reference 8.

4. *Bell-type Inequalities*– Quantum measurements violating Bell-type inequalities are supposed to be based on entangled states of single photons and prove the existence of quantum nonlocality. But the violations of inequalities rely on the correlation functions of the two ensembles of measurements as opposed to the same pair of photons, that is, the correlations are obtained as a result of a numerical comparison and are not a physical interaction. The photonic properties were carried away from the space and time of the original interaction, with the *measurement identifying* which of the two photons possessed the respective states of polarization.

Bell-type inequalities can also be violated classically because the same correlation function is derived for both the quantum and classical regimes, as explained in the previous section 3. Thus, from a technological perspective, functional devices needed for strong correlations between two separate outputs can be achieved with multiple photons, thereby obviating the need for complicated and expensive single photon sources and photodetectors.

In conclusion, a range of considerations rebut the concept of quantum nonlocality whereby a measurement of an entangled photon influences the outcome of a pair-measurement at another location.

Quantum-strong correlations which are needed for quantum data processing, can be produced by means of uncorrelated and multiphoton states as well as ‘classically’ by means of Stokes parameters on the Poincaré sphere. In this way the complicated and expensive single-photon sources and photodetectors become unnecessary.

## II. APPENDIX A -CONTRADICTORY STATEMENTS

If a collapse of the wave function is to take place for entangled photons upon detection of a photon at either location, then the two separate measurements do not coincide. In this case, a local measurement vanishes for the maximally entangled Bell states, e. g.  $|\Psi_{AB}\rangle = (|H\rangle_A |H\rangle_B + |V\rangle_A |V\rangle_B) / \sqrt{2}$ , that is,  $\langle \Psi_{AB} | \hat{\sigma}_A \otimes \hat{I}_B | \Psi_{AB} \rangle = 0$ , with  $\hat{I}_B = |H\rangle\langle H| + |V\rangle\langle V|$  being the identity operator, and the projecting Pauli operators are in this case  $\hat{\sigma}_1 = |H\rangle\langle V| + |V\rangle\langle H|$  and  $\hat{\sigma}_3 = |H\rangle\langle H| - |V\rangle\langle V|$ . Thus, a physical contradiction arises as local experimental outcomes determine the mixed quantum state of polarization of the ensemble to be compared with its pair quantum state. However, the experimental results of reference 10 which were obtained with independent photons clearly indicate the possibility of obtaining quantum-strong correlations without entangled photons as explained in reference 8.

The mixed quantum state  $|\Psi_{AB}\rangle$  is space- and time-independent and considered to be a global state which can be used in any context, anywhere, and at any time. Nevertheless, the Hilbert spaces of the two photons move away from each other and do not spatially overlap, so that any composite Hilbert space is *mathematically* generated by means of a tensor product at a third location where the comparison of data is performed. Even so, the absence of a Hamiltonian of interaction renders any suggestion of a mutual influence physically impossible– see reference 1.

Furthermore, the experimental results of references 11 and 12 were measured with a low level of entanglement, with the reported mixed states having one component much larger than the other, thereby allowing for measurements of unentangled product states. From equations (2) of both references, their experimental optimal ratios of the two amplitudes are 2.9 and 0.961/0.276, respectively.

Another glaring contradiction of the quantum nonlocality interpretation can be found in reference 13. In the caption to Fig.1, on its second page, one reads: “...if both polarizers area aligned along the same direction ( $\mathbf{a}=\mathbf{b}$ ), then the results of A and B will be either (+1; +1) or (-1; -1) but never (+1; -1) or (-1; +1.); this is a total correlation as can be determined by measuring the four rates with the fourfold detection circuit”.

This statement first deals with single, individual events but in the second part it mentions “rates” which

apply to ensemble of measurements (as degree or comparative extent of action or procedure). Now, if it is possible, with entangled photons, to have 100% correlation at the level of individual events, then one could easily carry out a short series of measurements to find simultaneous detections and prove directly the existence of quantum nonlocality, rather than use, indirectly, Bell-type inequalities to claim it from correlations of ensembles. Ensemble distributions also cover non-simultaneous single detections that are taken to be simultaneous in order to reach the 100% correlation value.

