



Urban and Rural Differences on Perception and Application of Indigenous Knowledge and Practices by Secondary School Biology Teachers in Ebonyi State, Nigeria

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ABSTRACT

The study assessed teachers' perception and application of indigenous knowledge in secondary school biology in of Ebonyi State. The study was conducted using biology teachers in Abakaliki Education Zone of Ebonyi State. The design of the study was descriptive design. Two research questions and two null hypotheses guided the study. 27 biology teachers randomly selected from 5 urban and 5 rural government secondary schools formed the sample for the study. The instrument used for data collection were Teachers Perception of Indigenous Knowledge Practices Questionnaire (TPIKPQ, $r = 0.83$) and Teachers Application of Indigenous Knowledge Practices Questionnaire (TAIKPQ, $r = 0.76$). The research questions were answered using mean and standard deviation while the hypothesis were tested at 0.05 degree of significance using independent sample t-test. The findings revealed that urban and rural teachers generally perceived indigenous knowledge as part of biology teaching in secondary schools in Ebonyi State, and they generally agreed that they apply indigenous knowledge in biology teaching in the secondary schools in Ebonyi State. Based on the findings, it is therefore recommended that teacher training programs should include modules on indigenous knowledge and its application in biology classroom. Curriculum developers should incorporate indigenous knowledge into the biology curriculum and finally the educational policymakers should support the integration of indigenous knowledge into secondary school biology.

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INTRODUCTION

Indigenous knowledge and practices (IKP) is the sum total of knowledge and skills which people in a particular area possess and which enable them to get the most out of their natural environment (De Beer & Whitlock, 2009). According to Onwu & Mosimege (2004), IKP is a collective knowledge and practices of an indigenous people about relationships between humans, animals and nature. IKP is therefore a unique information about people's beliefs, practices, and ways of knowing that is passed down from generation in an indigenous societies (Agrawal, 1996). Indigenous knowledge and practices are based on the wisdoms, insights and information that indigenous people have about their surroundings, cultural history, social relationships, and spiritual connections and ways of doing things. Indigenous knowledge and practices focuses on how people, other living things and the environment are connected. It's shaped by local languages, oral customs, rituals, local ceremonies and learning by doing. Indigenous knowledge and practices includes farming practices that are adapted to local soils, climates and crop varieties, traditional food sources and local food preservation techniques, medical practices which is based on local plants and healing techniques. Indigenous knowledge and practices also include traditional ecological knowledge with its deep understanding of local ecosystem including plants and animals, weather patterns and seasonal changes which is often used for resource conservation and management. IKP shows indigenous societies unique cultural, historical, and geographical contexts and their close ties to the land, water, plants, animals, and astronomical bodies. It emphasizes the preservation and promotion of indigenous languages, practices, cultures and traditions. It also improve our understanding of the world and encourages different ways of looking at knowledge and wisdom (Newberry & Trujillo, 2018).

According to Asejo & Doctor (2021), the preservation of IKP is a very big challenge due to influences of modernity. In order to be able to preserve this knowledge and practices, there should be a move to include these knowledge and practices in teaching and learning biology. Indigenous communities will be respected and given more power when indigenous knowledge and practices are applied in different areas of learning such as biology education. According to Ahanonye (2021), both indigenous knowledge and western education can be used as a tool to enhance science learning among high school learners. This implies that both indigenous knowledge and western knowledge are important in a biology classroom.

In the recent years, science teaching has become more aware of how important it is to teach native information (De Beer & Whitlock (2009). In the same way, biology teachers' professional development shall include teacher training and professional development programs that help teachers to learn more about indigenous knowledge and practices and teach them how to use it in their biology classes. Ogunninyi & Iwuanyanwu (2004) on his study focused

