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Predictor of Student Vision-Impairment Statuses as Determinant for Sustaining Inclusive Classroom Education in Ghana

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Abstract
The Educational System in Ghana embraced global initiatives on inclusive education focusing on removing all barriers to participation in education without paying adequate attention to vision-impairment problems and disregarding vision statuses of students as peculiar hindrances to inclusive classroom education. The crucial need for clear predictors for classifying vision-impairment problems of students to address effects of vision-impairment statuses of students on inclusive classroom education in Ghana urged the study to model and predict vision problems of students to classify their vision statuses towards successful integration of pedagogical technologies in inclusive classrooms. Majority of students appeared sighted (91.6%) but t-statistic of 0.47 and p-value of 0.64 showed no significant difference between seemingly full sight students and partial or full non-sight students, indicating that every student faced vision problem, irrespective of age and sex. The study concludes that, predictors of each student vision problem requires attention towards educational classification of vision impairment for students to overcome physical unavailable barriers to education and inform predictors of education barriers which determine predictors of vision assistances employed by students that reflect predictors of seat choices by students in inclusive classrooms to determine specific vision statuses of students.

Keywords: Vision-Impairment, Educational Classification, Inclusive Classroom

1. Introduction

Background of the study

The Educational System in Ghana (ESG) has embraced the global initiative on inclusive education as basis for enrollment of students. This initiative focuses on removing all barriers to participation in education for all students. However, the initiative for inclusive classroom education (1) does not adequately consider vision-impairment problems of students and 2) disregards vision statuses of students as peculiar hindrances to inclusive classroom education. Such disregard implies the need to provide clear predictors for classifying vision-impairment problems of students as vision statuses in inclusive classrooms, in order to address the effects of the vision-impairment statuses of students on their inclusive classroom education in Ghana.

Statement of the Problem

The Educational System in Ghana (ESG) seems to perpetuates systemic inequalities and limits the contributions of the vision impaired student to socio-economic development life because it has embraced the global initiative on inclusive education by [1] Education 2030: Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4 as basis for enrollment of students. The Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4 provides Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4 that Ensures inclusive and equitable quality education and promote lifelong learning opportunities for all. This global declaration on Inclusive education focuses on removing barriers to participation of all students and expects increasing learning outcomes of every student, ensures inclusive and equitable quality education and promote lifelong learning opportunities for all. However, Inclusive education disregards effect of vision-impairment problems of students as participation barriers on student learning outcomes. For instance, in her policy trend analysis of Challenges & opportunities for Inclusive Education in Ghana, [2] noted that, Negative Attitude of teachers, families & society towards inclusive education, inadequate Specific educational resources and strategies required for successful inclusive education although Inclusive education provided equal opportunities for all children whether disabled or able. However, the real-world implications of this problem are significant when vision impaired students are bulked together with seemingly sighted students in one classroom for inclusive classroom education. The reason is, the Educational System in Ghana (ESG) has embraced the global initiative on inclusive education as basis for enrollment of students. This initiative of inclusive education focuses on removing all barriers to participation in education for all students using inclusive classrooms to perpetuate systemic inequalities and limit the contributions of the vision impaired student to socio-economic development life. Addressing this issue is crucial to fostering inclusivity and ensuring that vision impaired learners can access opportunities to thrive in academic and professional spheres [3], [4]. Although the initiative for inclusive education focuses on removing all barriers to participation in education for all students using inclusive classrooms, the initiative for inclusive classroom education (1) has not adequately considered vision-impairment problems of students and (2) has disregarded vision statuses of students as peculiar hindrances to inclusive classroom education. Such disregards suggest that, there is the need for this study to provide specific predictors of vision statuses of students for classifying their vision impairment in inclusive classrooms.