Ensembles of two separate measurements lead to two sets of probabilities. Correlations between distributions of ensemble probabilities are calculated as the expectation value of the correlation operator  $\hat{C} = \hat{\sigma}_A \otimes \hat{\sigma}_B$  to be  $E_c = \cos [2 (\theta_A - \theta_B)]$  as opposed to probabilities of single, individual events  $P_{A \text{ or } B} = \cos^2 \theta$ , identical for both locations with  $E_c = 1$ .

For example, if one in ten photons is detected, then, for entangled photons, the two separate detections should happen simultaneously with a ratio of 1:10, as claimed with quantum nonlocality. This would allow a direct measurement and demonstration of quantum nonlocality without the need for Bell-type inequalities that involve ensembles of measurements. But this cannot be done because a single photon is diverted by the quantum Rayleigh scattering in a dielectric medium from a straight-line propagation. Therefore, no quantum nonlocality has been demonstrated in so far as single photons are concerned.

### III. APPENDIX B -GENERAL CORRELATION FUNCTIONS

The correlation function is a *numerical* calculation as opposed to a physical interaction. Thus, the numerical comparison of the data sets is carried out at a third location C where the reference system of coordinates is located for comparison or correlation calculations of the two sets of measured data, and does not require physical overlap of the observables whose operators are aligned with the system of coordinates of the measurement Hilbert space onto which the detected state vectors are mapped. In this case, the correlation operator  $\hat{C} = \hat{\sigma}_A \otimes \hat{\sigma}_B$  can be reduced to [14; Eq. (A6)]:

$$\hat{C} = (\mathbf{a} \cdot \hat{\sigma})(\mathbf{b} \cdot \hat{\sigma}) = \mathbf{a} \cdot \mathbf{b} \hat{1} + i (\mathbf{a} \times \mathbf{b}) \cdot \hat{\sigma} \quad (B1)$$

where the polarization vectors  $\mathbf{a}$  and  $\mathbf{b}$  identify the orientation of the detecting polarization filters in the Stokes representation, and  $\hat{\sigma} = (\hat{\sigma}_1, \hat{\sigma}_2, \hat{\sigma}_3)$  is the Pauli spin vector (with  $\hat{\sigma}_2 = i \hat{\sigma}_1 \hat{\sigma}_3$ ). The presence of the identity operator in Eq. (B1) implies that, when the last term vanishes for a linear polarization state, the correlation function is determined by the orientations of

the polarization filters. This can be easily done with independent and linearly polarized states.

In order to emphasize the role played by independent states of photons, these states  $|\psi_k\rangle$  will be expanded in terms of the polarization eigenstates of the reference system of coordinates that will also define the joint Poincaré sphere. The states are, with  $k = A$  or  $B$ :

$$|\psi_k\rangle = \cos \varphi_k |x\rangle + \sin \varphi_k |y\rangle \quad (B2)$$

for two different angles  $\varphi_A$  and  $\varphi_B$ , relative to the  $x$  – axis of reference in the measurement-related Hilbert space onto which the detected states are projected by the measuring detectors  $A$  and  $B$ , respectively.

The polarization operator  $\hat{\sigma}$  projects the incoming states onto the measurement Hilbert space for comparison of the two separate data sets. The polarization measurement operators of  $\hat{\sigma}(\theta_k) = \sin (2\theta_k) \hat{\sigma}_1 + \cos(2\theta_k) \hat{\sigma}_3$  produce the output states

$$|\Phi_k\rangle = \sin (2\theta_k) \hat{\sigma}_1 |\psi_k\rangle + \cos(2\theta_k) \hat{\sigma}_3 |\psi_k\rangle \quad (B3)$$

Which, analogously to the overlapping inner product of two state vectors, lead to the correlation function of

$$E_c = \langle \Phi_A | \Phi_B \rangle = \cos[2 (\theta_A - \theta_B) - (\varphi_A - \varphi_B)] \quad (B4)$$

Recalling that the phases  $\varphi_k$  are set in the Jones representation, this result links the overlap of the Jones vectors to the correlation of the corresponding Stokes vectors  $\vec{s}_{A \text{ or } B}$  on the Poincaré sphere where the angle  $2\varphi_k$  applies, that is:

$$E_c = \vec{s}_A \cdot \vec{s}_B = \cos 2 (\Delta \phi) \quad (B5)$$

$$\Delta \phi = \theta_A - \theta_B - (\varphi_A - \varphi_B)$$

The quantum correlation function of Eq. (B5) between two independent states of polarized photons is equivalent to the overlap of their Stokes vectors on the joint Poincaré sphere of the measurement Hilbert space. Quantum-strong correlation are possible with independent states of photons because the source of the correlation is the polarization states of the detecting filters or analyzers, making any claim of quantum nonlocality unnecessary.

