ROLES OF MATHEMATICS EDUCATION TOWARDS SUSTAINABLE DEMOCRACY IN NIGERIA.

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Abstracts

This paper seeks to bring the roles of mathematics education in sustainable democracy in Nigeria into the limelight. In this paper, Nigeria was captured as a set whose subset comprises the states, Senatorial Districts and Local Government Areas. It introduces strong predictor-corrector methods as an instrument that will provide democratic stability in governance during decision-making. The result of Euler's method shows that the x=1, sustainable value of democracy y=f(x) is 0.6127964462, which indicates that sustainable democracy can be achieved in Nigeria by critically observing all the necessary steps needed.

Keywords: *Democracy, Electorates, Mathematics and Technology*

Introduction

Nigeria has suffered political or democratic instability in the past, and even now, since the military era is still persistent in this democratic dispensation. This suffering is attributed to some personalities who made themselves kingmakers, power brokers, or self-acclaimed leaders. This syndrome that has kept Nigeria in the dark can be curtailed by demonstrating the knowledge of mathematics education as a vital tool for sustainable democracy. Mathematics has several branches with principles or concepts such as Sets, Logarithm functions, Probability theory, and Differential equations. However, a few can firmly be represented and applied in achieving sustainable democracy.

A set is a collection of well-defined objects characterized by their elements. However, Nigeria as a Nation is a SET whose subsets are the six (6) Geo-Political zones comprising the States, Senatorial Districts or Constituencies and Local Government Areas. Each of these groups is represented by an elected representative in the Government Policymaking echelon, projecting his people's ideologies, norms, problems and demands to the government. According to Ezenwani in Eze (2008), selecting these representatives by the people is crucial for a stable government. Homo-morphism is a sure process of set transformation to ensure that democracy is sustained. Democracy is a form of government, referred to as government of the people, by and for the people. According to Ntalaja (2002), democracy is a form of governance that supports and encourages morals and accords the people's right to participate in decision-making that concerns their collective will and interest. Giddens (1996) and Asua and Udofia (2016) see democracy as a government that allows the citizens to participate in political decision-making and elect representatives to govern them for a specified time. Thus, it is believed that democracy involves the transfer of power or people's sovereignty via elections to the elected to form a government. They are a set of people who will legitimize governmental control of the formed government over the people (citizens).

Sustainable Democracy is the act whereby the electorates' rights are protected. It could be noted here that democracy is the culture and values in a society that triggers the development of all aspects for the interest of the present and future generations. Ogbe and Ojie (2020) see sustainable democracy as a systematic process of changing the orientation and attitude of citizens and the institutions of governance through a continuous political education that will positively impact democracy in a society. These positive attitudes of the electorates should be devoid of vote-buying and electoral thuggery but can be avoided by voting en masse and resisting all forms of electoral malpractices.

Mathematics Education and Sustainable Democracy

According to Ezeamenyi in Eze [2008], mathematics studies size, numbers and patterns. Mathematics is the most international of all subjects, and mathematical understanding influences decision-making in all areas of life-private, social and civil [Anatomy and Walshaw,2009]. To further stress this point, Democracy, one of the modern systems of governance, is always referred to as a game of numbers. Interestingly, mathematics is unarguably known as a branch of science that uses the number as an ingredient to study, generalize and explain phenomena, political systems inclusive. One would now ask how a political system can be developed without mathematics. Todaro and Smith [2003] define sustainable development as a "Pattern of development that permits future generations to live at least as well as the current generation". It is believed that Mathematics education is a key to increasing post-school and citizenship of young people in Nigeria. The knowledge of mathematics acquired is an essential tool in society today in democratic processes. According to Yara [2009], the contribution that mathematical knowledge and skills have made to economics, industrial and technological growths of the modern world are quite obvious to almost everyone. Hence, mathematics education should be used as a tool for sustainable democracy due to its relevance to society.

Mathematical Predictor-Corrector Methods in Democracy

The idea behind the predictor-corrector methods is to use a suitable combination of an explicit and an implicit technique to obtain a method with better convergence characteristics. The combination of the FE and the AM2 methods is employed often. Here, we use the FE as a predictor equation to get y^p_{n+1} and subsequently use the AM2 as a corrector equation to get the final computed solution y_{n+1}.

Decision-making in government should rather be scientific than otherwise. One of the mathematical models is the predictor-corrector method to address and ensure sustainable democracy in Nigeria. In the case of deterministic ordinary differential equations, it has been known that predictor-corrector methods can be used to achieve and improve democratic stability. It should be noted that errors arise naturally during legislation or governance; these errors can best be resolved technically by applying the predictor-corrector method. Based on this, it is essential to understand the propagation of such errors in scenario simulation. Therefore, it is wise to recognize that the democratic stability of a scheme or system must have priority over a potentially higher-order convergence.