Relevant Literature on the Subject

Global studies by [5] classifies vision impairment into two groups, distance and near presenting vision impairment. Distance vision impairment group include (1) Mild – who exhibit vision acuity worse than 6/12 to 6/18, (2) Moderate – with vision acuity worse than 6/18 to 6/60 (3), Severe – in which vision acuity is worse than 6/60 to 3/60 and (4) Vision-Impairment – with vision acuity worse than 3/60. Near vision impairment group exhibits Near vision acuity worse than N6 or M.08 at 40cm. Further classifications of vision impairment by the World Health Organization is based on vision in the better eye with the best possible correction with glasses. In this classification, a person with 20/30 to 20/60 is considered mild vision loss, or near-normal vision. One with 20/70 to 20/160 is considered moderate vision impairment, or moderate low vision. 20/200 or worse vision loss is considered severe vision impairment, or severe low vision. Persons with 20/500 to 20/1000, are considered to have profound vision impairment or profound low vision. There are other persons with less than 20/1000, who are considered to be near-total vision impaired or near-total low vision. Those with no light perception, are considered total vision impaired, or

total blindness. Other levels of vision impairment based on vision field loss due to loss of peripheral vision also exist. In the United States, for instance, any person with vision that cannot be corrected to better than 20/200 in the best eye, or who has 20 degrees or less of vision field remaining, is considered legally blind. Hence, views of [6], suggest that, anyone with uncorrectable or reduced vision is vision impaired. Uncorrectable means vision that is not further improved by spectacles or contact lenses. For the [6] it does not mean vision hen not wearing glasses [6]. However, such assertions do not base on clear predictor of vision impairment problems, ignore effects of living with diverse vision impairment conditions on inclusive classroom education and refuse to consider that such conditions present participation barriers to educational experiences of students. This study provides predictors for clear classification of vision-impairment problems of students as vision statuses of students in inclusive classrooms in the Education System of Ghana (ESG). The study conceptualizes vision impaired problems of students relative to their participation barriers to educational experiences in inclusive classrooms.

Further, the Education System of Ghana employs the traditional lecture setup of seating arrangement which typically consists of rows and columns of fixed seating. In this seating arrangement, students face the instructor with their backs to one another. This classroom seating arrangement is historically common in colleges and universities, minimizing student-student communication. The highest communication interactions between the teacher and the students typically occurs with students in the first row or along the middle of the classroom. Students in back rows are more likely to be less engaged [7]. Such classrooms with seats that are ordered in rows and columns offer students opportunities to face the teacher and work board or white board based on the assumption that students may not need vision assistance. This seating set up implies that, all students could see. However, several assertions indicate that, vision impairment takes many forms and exists in varying degrees, implying that, vision acuity alone may not be good predictor of vision problems among people. The reason is, someone with relatively good acuity (20/40) can have difficulty functioning, while someone with worse acuity (20/200) might not have any real problems performing daily activities. One major hindrance to inclusive classroom education appears to be the conventional seating arrangement of fixed rows and columns of seats in inclusive classrooms. This seating arrangement overlooks (1) the relationships between potential varied vision-impairment statuses of students and (2) their seat preferences as criteria for classifying the vision statuses of students towards technology enhanced education. This perspective further overlooks (3) the relationships between potential risks of vision-impaired student engagement with varied educational experiences.

Prioritization of general education without focusing on accessibility for students with disabilities [8] in inclusive classrooms, where visualization and interaction are critical, can present vision impaired students with disadvantages due to limited access to tailored education. This reason is, absence of adequate inclusive design approaches can prevent vision impaired students from fully engaging with various education platforms [9]. Further, the current state of education in Ghana reveals infrastructural gaps, inadequate teacher training, and limited resource allocation for inclusive education [10], [11], the challenges perpetuate inequities in education outcomes and hinder vision impaired students from meaningful participation in education.

Additionally, the Education System of Ghana employs the traditional lecture setup of seating arrangement which typically consists of rows and columns of fixed seating. In this seating arrangement, students face the instructor with their backs to one another. This classroom seating arrangement is historically common in colleges and universities, minimizing student-student communication. The highest communication interactions between the teacher and the students typically occurs with students in the first row or along

the middle of the classroom. Students in back rows are more likely to be less engaged [7]. Such classrooms with seats that are ordered in rows and columns offer students opportunities to face the teacher and work board or white board based on the assumption that students may not need vision assistance. This seating set up implies that, all students could see. However, several assertions indicate that, vision impairment takes many forms and exists in varying degrees, implying that, vision acuity alone may not be good predictor of vision problems among people. The reason is, someone with relatively good acuity (20/40) can have difficulty functioning, while someone with worse acuity (20/200) might not have any real problems performing daily activities. Moreover, such assertions do not base on clear predictor of vision impairment problems, ignore effects of living with diverse vision impairment conditions on inclusive classroom education and refuse to consider that such conditions present participation barriers to educational experiences of students. This study provides predictors for clear classification of vision-impairment problems of students as vision statuses of students in inclusive classrooms in the Education System of Ghana (ESG). The study conceptualizes vision impaired problems of students relative to their participation barriers to educational experiences in inclusive classrooms.