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## Center for Research in Sustainable Ecological Production in Macaraquita from Chepo of Las Minas

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**Abstract-** This project will be of great impact for the population of the Azuero region, for the Technological University of Panama (UTP), and for the inhabitants of Macaraquita, Chepo, and Las Minas, since this center will be the appropriate setting where lectures and courses will be held on the practical application of technological trends in sustainable production, focused on the dissemination of our research, so that the following projects will be located in interconnected facilities with towers and wires for moving:

- Training center section
- Section of orchid bioparks
- Wind generation section
- Section of water processing plant
- Aquaculture section
- Greenhouse section of healthy fruits and apiary

**Keywords:** *sustainable production, aquaculture, apiary, healthy fruits, wind generation.*

**GJRE-G Classification:** *DDC Code: 621.45 LCC Code: TJ820*



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# Center for Research in Sustainable Ecological Production in Macaraquita from Chepo of Las Minas

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**Resumen-** Este proyecto será de gran impacto para la población de la región de Azuero, para la Universidad Tecnológica de Panamá (U.T.P.), y para los pobladores de Macaraquita, de Chepo, de Las Minas, ya que este centro, será el escenario adecuado donde se dictarían charlas y cursos, sobre la aplicación práctica de las tendencias en producción ecológica sostenible, enfocadas en la divulgación de nuestra investigación, por lo que se ubicarán en instalaciones interconectadas con torres y cables para moverse entre los siguientes proyectos:

- Sección de centro de capacitación
- Sección de bioparque de orquídeas
- Sección de generación eólica
- Sección de planta procesadora de agua
- Sección de acuicultura
- Sección de invernadero de frutos sanos y apiario

En dichas secciones se estarán realizando capacitaciones teórico-prácticas, para la población sobre cada uno de los proyectos antes mencionados, esto le brindará a la institución una mejor comunicación con la comunidad y así poder continuar con los trabajos posteriores a la construcción, que serían la labor de mantenimiento, cuidados y desarrollo de la infraestructura y los proyectos.

**Palabras Claves:** *producción sostenible, acuicultura, apiario, frutos sanos, generación eólica.*

**Abstract-** This project will be of great impact for the population of the Azuero region, for the Technological University of Panama (UTP), and for the inhabitants of Macaraquita, Chepo, and Las Minas, since this center will be the appropriate setting where lectures and courses will be held on the practical application of technological trends in sustainable production, focused on the dissemination of our research, so that the following projects will be located in interconnected facilities with towers and wires for moving:

- Training center section
- Section of orchid bioparks
- Wind generation section
- Section of water processing plant
- Aquaculture section
- Greenhouse section of healthy fruits and apiary

In these sections theoretical-practical training will be conducted for the population on each of the aforementioned projects, this will provide the institution with better

communication with the community and thus be able to continue with the post-construction work, which would be the maintenance work, care and development of infrastructure and projects.

**Keywords:** *sustainable production, aquaculture, apiary, healthy fruits, wind generation.*

## I. INTRODUCTION

La donación de 50 hectáreas a la U.T.P. ha generado la necesidad de aprovechar esos terrenos y cumplir con la misión de la universidad de generar conocimiento apropiado para contribuir al desarrollo sostenible del país y de América Latina.

Este proyecto tiene como fin un trabajo conjunto en la educación, conservación y valoración de los ecosistemas de la región. Constará de unos edificios prefabricados de forma hexagonal, los puntos verdes en la imagen de la. Figuras 1, 2 y 3, y unas torres conectadas con cables para que los investigadores puedan moverse sin peligro sobre el bosque.