By such, we meant that given the differential equation $y^{1'}=f(x,y)$, a set of starting values (x_0, y_0) and a step length (h), we can then find the value of y^1. The values of x_1 and y_1 become the starting values for the next iteration, so the procedure goes on, one step at a time.

A simple multi-step method employed to ensure a sustainable democracy is given by the equations below:

$\bar{y}_1 = y_0 + hf(x_0, \bar{y}_1)$ ---------- (1)

$y_1 = y_{0+} ½h \{f(x_0,y_0) + f(x, \bar{y}_1)\}$ ---------- (2)

Here, we calculate $\bar{y}_1$ first from the given initial conditions x_0 and y_0. We call this equation the **PREDICTOR** because it gives $\bar{y}_1$ as the first estimate of y_1. Using $\bar{y}_1$ in the second equation provides a more accurate value for y_1. We call this equation the **CORRECTOR.**

From the analysis above, it should be noted that the predictor here refers to the **ELECTORATES** while the corrector is referred to as the **REPRESENTATIVE** of the people.

Applying the equations above will reduce the errors in governance for a sustainable democracy, as shown in the question below:

Given the initial value condition of democracy $X_0=0.5$, and the range value f(x)=0.2 to 1, calculate the sustainable value of democracy y=f(x) for $x_0 \leq x \leq x_n$

Solution:

Using the Euler's method

Table 1: The interval Euler-Trapezoidal (predictor-corrector) method

X	**y=f(x)**
0.5	0.2
0.55	0.248
0.6	0.2949248
0.65	0.3405757681
0.7	0.3847761754
0.75	0.4273735402
0.8	0.468241133
085	0.5072786451
0.9	0.5444120639
0.95	0.5795928391
1	0.6127964462

From Table 1, it was observed that the x=1, sustainable value of democracy **y=f(x)** is 0.6127964462, which indicates that sustainable democracy can be achieved in Nigeria by critically observing all the necessary steps, shows that the representatives and the electorates will enjoy the Dividend of Democracy. In other words, when x< 0.5, the democracy of Nigeria is less sustained because the elected or the representatives will not have the interest of the electorates at heart, just as the era of the Dollar rains in the hands of a few individuals called "delegates" in the just-concluded parties' primary elections for the 2023 general election.

Predictor-Corrector method for Electoral Act Amendment bill 2022

The conduct of elections in any country, especially in Nigeria, is very important because it gives the procedure that allows citizens (electorates) to choose representatives who will hold positions of authority within it.

In a democratic system, elections are supposed to be free and fair. A good legal framework has been recognized as a prerequisite for credible, free and fair elections.

Most of the challenges encountered include irregularities that put the entire electoral process in doubt; legislative framework poised a problem that puts constraints on the electoral processes in Nigeria; the inability of various stakeholders to play their roles; Lack of room for inclusiveness in the electoral system; lack of independence of electoral commissions; the long process of election dispute resolutions; irresponsible behaviour by politicians; thuggery and violence; and monetization of politics. Based on the abovementioned problems, the Electoral Act must address the constraints for effective and sustainable democracy when passed into law.

The Electoral Act provides for the structure and activities of the Independent National Electoral Commissioner (INEC), which determines its powers and guidelines for registering voters, procedures for the conduct of elections, the registration and regulation of political parties, and electoral offences and the determination of election offences.

During the return of civil rule or democracy in 1999, the electoral Act was first passed in 2001 and reviewed in 2002, 2006, and 2010. Several attempts have been made to amend the electoral acts, which will address the deficiencies noticed during elections.

There were several attempts after the 2015 Elections to amend the Electoral Law by the introduction of the Electoral Act Amendment Bill to make the use of card readers legal. It is a process and not a person that can withhold anything. However, the President withheld assent for two definite reasons: some irregularities observed and the amendment being too close to the elections (less than three months).

In 2021, the Electoral Act amendment bill made provisions for card readers and forbade political party members from taking up employment or appointment in INEC during the electioneering period; and provisioned for electronic transmission of results. The amendment also makes provision to delete or remove the provision for the conduct of indirect primaries in the nomination of party candidates and to effect direct primaries to be compulsory for all political parties.

If used or applied by the National and State Assembly legislators during this Electoral Act Amendment Bill, the Predictor-Corrector method will enhance the Sustainability of Democracy in Nigeria by 2023.

Recommendations

We, therefore, recommend how policymakers can use mathematics education knowledge to improve and sustain democracy in Nigeria. Policies guiding electoral amendment, the wishes of the citizens of electorates should be well respected because ideologies are never personal and are to be accepted by society. Mathematicians should be involved or incorporated during scientific and effective decision-making for a better and sustainable democracy in Nigeria.

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