on Practical Argumentation Course an instructional tools for enhancing teachers' understanding of, and ability to apply indigenous knowledge in the classroom. For example there are indigenous practices that are used in controlling erosion, conservation of the environment and production of crops. To control erosion in the local setting of Igboland, there is the construction of water reservoir inside each compound known as 'umi'. This umi can be constructed in two ways, one which is cemented and water from the zinc channeled into it, and secondly it can be dung in the ground where run off water are collected. In each compound, there must be umi which does not allow rain water to leave the compound, thereby controlling the amount of water in the streets, which in turn controls erosion. Again there is 'ima ekpe' where small ridges are constructed on a sloppy land so as to conserve the land and make it fertile. Osmosis and fermentation can also be demonstrated by soaking of maize for corn and soaking of cassava for foo-foo. Again the practice of labelling a forest 'ofia arusi' is a way of conserving the soil, plants, animals and air. This is because no one is allowed to enter such forests to cut tress or hunt. Most of the endangered species of plants and animals are usually preserved in such forests. All these and many more are knowledge and practices which can be inculcated in a biology classroom, this will make concepts in biology more understanding and also help to preserve indigenous practices. It will also help to relate biological concepts to everyday life and activities of students.

Applying IKP, biology teachers can give their students a more comprehensive and well-rounded education that trains them to deal with complex problems with empathy, ethical awareness, and a deep connection to the natural world. This is because IKP supports effective teaching and learning, which leads to deeper and better comprehension of content taught (Adedigba, Soretire & Ajayi, 2023). Integration of IKP shows how important different ways of knowing and learning are as we continue to live in a global world that is becoming more and more connected (Asejo & Doctor, 2021). In line with applying IKP in the classroom, for example soaking of maize to prepare pap and soaking of tiger nuts can be used to buttress the process of osmosis. By examining the reproductive parts, such as flowers and fruit, students can learn about the process of pollination and seed dispersal. By examining the flowers and fruits of these plants, students can also learn about the role of insects or other animals in the pollination (Onwa & Mosimege, 2004). The above information shows that biology classroom practices are based on students' daily life experiences with local materials which will give best understanding. IKP has been recognized as an important resource for education, but its integration into the mainstream curriculum has been limited (Ogunninyi, 2004). There is therefore need to find out teachers perception of IKP since they are the ones that will transform the curriculum into knowledge.

Teachers' perception of IKP are very crucial if biology curriculum is to accommodate it, because teachers are the path through which the importance of

IKP can be transferred and recognized by the students as an essential components of biology. Teachers who are aware of and incorporate indigenous knowledge into their teaching practices can provide a more engaging and culturally relevant learning experience for those from indigenous backgrounds. However teachers may face challenges in integrating indigenous knowledge into their teaching, including limited knowledge of indigenous communities and traditions, and a lack of support or resources (Onwu & Mosimege, 2004). Asejo & Doctor (2021) found out that teachers do not have full perception and application on the concepts of IKP, and their perception will greatly affects their application of the concepts. Ogunninyi & Iwuanyanwu (2024) discovered that teachers had mixed perceptions on the effectiveness of IKP on biology education. Their perception however changed after being subjected to six months argumentation course. When teachers are fully aware of IKP and are trained on how to incorporate it in the biology classroom, their perception will change and they will be eager to apply it in the classroom.

Application refers to the use of IKP in secondary school biology teaching. It involves the integration of IKP into lesson plans, instructional materials, and assessment strategies (Aikenhead & Michell, 2011). Effective application of indigenous knowledge requires teachers to be aware of IKP and its relevance to biology education, as well as possess the skills and confidence to incorporate it into their teaching practices (Asejo & Doctor, 2021). Application of IKP enables teachers to link students' local knowledge to biology, which leads to an improved understanding of biology in the classroom. De Beer & Whitlock (2009) found out that application of IKP in botany class has a positive effect on students' engagement and achievement. According to their findings, students exposed to IKP discovered that both IKP and western education are valuable in promoting effective outcomes in botany classrooms.

Rural secondary schools are educational institutions located in non-urban towns. It is often characterized by lower students' population density, access to local resources and practices, fewer teachers and close relationships between students, teachers and community. On the other hand, urban secondary schools are educational institutions located in cities. It is typically characterized by higher students' population density, low access to local resources and practices, little or no relationship between teachers, students and the community. This study therefore seeks to examine urban and rural teachers' perceptions and application of indigenous knowledge in secondary school biology classroom.

