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ASSESSMENT OF SENIOR SECONDARY SCHOOL STUDENTS MEDICAL DIAGNOSES ON THE EYE USING ARTIFICIAL INTELLIGENCE (EXPERT SYSTEM): IMPLICATIONS FOR EDUCATIONAL ADMINISTRATORS

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Abstract
The study assessed Senior Secondary School Students Medical Diagnoses on the Eye using Artificial Intelligence (Expert System): Implications for Educational Administrators. Two research questions guided the study. The study adopted a descriptive survey design. The population of the study consisted of two thousand secondary school students (2000) drown from two Education zones in Enugu State (Udi and Nsukka Education zones respectively). A sample size of 400 students was drawn using multi-stage sampling procedure. Firstly, simple random sampling technique was used to draw two education zones from Enugu State. Secondly, proportionate stratified random sampling technique was used to draw 400 students from both Udi and Nsukka education zones representing 20% of the population. The instrument used for data collection was the researchers' developed questionnaire tagged 'Assessment of Students' Medical Diagnoses on the Eye Using Artificial Intelligence Questionnaire (ASMDEUAIQ)'. The instrument was validated by three experts from the Faculty of Education, University of Nigeria, Nsukka (two from Educational Foundations- Educational Management & Policy, and one from Science Education- Measurement and Evaluation Unit). The instrument was trial tested in Enugu-East Education zone, which yielded reliability coefficients of 0.78 and 0.76 for the two clusters respectively. Mean and standard deviation were used to answer the research questions. The findings of the study revealed that, only rule-based expert system were used by the ophthalmologist and the problems of secondary school students are the eye symptoms.

Keywords: Secondary school students, Medical diagnosis, eye, expert system

Introduction

Secondary school students usually have eye problems without realizing it is a serious problem that could be handled with just some medical help of treatment. Some of them do not tell their parents or make them be aware of such eye problems. Secondary school plays an important role in molding the character and moral behaviour of students as well as achieving the educational goals. Secondary schools help in the attainment of the societal needs and aspirations through teaching and learning by inculcating the right values and respect for the elders (Edikpa, Chukwuma, Agu, Amoke, Adepoju & Onu, 2020). Secondary school no doubt, inspires students with the desire for self-improvement, achievement of excellence, higher education and other private sectors. Secondary education is the level of education that provides the input resources into the nation's economy and tertiary education system (Walkar, 2016). Secondary schools, especially senior secondary schools stretched to post-basic education programmes that prepare the students for higher education and other career choices (FRN, 2018). It is the engine room that provides the input resources into the nations' economy and tertiary education system (Eze, 2024). As such, secondary school is responsible for enhancing growth, development, good behavior and academic progress of the students during their most sensitive and critical stages in life. The senior secondary education prepares the students for higher education and other career choices. Students refer to individuals engaged in learning, especially in secondary schools or colleges. Igi (2020) defined students as group of persons registered in various educational institutions for the acquisition of specific skills and knowledge under the management of administrators (Principals and Teachers). Students are very important in this study since one cannot discuss the assessment of senior secondary school students medical diagnoses on the eye using artificial Intelligence (Expert System) without the students

to ascertain whether there is a relationship or not. Secondary school trains majority of adolescents who eventually become leaders of tomorrow. Ogundele, Sambo and Bwoi (2015) posited that, secondary education is the level of education that usually comes after primary education and before tertiary education which prepares students for higher education. This is in line with Federal Republic of Nigeria (2014) in her National Policy on Education that defined secondary education as the education children received after primary education and before tertiary level of education. As such, there is need to introduce artificial intelligence in the secondary schools to prepare students for future growth and development of the society. Secondary school belongs to the global world where Artificial Intelligence technologies remain the order of the day.

Artificial Intelligence is the intelligence of machines or software as opposed to the intelligence of humans or other animals. It is a field of study in computer science that develops and studies intelligent machines. It refers to the simulation or approximation of human intelligence in machines (Edikpa, 2001). AI is a computer technology that can perform a number of functions in all aspects of life. Artificial Intelligence as a branch of technology encompasses the various techniques and approaches such as: machine learning, deep learning, natural language processing, computer vision and robotics for the management of university education (Abinbola & Idakwoji, 2023). These technologies enable computer users to analyze vast amounts of data, recognize patterns, make predictions and automate complex processes for the growth of students and institutional development. Ogunode and Gregory (2023) defined artificial Intelligence as the development of computer systems and machines capable of performing tasks that typically require human intelligence. Artificial Intelligence has applications across numerous fields, including health care, finance, transportation, customer service and education (Manafa & Onyekaba, 2025). Nigeria has a population of over 200 million people and has short supply of doctors and nurses. Some of the young doctors and nurses available left the country in search of greener pastures. Ibezim (2024) listed number of medical doctors across states in Nigeria, indicating 2,070 from Enugu and 1,518 from the sister state Anambra. Most hospitals have few doctors with many patients waiting to be attended to. Consequently, there is need for an artificial intelligence (expert system) that can help the doctors to see more people, and most especially non-experts in diagnosing diseases of the large population of the people that needs to be attended to in this country. A healthy nation is a wealthy nation, and health is a critical aspect of life, and people will go to great lengths to ensure their well-being, welfare of children and relatives. The world health organization (2023) defined health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. It could be defined as the absence of any disease or impairment. More so, health is a state that allows the individual to adequately cope with all demands of daily life. It could be a state of balance, an equilibrium that an individual has established for himself, between himself, his social and physical environment.