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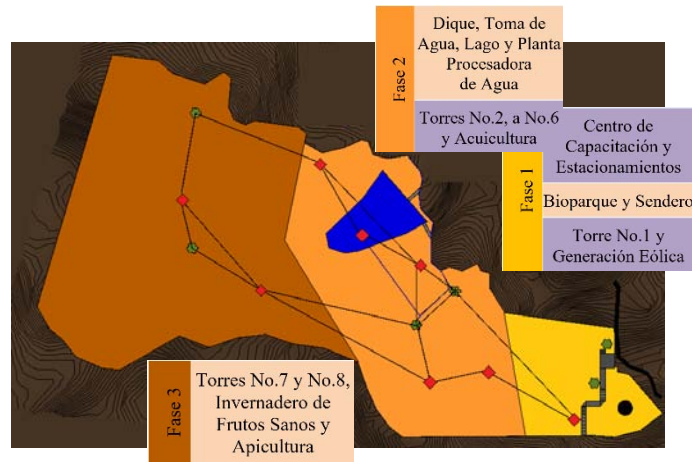


Figura 1: [1]Fases del Proyecto

Aunque sabemos que es una región donde el desarrollo turístico es casi nulo, sólo una vez al año (Feria de la Flor del Espíritu Santo); es por este motivo que tenemos como plan mantener durante todo el año este movimiento e involucrar a los mismos pobladores para que sean los principales motivadores de nuestro proyecto y la logística para la atención a los visitantes, les beneficie. Para lo que hay que crear un lago, una potabilizadora y electricidad por Generación eólica.

El Centro será una oportunidad de reunir a nacionales y extranjeros para compartir las maravillas de las orquídeas, el mundo vegetal e incluso la vida animal. Buscamos llegar a ser una fuente de inspiración para grupos campesinos para que tomen el control del

destino de sus bosques a través del apoyo a la preservación de las partes vírgenes e inexploradas de sus regiones ayudándolos a establecer semilleros para producir flores y plantas locales con un potencial de mercado nacional e internacional.

Seremos una fuente de información para nuevas ideas e investigaremos las maravillas de las orquídeas y la biodiversidad de la región de Las Minas; un oasis rodeado de exuberante belleza natural. El lago será ejemplo de manejo adecuado del recurso hídrico ya que la distancia entre el desvío del agua y el rebosadero va a ser mínima afectando poco al ambiente y aprovechando la misma para el consumo humano y la cría de peces.



Figura 2: [1]Edificios Hexagonales Prefabricados



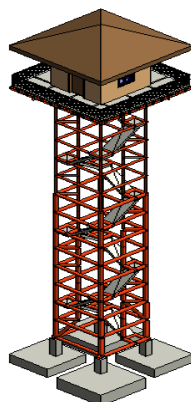


Figura 3: [1]Torres

## II. PROBLEM DESCRIPTION

Se necesita fomentar el potencial humano, económico e investigativo de la región a través de la capacitación, por medio de profesionales que promuevan dichos proyectos. Hay mucho que hacer en Chepo de Las Minas, para aquellos que les gustan las actividades propias del clima de montaña, pero todavía no hay desarrollo turístico que permita ofrecer el lugar como un ejemplo de que la producción agrícola sostenible es posible.

Aunque sabemos que es una región donde el desarrollo turístico es casi nulo, sólo una vez al año (Feria de la Flor del Espíritu Santo); pero según [2](Arditti, J., 1992) existen alrededor de 32000 especies por lo que la meta es generar nuevas investigaciones como plan para mantener durante todo el año este movimiento turístico para la autogestión con actividades diversas e involucrar a los mismos pobladores para que sean los principales motivadores de nuestro proyecto y la logística para la atención a los visitantes, les beneficie. Para lo que hay que crear un lago, una potabilizadora y electricidad por generación eólica.

	Proyectos	Costo de Inversión por Proyecto (B/.)	Ingresos Anuales por Proyecto (B/.)	Costo de Operación Anual por Proyecto (B/.)
Fase 1	Centro de Capacitación y Estacionamientos	95,690.37	41,500.00	27,200.65
	Bioparque y Sendero	44,747.91	19,600.00	10,990.30
	Torre No.1 y Generación Eólica	39,525.00	17,280.00	1,950.00
Fase 2	Dique, Toma de Agua, Lago y Planta Procesadora de Agua	41,320.54	100,000.00	75,360.00
	Torres No.2, a No.6 y Acuicultura	139,654.60	190,479.20	25,523.84
Fase 3	Torres No.7 y No.8, Invernadero de Frutos Sanos y Apicultura	23,674.40	9,600.00	7,758.60
<b>Totales</b>		<b>384,612.82</b>	<b>378,459.20</b>	<b>148,783.39</b>