Research Questions

The following Research questions guided the study

1. What are urban and rural teachers' perceptions of indigenous knowledge and practices in biology teaching in secondary schools?
2. What are urban and rural teachers' responses to the application of indigenous knowledge and practices in biology teaching in secondary schools?

Hypothesis

H₀₁: There is no significant difference between urban and rural teachers' perceptions of use of indigenous knowledge and practices in biology teaching in secondary schools.

H₀₂: There is no significant difference between urban and rural teachers' responses to the application of indigenous knowledge and practices in biology learning in secondary schools.

METHOD

The design of the study is descriptive survey design. The study was carried out in Abakaliki Education Zone of Ebonyi State. Ten (10) schools each were selected from urban and rural setting in the zone using simple random sampling. All the biology teachers in the selected schools were used for the study. In the urban schools there were sixteen 16 biology teachers while in the rural schools there are eleven 11 biology teachers totaling 27 teachers.

The instrument used for data collection was Teachers' Perception and Application of Indigenous knowledge and Practices Questionnaire (TPAIKPQ). The instrument was constructed on four points (4) point scale of strongly agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD). The questionnaire was divided into three sections. Section A deals with the bio data of the respondents, section B deals with the teachers perception of indigenous knowledge while Section C deals with teachers application of indigenous knowledge. TPAIKPQ was trial tested using ten teachers outside the zone of study, and the result used to get 0.83 in cluster B and 0.76 in cluster C as the reliability estimate. The overall reliability co- efficient of the instrument is 0.82. Mean below 0.25 was dropped according to mean benchmark. Null hypothesis was rejected when P value was less than or equal to ($P \leq 0.05$), but was accepted when greater than ($P > 0.05$).

RESULTS

Table 1: Mean and Standard Deviation Scores of Urban and Rural Teachers' Perceptions of Indigenous Knowledge in Biology Teaching in Secondary Schools

Group Statistics						
S/N	Items	Location	N	X	SD	Dec.
1	There is biology in our Indigenous language and practices.	Urban	16	3.19	0.54	A
		Rural	11	3.64	0.51	A
2	Biology must be taught by incorporating it with Indigenous knowledge and practices.	Urban	16	3.25	0.45	A
		Rural	11	3.18	0.41	A
3	Biology is taught and learned as a foreign subject and has no place for Indigenous knowledge and practices.	Urban	16	2.13	0.81	D
		Rural	11	2.45	0.82	D
4	It is simple to integrate biology into one's individual views of the natural world.	Urban	16	3.25	0.45	A
		Rural	11	3.18	0.60	A
5	Successive integration can be made between biology and students' daily experiences.	Urban	16	3.25	0.45	A
		Rural	11	3.64	0.51	A
6	Students should be taught to use their traditional applications to support biological investigations.	Urban	16	3.63	0.50	A
		Rural	11	3.55	0.82	A
7	Learning biology which is not linked to our way of life empowers students by providing a new way of thinking.	Urban	16	1.81	0.75	D
		Rural	11	2.18	1.17	D
8	Biology education will be effective when linked to students' Indigenous knowledge.	Urban	16	3.56	0.51	A
		Rural	11	3.45	0.52	A
9	Biology taught in Nigeria provides education linked to students' everyday experiences.	Urban	16	3.00	0.63	A
		Rural	11	3.45	0.52	A
10	Western biology and Indigenous biology are the same thing.	Urban	16	3.00	0.37	A
		Rural	11	3.00	0.45	A
	Overall Mean and SD on Teachers' Perceptions	Urban	16	3.01	0.46	A
		Rural	11	3.17	0.54	A

(X = Mean; SD = Standard deviation; Dec. = Decision, A = Agree; D = Disagree)

Table 1 shows the mean and standard deviation scores of the responses of the urban and rural teachers' perceptions of IKP in biology teaching in secondary schools in Ebonyi State. The table shows that the urban and rural teachers generally indicated that they perceive IKP as part of biology teaching in secondary schools in Ebonyi State. This was premised on the fact that the overall mean and standard deviation of the urban and rural teachers which were 3.01 ± 0.46 , and

3.17 ± 0.54 respectively were above the mean benchmark of 2.5 set for the study. Meanwhile, the overall mean response of the rural teachers was higher than that of their urban counterparts with a numerical value of 0.16. Furthermore, the overall standard deviation of the urban teachers was lower than that of their rural counterparts. This shows that the responses of the urban teachers were more clustered around their overall mean than those of their rural counterparts.