The proposed approach or solution

The study examines (1) the assertion that, vision acuity alone may not be good predictor of vision problems among people, (2) that inclusive classroom education could be hindered by the conventional seating arrangement of fixed rows and columns of seats in inclusive classrooms. This is necessary because, the conventional seating arrangement overlooks (1) the relationships between potential varied vision-impairment statuses of students and (2) their seat preferences association with criteria for classifying the vision statuses of students towards enhanced education. The perspective further overlooks (3) the relationships between potential risks of vision-impaired student engagement with varied educational efforts on their individual or collective educational experiences. Moreover, such disregard also overlooks the educational and contextual needs and interests of vision impaired students and does not consider effects of vision impairment status of students on their education. Hence, this study analyzes vision-impairment statuses of students in inclusive classrooms, their associated seat preferences, relative educational and contextual needs and interests and the relationships to provide specific predictors of vision statuses of students towards classifying their vision impairment in inclusive classrooms. The focus of study is relevant because several assertions indicate that, vision impairments take many forms and exist in varying degrees. This implies that, vision acuity alone may not be sole predictor of vision problems among people. Someone with relatively good acuity (20/40) can have difficulty functioning, while someone with worse acuity (20/200) might not have any real problems performing daily activities. The discussion suggests to this study that classification of vision statuses largely dwells on subjective descriptions. This requires the study to provide models of predictors of vision problems of students in inclusive classrooms.

Models of predictors of vision problems of students in inclusive classrooms are relevant because, schools in Ghana are known to use the traditional lecture setup of seating arrangement which typically consists of rows and columns of fixed seating. Students face the instructor with their backs to one another. This classroom seating arrangement is historically common in colleges and universities, minimizing student-student communication. The highest communication interactions between the teacher and the students typically occurs with students in the first row or along the middle of the classroom. Students in back rows are known to be more likely to be less engaged [7]. Such classrooms with seats that are ordered in rows and columns offer students opportunities to face the teacher and work board or white board. This could be with the assumption that students may not need vision assistance. This arrangement and use of seats in the

classroom imply that, students could see and participate fully in class wherever they sit in the classroom. However, such notion does not consider effects of vision impairment status of individual students on their learning. The study establishes that vision impairment of students can determine seat choices by students in classroom towards overcoming participation barriers for accessing effective education.

[12] consider class arrangement as a layout of the physical setup of chairs, tables, materials in a school classroom in their analysis of influence of types of seating arrangements on student education. The reason could be that, in most countries, this arrangement is often chosen by a paid professional teacher with the assistance of a seating chart. This is because, deciding upon a classroom arrangement is typically done at the beginning of a school year as part of classroom management. The decision to change the classroom environment is thought to affect the student engagement, focus and participation [12]. This suggests that, seating location is related to academic achievement and classroom participation, and class arrangement has the ability to affect the communal environment within the room. This implies that, seating arrangement as the physical configuration of a classroom, is more than an organizational or stylistic choice by the instructor. In-person classroom seating arrangements, for instance, is known to affect student learning, motivation, participation, and teacher-student and student-student relationships [13]. In the virtual classroom space for example, such as real-time platforms like Zoom, instructional choices to employ engagement strategies and provide opportunities for feedback can impact on student learning outcomes [14]. However, there are specific strategies and examples to enhance student learning in a variety of classroom spaces such as in-person classroom learning spaces, where an instructor can maximize student engagement by changing the physical setup of chairs, tables, and presentations in the classroom.