The sector faces numerous challenges including inadequate infrastructure and a shortage of skilled healthcare professionals. Many Nigerians suffer from various health issues such as blood pressure, diabetes, infections, strokes, erectile dysfunctions, infertility, liver problems, ulcer, kidney problems, eye problems, among others. Such health issues could be examined through an expert system (artificial intelligence) (Edikpa, 2001). An expert system is a computer program or a piece of software which uses database of expert knowledge to offer advice in areas as medical diagnosis. It uses artificial intelligence (AI) technologies to simulate the judgment and behavior of the human or an organization that has expertise and experience in a particular field. It uses computer system emulating the decision- making ability of a human expert. Expert systems are interactive, trustworthy computer-based decision-making tools that utilize data and heuristics to address challenging decision–making issues. It is designed to solve complex problems by reasoning through bodies of knowledge, represented as rules rather than through conventional procedural code. It is regarded as representing the pinnacle of human knowledge and wisdom. An expert system's job is to resolve the trickiest problems in a specific

field. Six application of expert system include: classification, monitoring, process control, diagnosis, scheduling, planning and generation of options of which it collects facts and heuristics about the systems domain. Types of expert systems include: Rule-based Expert Systems, Fuzzy Logic Expert Systems, Knowledge–based Expert Systems and Neural Networks Expert Systems. Rule-based expert system are the most common type of expert system, Fuzzy logic expert system are used to handle uncertainty and imprecision in data analysis (https//www.baeldung.com< expert, 2023)

The eye is one of the most important organs of the body of which without the eye, one cannot see. The magnitude of the tragedy of loss of sight sentences majority of our population to a lifetime of begging and dependence on their relatives or the general public. Their children will not go to school rather they take their blind parents around begging for alms. Students with eye problems cannot see the board very well; some of them do not perform well in class, and this brings untold hardship, frustrations as well as lagging behind in class and some die in silence without speaking out for help (Eze, 2024). Most often, teachers' do not notice such problems or identify such students on time. There are so many eye problems or diseases. Dawodu (1997) listed common eye problems as: Conjunctivitis, Cataract Glaucoma, Uveitis, Trachoma, Onchocerciasis, Retinoblastoma, Orbital Cellulitis Pseudo tumor and Vitamin A Deficiency. National Eye institute (2023) listed some common eye conditions as: Age- Related Macular Degeneration, Amblyopia (Lazy Eye) Astigmatism, Cataracts, Color Blindness, Diabetic Retinopathy, Dry Eye and Floaters. Symptoms of these eye problems are: redness of the eye (infection) Lacrimation, feeling of sandy sensation inside the eye, pussy discharges may be present, pains or itching, photophobia, swollen of the eyelids, trichiasia, scaring, opacity of the coma, severe itching, skin patches, visual impairment, skin modules, neurosis, proptosis, tenderness, and blindness among other (Guinness Eye Hospital Onitsha, 2023). Some of these eye problems were suffered by the secondary school students, but could not let anybody know about it.

Educational administrators should build social responsibility; awareness collaborated with teachers to check on students that portray short sightedness or any eye problems in class. This could be done by the class teachers with the delegation of the school principals. The growing rate of poor dictation of the eye problems lead to some hospitals that do not have expert system to treat their patients relying on the conventional method of general impression, historical data and physical examination due to the fact that most hospital in town do not have computerized medical diagnoses (expert system) for the eye in treating their patients (Edikpa, 2001). This means that, the personal observation of the ophthalmologist about the patients' eye as the patients enters the doctors' consulting room without questioning. This is more or less the guesswork stage, where the ophthalmologist assumes certain things in his mind like patients eye weakness, apparent age, weight, deformities of the eye or looking pale. Historical data are data collected by interrogating the patient as a new patient, while the ophthalmologist quickly run down the old patients past history to know the patients likely illness. This help to obtain medically relevant information from the patients' data such as the patients' biography, symptoms fact, and history of illness. This reveals if that particular disease has affected the patients eye before or not if affected, how long or how often the treatment was administered, and reaction to the drug given, if any.