Figura 4: [1] Inversión, Ingreso y Operación





Figura 5: [1] Gira estudiantil a Macaraquita



Figura 6: [1] Señor Lira, dueño del terreno donado a la Universidad Tecnológica de Panamá

### III. CONCLUSIONS

*Los proyectos por separado recuperarían la inversión a diferentes edades, pero trabajando en conjunto lo harían en 2 años, siendo autosostenible, produciendo empleos y ganancias, pero lo más importante es que la construcción del Centro beneficiará directamente a la comunidad de Macaraquita de Chepo de Las Minas y diversas comunidades aledañas a la región. Se pretende fomentar un sentimiento de orgullo sobre las maravillas naturales que existen en su medio. Nos proponemos alentar la conservación de la naturaleza con la educación.*

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Fellows can use the honored title of membership. The "FERC" is an honored title which is accorded to a person's name viz. Dr. John E. Hall, Ph.D., FERC or William Walldroff, M.S., FERC.

Career

Credibility

Exclusive

Reputation

### RECOGNITION ON THE PLATFORM

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Career

Credibility

Reputation

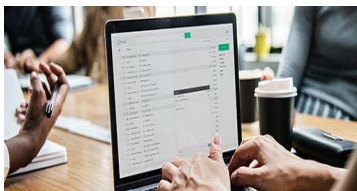
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Career

Financial



## GJ ACCOUNT

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Career

Credibility

Reputation



## PREMIUM TOOLS

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To take future researches to the zenith, fellows receive access to all the premium tools that Global Journals have to offer along with the partnership with some of the best marketing leading tools out there.

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Credibility

Financial

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Financial

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Credibility

Exclusive

Reputation

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## ASSOCIATE OF ENGINEERING RESEARCH COUNCIL

ASSOCIATE OF ENGINEERING RESEARCH COUNCIL is the membership of Global Journals awarded to individuals that the Open Association of Research Society judges to have made a 'substantial contribution to the improvement of computer science, technology, and electronics engineering.

The primary objective is to recognize the leaders in research and scientific fields of the current era with a global perspective and to create a channel between them and other researchers for better exposure and knowledge sharing. Members are most eminent scientists, engineers, and technologists from all across the world. Associate membership can later be promoted to Fellow Membership. Associates are elected for life through a peer review process on the basis of excellence in the respective domain. There is no limit on the number of new nominations made in any year. Each year, the Open Association of Research Society elect up to 12 new Associate Members.



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Global Journals sends a letter of appreciation of author to the Dean or CEO of the University or Company of which author is a part, signed by editor in chief or chief author.



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Career

Credibility

Exclusive

Reputation



### CERTIFICATE

#### CERTIFICATE, LOR AND LASER-MOMENTO

Associates receive a printed copy of a certificate signed by our Chief Author that may be used for academic purposes and a personal recommendation letter to the dean of member's university.

Career

Credibility

Exclusive

Reputation



### DESIGNATION

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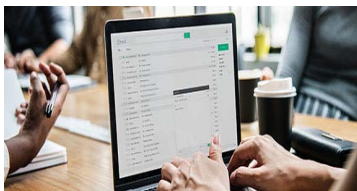
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Financial

## AND MUCH MORE

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ASSOCIATE	FELLOW	RESEARCH GROUP	BASIC
<p>\$4800 lifetime designation</p> <hr/> <p>Certificate, LoR and Momento 2 discounted publishing/year Gradation of Research 10 research contacts/day 1 GB Cloud Storage GJ Community Access</p>	<p>\$6800 lifetime designation</p> <hr/> <p>Certificate, LoR and Momento Unlimited discounted publishing/year Gradation of Research Unlimited research contacts/day 5 GB Cloud Storage Online Presense Assistance GJ Community Access</p>	<p>\$12500.00 organizational</p> <hr/> <p>Certificates, LoRs and Momentos Unlimited free publishing/year Gradation of Research Unlimited research contacts/day Unlimited Cloud Storage Online Presense Assistance GJ Community Access</p>	<p>APC per article</p> <hr/> <p>GJ Community Access</p>



## PREFERRED AUTHOR GUIDELINES

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### **We accept the manuscript submissions in any standard (generic) format.**

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from <https://globaljournals.org/Template.zip>

Authors should submit their complete paper/article, including text illustrations, graphics, conclusions, artwork, and tables. Authors who are not able to submit manuscript using the form above can email the manuscript department at [submit@globaljournals.org](mailto:submit@globaljournals.org) or get in touch with [chiefeditor@globaljournals.org](mailto:chiefeditor@globaljournals.org) if they wish to send the abstract before submission.