Table 2: Mean and Standard Deviation Scores of Urban and Rural Teachers' Responses to the Application of Indigenous Knowledge in Biology Teaching in Secondary Schools

Group Statistics						
S/N	Items	Location	N	X	SD	Dec.
11	I use students' experiences like soaking maize for pap to demonstrate osmosis.	Urban	16	2.58	0.89	A
		Rural	11	3.91	0.30	A
12	I classify plants into families and groups based on their cultural properties.	Urban	16	1.56	0.63	D
		Rural	11	1.36	0.51	D
13	I emphasize drying food as a way of preserving food since we are in the tropics.	Urban	16	3.31	0.48	A
		Rural	11	3.36	0.51	A
14	I classify different types of soil used in planting based on cultural properties.	Urban	16	3.38	0.50	A
		Rural	11	2.55	0.82	A
15	I relate the biological names of plants and animals to their local names.	Urban	16	2.94	0.93	A
		Rural	11	2.09	0.70	D
16	I relate the conservation of forests/animals to the presence of a forbidden forest (ofia arusi).	Urban	16	2.56	0.73	A
		Rural	11	2.09	0.94	D
17	I relate events like erosion, and flooding, to human activities in the community.	Urban	16	2.56	0.81	A
		Rural	11	3.64	0.51	A
18	I relate plants to their medicinal values.	Urban	16	1.75	0.45	D
		Rural	11	1.18	0.41	D
	Overall Mean and SD on Teachers' Application of Indigenous Knowledge	Urban	16	2.55	0.61	A
		Rural	11	2.51	0.49	A

(X = Mean; SD = Standard deviation; Dec. = Decision, A = Agree; D = Disagree)

Table 2 contains the mean and standard deviation scores of the responses of the urban and rural teachers on the application of IKP in biology teaching in secondary schools in Ebonyi State. The table further that the urban and rural teachers agreed to items 11, 13, 14, and 17, but disagreed with items 12 and 18. Meanwhile, in items 15 and 16, the urban teachers agreed while the rural teachers disagreed. Moreover, the overall mean responses of the urban and rural teachers were 2.55 ± 0.61 and 2.51 ± 0.49 respectively.

These overall mean responses of the teachers were above the mean benchmark of 2.5 set for the study. Meanwhile, the overall mean response of the urban teachers was slightly higher than that of their rural counterparts with a numerical value of 0.04. Furthermore, the overall standard deviation of the rural teachers was lower than that of their urban counterparts. This shows that the responses of the rural teachers were more clustered around their overall mean than that of their urban counterparts.

Table 3: Independent sample t-test on Urban and Rural Teachers' Perceptions of Indigenous Knowledge in Biology Teaching

	Levene's Test		t-test for Equality of Means						
	F	Sig.	t	Df	p	MD	SED	95% ID	
Equal variances assumed	0.922	0.346	-0.865	25	0.395	-0.166	0.192	-0.563	0.230
Equal variances not assumed			-0.840	19.299	0.411	-0.166	0.198	-0.581	0.248

(P = sig (2-tailed). MD = Mean Difference; SED = Standard Error Difference; CID = confidence Interval Difference)

Table 3 shows the independent sample t-test conducted on the responses of the urban and rural teachers to test the null hypothesis 1. The table shows that Sig. value ($p = 0.346$) obtained in Levene's test was greater than 0.05. This implies that the variances are assumed to be equal. Furthermore, the results in the equal variances assumed section in the Table show a t-value of -0.865 and a p-value of 0.395, $p > 0.05$ at a 25 degree of freedom. Therefore, the null hypothesis one (H_{01}) which states that there is no significant difference between urban and rural

teachers' perceptions of Indigenous knowledge in Biology teaching in secondary schools in Ebonyi State was accepted. This shows that the numerical difference observed in Table 1 could probably be attributed to sampling error. This study, therefore, found no statistically significant difference in the perceptions of the urban and rural teachers of Indigenous knowledge in biology teaching in secondary schools in Ebonyi State at $t_{(25)} = -0.865$, $p = 0.395 > 0.05$.