Medical and surgical histories indicate where the patients' previous disease is considered. For women, the no of pregnancies, abortion, and miscarriages encountered are diagnosed. Family and social history is a case he ophthalmologist checks whether that particular eye disease run in the family of the patient. The optician also finds out the patients habit with respect to eating, alcohol, tobacco and drugs. Physical examinations of the eye for outward symptoms are checked in addition to the general impression and the historical data gotten, and the ophthalmologist arrives at a provisional diagnosis stating other minor problems which might be the cause of the eye problem. Thus, ophthalmologist achieves this by merely making an intelligent guess. A student who do not know anything about medical will go home

believing that he has seen an ophthalmologist or an eye doctor. On this background, there is need to investigate the assessment of senior secondary school students medical diagnoses on the eye using artificial intelligence (Expert System) in Enugu State.

Statement of the Problem

Some students are known for having lower grades in class even when they seem to be intelligent. The growing rate of poor performance for such students was unnoticed. Some students feel embarrassed or ashamed to tell their parents or an ophthalmologist their actual symptoms or may tend to withhold the information that can help diagnose their eye problems. Some patients waste a whole day in the hospitals without being attended to by the ophthalmologist because the hospital may have only one doctor on seat. Thus making the patients to waste time and money as the adage that says "Time is money"

The ophthalmologist good or bad mood may affect the diagnosis of the patients' eye. The patients' affluent patient, students' and poor patients' treatment can never be the same, one's wealth affects the patients treatment whether to be treated with costly drugs or cheap drugs according to what the patient can afford. Thus, considering the problems, this study becomes imperative.

Purpose of the study

The aim of the study was to investigate the assessment of senior secondary school students' medical diagnoses on the eye using artificial intelligence (Expert System) in Enugu State. Specifically, the study seek to

1. find out the level of utilization of expert system by the optician clinics in diagnosing secondary school students' eye problems in Enugu State; and
2. determine the symptoms of the eye diseases of the secondary school students in Enugu State.

Research Questions

The following two research questions guided the study.

1. What is the level of utilization of expert system by the optician clinics in diagnosing secondary school students' eye problems in Enugu State?
2. What are the symptoms of the eye disease of the secondary school students in Enugu State?

Methods

A descriptive survey design was used for the study. The descriptive survey aims at collecting data on and describing it in a systematic manner the characteristics, features or facts about a given population. This design is more appropriate for the study because this study aims to collect data from secondary school students in Enugu State. The population of the study consisted of two thousand secondary school students (2000) drown from two Education zones in Enugu State (Udi and Nsukka Education zones respectively). A sample size of 400 students was drawn using multi-stage sampling procedure. Firstly, simple random sampling technique was used to draw two education zones from Enugu State. Secondly, proportionate stratified random sampling technique was used to draw 400 students from both Udi and Nsukka education zones representing 20% of the population. The instrument used for data collection was the researchers' developed questionnaire tagged 'Assessment of Students' Medical Diagnoses on the Eye Using Artificial Intelligence Questionnaire (ASMDEUAIQ)'. The instrument was validated by three experts from the Faculty of Education, University of Nigeria, Nsukka (two from Educational Foundations- Educational Management & Policy, and one from Science Education- Measurement and Evaluation Unit). The instrument was trial tested in Enugu-East Education zone, which yielded reliability coefficients of 0.78 and 0.76 for the two clusters respectively. The four-point rating scale of Strongly Agreed (4), Agreed (3), Disagreed (2), and Strongly Disagreed (1) were used to answer the questionnaire. Mean and standard deviation were used to answer the two research questions. The main range which determined

the acceptance level was 2.50 and above, while scores from 2.49 and below were considered rejected.

Results

Research Question One: What is the level of utilization of expert system by the optician clinics in diagnosing secondary school students' eye problems in Enugu State?

Table 1: Level of utilization of expert system by the optician clinics in diagnosing students eye problems

S/N	Items	Mean	SD	Decision
1.	Ophthalmologist use Rule –based Expert Systems	2.56	0.94	High
2.	Fuzzy logic expert systems	2.30	1.13	Low
3.	Knowledge-based expert system	2.45	1.08	Low
4.	Neural Network expert systems	2.48	1.06	Low

Data on Table 1 present the mean scores and standard deviation on the level of utilization of expert systems by the optician clinics in diagnosing secondary school students' eye problems. The respondents accepted only rule-based expert system used by the ophthalmologist to a high extent. They rejected fuzzy logic expert system, knowledge-based expert system and neural network expert system to a low extent below the criterion mean score of 2.50.