### BEFORE AND DURING SUBMISSION

Authors must ensure the information provided during the submission of a paper is authentic. Please go through the following checklist before submitting:

1. Authors must go through the complete author guideline and understand and *agree to Global Journals' ethics and code of conduct*, along with author responsibilities.
2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s) names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

### Declaration of Conflicts of Interest

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Authors are solely responsible for all the plagiarism that is found. The author must not fabricate, falsify or plagiarize existing research data. The following, if copied, will be considered plagiarism:

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- Ideas
- Findings
- Writings
- Diagrams
- Graphs
- Illustrations
- Lectures



- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

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2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

### Changes in Authorship

The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

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### Appealing Decisions

Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

### Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

### Declaration of funding sources

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## PREPARING YOUR MANUSCRIPT

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.



### ***Manuscript Style Instruction (Optional)***

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

### ***Structure and Format of Manuscript***

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

- a) A title which should be relevant to the theme of the paper.
- b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
- c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
- d) An introduction, giving fundamental background objectives.
- e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
- f) Results which should be presented concisely by well-designed tables and figures.
- g) Suitable statistical data should also be given.
- h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

- i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
- j) There should be brief acknowledgments.
- k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.



## FORMAT STRUCTURE

***It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.***

All manuscripts submitted to Global Journals should include:

### **Title**

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

### **Author details**

The full postal address of any related author(s) must be specified.

### **Abstract**

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

### **Keywords**

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in a research paper?" Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

### **Numerical Methods**

Numerical methods used should be transparent and, where appropriate, supported by references.

### **Abbreviations**

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

### **Formulas and equations**

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

### **Tables, Figures, and Figure Legends**

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.



## Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

## PREPARATION OF ELECTRONIC FIGURES FOR PUBLICATION

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

## TIPS FOR WRITING A GOOD QUALITY ENGINEERING RESEARCH PAPER

Techniques for writing a good quality engineering research paper:

**1. Choosing the topic:** In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

**2. Think like evaluators:** If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

**3. Ask your guides:** If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

**4. Use of computer is recommended:** As you are doing research in the field of research engineering then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

**5. Use the internet for help:** An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow [here](#).





**6. Bookmarks are useful:** When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

**7. Revise what you wrote:** When you write anything, always read it, summarize it, and then finalize it.

**8. Make every effort:** Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

**9. Produce good diagrams of your own:** Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

**10. Use proper verb tense:** Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

**11. Pick a good study spot:** Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

**12. Know what you know:** Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

**13. Use good grammar:** Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

**14. Arrangement of information:** Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

**15. Never start at the last minute:** Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

**16. Multitasking in research is not good:** Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

**17. Never copy others' work:** Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

**18. Go to seminars:** Attend seminars if the topic is relevant to your research area. Utilize all your resources.

**19. Refresh your mind after intervals:** Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

**20. Think technically:** Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.



**21. Adding unnecessary information:** Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

**22. Report concluded results:** Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

**23. Upon conclusion:** Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

## INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

### **Key points to remember:**

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

### **Final points:**

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

*The introduction:* This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

### **The discussion section:**

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

### **General style:**

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

**To make a paper clear:** Adhere to recommended page limits.

### *Mistakes to avoid:*

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.

- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

#### **Title page:**

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

**Abstract:** This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

*Reason for writing the article—theory, overall issue, purpose.*

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

#### **Approach:**

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

#### **Introduction:**

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

*The following approach can create a valuable beginning:*

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.



**Approach:**

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

**Procedures (methods and materials):**

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

**Materials:**

*Materials may be reported in part of a section or else they may be recognized along with your measures.*

**Methods:**

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

**Approach:**

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

**What to keep away from:**

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

**Results:**

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.



**Content:**

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

**What to stay away from:**

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

**Approach:**

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

**Figures and tables:**

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

**Discussion:**

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.



**Approach:**

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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<i>Introduction</i>	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
<i>Methods and Procedures</i>	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
<i>Result</i>	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
<i>Discussion</i>	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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