Table 4: Independent Sample t-test on Urban and Rural Teachers' Responses to Application of Indigenous Knowledge in Biology Teaching

	Levene's Test		t-test for Equality of Means						
	F	Sig.	t	Df	p	MD	SED	95% CID	
Equal variances assumed	1.447	0.240	0.195	25	0.847	0.043	0.223	-0.415	0.502
Equal variances not assumed			0.202	24.148	0.841	0.043	0.214	-0.399	0.485

Table 4 contains the independent sample t-test conducted on the responses of the urban and rural teachers to test the null hypothesis 2. The table shows that Sig. value ($p = 0.240$) obtained in Levene's test was greater than 0.05. This implies that the variances are assumed equal. Furthermore, the results in the equal variances assumed section in the table show a t-value of -0.195 and a p-value of 0.847, $p > 0.05$ at a 25 degree of freedom. Therefore, null hypothesis two (H_{02}) which states that there is no statistically significant difference between urban and rural teachers' responses to the application of Indigenous knowledge in biology teaching in secondary schools in Ebonyi State was accepted. This shows that the numerical difference observed in Table 2 was not

significant and could be attributed to sampling error. This study, therefore, found no statistically significant difference in the responses of urban and rural teachers on the application of Indigenous knowledge in biology teaching in secondary schools in Ebonyi State at $t_{(25)} = 0.195$, $p = 0.847 > 0.05$.

DISCUSSION OF RESULTS

The study shows that the urban and rural teachers' perception of IKP is generally high. They agreed that there is biology in their indigenous knowledge and practices and that biology must be taught by incorporating it with IKP. Biology teaching in Nigeria

education system will be more effective if it is linked to the students' daily experiences instead of using western experiences. The overall mean response of the rural teachers was higher than that of their urban counterparts. The finding is in line with Asejo & Doctor (2021) who discovered that teachers has full perception of IKP while Ogunniyi & Iwuanyanwu (2024) discovered that teachers has mixed perception of IKP.

This study showed that the teachers generally agreed they apply IKP in biology teaching in the secondary schools in Ebonyi State. Specifically, the urban and rural teachers generally agreed that they use students' experiences like soaking maize for pap to demonstrate osmosis, they emphasize drying food as a way of preserving food since they are in the tropics, they classify different types of soil used in planting based on cultural properties, and they relate events like erosion, and flooding, to human activities in the community. Meanwhile, the overall mean response of the urban teachers was slightly higher than that of their rural counterparts.

This study also found no significant difference in the responses of urban and rural teachers on the application of Indigenous knowledge in biology teaching in secondary schools in Ebonyi State. The study revealed that the urban and rural teachers generally agreed that they apply IKP in biology teaching in the secondary schools in Ebonyi State. This findings is in accordance with Ahanonye (2021) and Asejo & Doctor (2021) who also in her studies found out that teachers are aware of their indigenous knowledge and the possibilities of applying such knowledge in their life science classrooms. De Beer & Whitlock (2009) discovered that application of IKP in the classroom had a positive effect on students' understanding of the concept. The application of indigenous knowledge into biology classroom provides a unique perspectives on the natural world, which can complement scientific knowledge and promote a more comprehensive understanding of biological concepts.

CONCLUSION

Based on the finding of the study, the researcher drew the conclusion that secondary school biology teachers in Ebonyi State have a good perception of indigenous knowledge and practices in biology. Teachers considers indigenous knowledge and practices as a powerful tool for effective teaching and learning in biology. When indigenous knowledge and practices are used in biology classrooms, the students are likely to have deeper and better understanding of what is taught.

Recommendations

The following recommendations were made, based on the findings:

1. Teacher training programs should include modules on indigenous knowledge and its application in biology teaching.

2. Curriculum developers should incorporate indigenous knowledge into the biology curriculum topics.

3. Educational policymakers should support the integration of indigenous knowledge into secondary school biology.

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