Research Question Two: What are the symptoms of the eye disease of the secondary school students in Enugu State?

Table 2: Symptoms of the eye disease of the secondary school students

S/N	Symptoms	Mean	St.D.	Decision
1.	Inability to see at night	3.12	0.87	Agree
2.	Melting of the cornea	2.67	0.90	Agree
3.	Photophobia	2.91	1.00	Agree
4.	Blindness	2.73	0.92	Agree
5.	Lacrimation	3.31	0.88	Agree
6.	Redness of the eye	3.17	0.89	Agree
7.	Bumping over objects	2.96	0.95	Agree
8.	Color changes	3.30	0.91	Agree
9.	Polyuria	2.56	0.95	Agree
10.	White spot in the eye	2.91	1.00	Agree
11.	Diplopia	2.96	0.96	Agree
12.	Gradual loss of vision	3.12	0.92	Agree
13.	Swollen of the eye lids	3.07	0.81	Agree
14.	Pains in the eye	2.73	1.08	Agree
15.	Severe itching	2.67	0.92	Agree
16.	Eye discharge	2.88	0.94	Agree
17.	Scarring	3.18	0.89	Agree
18.	Inability to close the eye	3.38	0.79	Agree
19.	Tenderness	2.76	0.92	Agree
20.	Dryness of the cornea	3.13	0.88	Agree
21.	Corneal ulceration	3.07	0.81	Agree
22.	Conjunctiva ketosis	3.19	0.87	Agree

Data in Table two present the mean scores and standard deviation of respondents on the symptoms of the eye disease of the secondary school students in Enugu State. The agreed on all the items with high mean scores above the criterion mean of 2.50. Therefore, the symptoms of eye disease of the secondary school students in Enugu State include: inability to see at night, melting of the cornea, photophobia, blindness, redness of the eye, lacrimation, bumping over objects, color changes, polyuria, white spot in the eye, diplopia, gradual loss of vision, pains in

the eye, swollen of the eye lids, severe itching, eye discharge, scarring, inability to close the eye, tenderness, dryness of the cornea, corneal ulceration, and conjunctiva ketosis.

Discussions

The findings of research question one revealed that, the level of utilization of expert systems by the optician clinics in diagnosing secondary school students' eye problems. The respondents accepted only rule-based expert system used by the ophthalmologist to a high extent. They rejected fuzzy logic expert system, knowledge-based expert system and neural network expert system to a low extent. An expert system is a computer program or a piece of software which uses database of expert knowledge to offer advice in areas as medical diagnosis. It uses artificial intelligence (AI) technologies to simulate the judgment and behavior of the human or an organization that has expertise and experience in a particular field. It uses computer system emulating the decision- making ability of a human expert. Expert systems are interactive, trustworthy computer-based decision-making tools that utilize data and heuristics to address challenging decision–making issues. This is in line with Turner's (2023) view that our hospitals do not have enough expert systems to diagnosis the eye.

The findings of research question two revealed that, the symptoms of eye disease of the secondary school students in Enugu State include: inability to see at night, melting of the cornea, photophobia, blindness, redness of the eye, lacrimation, bumping over objects, color changes, polyuria, white spot in the eye, diplopia, gradual loss of vision, pains in the eye, swollen of the eye lids, severe itching, eye discharge, scarring, inability to close the eye, tenderness, dryness of the cornea, corneal ulceration, and conjunctiva ketosis. These were in line with Guinness Eye Hospital Onitsha, (2023) that symptoms of these eye problems are: Redness of the eye (infection) Lacrimation, Feeling of sandy sensation inside the eye, Pussy discharges may be present, Pains or itching, Photophobia, Swollen of the eyelids, Trichiasia, Scaring, Opacity of the coma, Severe itching, Skin patches, Visual impairment, Skin modules, Neurosis, Proptosis, Tenderness, and Blindness among others. The National Eye Institute, (2023) also listed some common eye conditions: Age-Related Macular Degeneration, Amblyopia (Lazy Eye) Astigmatism, Cataracts, Color Blindness, Diabetic Retinopathy, Dry Eye and Floaters.

Conclusion

Secondary school students are the future hope of this nation as such their health problems especially the eye should be taken good care of by the teachers and the principals. Students should be advised to report any symptoms of eye problem early for proper solution and treatment.

Recommendations

1. The Federal Ministry of health should ensure that every hospital must be equipped with expert system that will take care of diagnosing the patients' eyes.
2. Hospitals should treat eye problems with minimal cost to enable these baggers and the poor to access the hospital easily.

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