Looking at preferences by students in a traditional classroom, the traditional lecture setup typically consists of rows of fixed seating where students face the instructor with their backs to one another. This classroom seating arrangement is known to minimize student-student communication and largely supports a “sage on the stage” learning environment. The traditional classroom provides communication interactions which occurs between teachers and students in the first row or along the middle of the classroom. Students in back rows are more likely to be less engaged. Hence, the student can make a choice of seat in the classroom either to sit in front, sit in the middle or back row, to suit their learning. However, roundtable model makes use of seminar-course room arrangements that may consist of an instructor and students sitting around a single large table. This seating arrangement can also be formed using individual desks. Students and instructors all face one another in this setup, which can support whole-class as well as partner dialogue. However, Instructional communication theory suggests that seating arrangements can impact how the instructors communicate with students and how students interact with one another, impacting engagement, motivation, and focus [12]. This means that, the set-up of the classroom space shapes instructor pedagogy, choice of activities, and on-task student behavior. For example, a classroom with seating affixed and directed toward a podium at the front of the room results in instructors spending more time in lecture and students demonstrating less active engagement. In contrast, roundtable seating arrangements lead to instructors and students engaging in more active learning activities, resulting in improved learning outcomes [15].

Studies demonstrate that students prefer more flexible seating arrangements [16]. In particular, students express a preference for classrooms with mobile than fixed chairs, and trapezoidal tables with chairs on casters than rectangular tables with immobile chairs. This points to the fact that, spaces designed in a student-centered manner, focusing on learner construction of knowledge and collaboration, can support student learning [17]. Although, in reality, many classrooms have been built using more conventional

models for lecture and seminar-type courses, use of such conventional classroom model should not prevent instructors from considering more ways to modify seating arrangements and align those arrangements with demands of classroom activities to maximize student learning. This suggests to the study to focus on contextualizing reasons given by students for making choices of seat in the traditional classroom, relative to individual or group vision status.

The traditional lecture setup of seating arrangement which typically consists of rows and columns of fixed seating is employed by schools in Ghana. In this seating arrangement, students face the instructor with their backs to one another minimizing student-student communication. The highest communication interactions between the teacher and the students typically occurs with students in the first row or along the middle of the classroom. The [7] notes that, students in back rows are more likely to be less engaged. Although classrooms with seats that are ordered in rows and columns offer students opportunities to face the teacher and work board or white board, this could be with the assumption that students may not need vision assistance. This assumption implies that, all students could equally see. However, such notion does not consider effects of vision impairment status of students on their education.

Analyzing influence of types of Classroom Seating Arrangements on student Education, [12] considered class arrangement as a layout of the physical setup of chairs, tables, materials in a school classroom. In most countries, this arrangement is often chosen by a paid, professional teacher with the assistance of a seating chart. Deciding upon a classroom arrangement is typically done at the beginning of a school year as a part of classroom management. The decision to change the classroom environment is thought to affect the student engagement, focus and participation [12]. This suggests that, seating location is related to academic achievement and classroom participation, and class arrangement has the ability to affect the communal environment within the room. This implies that, seating arrangement as the physical configuration of a classroom, is more than an organizational or stylistic choice by the instructor. In-person classroom seating arrangements, for instance, is known to affect student learning, motivation, participation, and teacher-student and student-student relationships [13]. In the virtual classroom space, such as real-time platforms like Zoom, instructional choices to employ engagement strategies and provide opportunities for feedback can impact on student learning outcomes [14]. However, there are specific strategies and examples to enhance student learning in a variety of classroom spaces such as in-person classroom learning spaces, where an instructor can maximize student engagement by changing the physical setup of chairs, tables, and presentations in the classroom.

Analyses of seat preferences by Students in a Traditional Classroom suggest that, the traditional lecture setup typically consists of rows of fixed seating where students face the instructor with their backs to one another. This classroom seating arrangement is known to minimize student-student communication and largely supports a “sage on the stage” learning environment. The traditional classroom provides communication interactions which occurs between teachers and students in the first row or along the middle of the classroom. Students in back rows are more likely to be less engaged. Hence, the student can make a choice of seat in the classroom either to sit in front, sit in the middle or back row, to suit their learning. However, roundtable model makes use of seminar-course room arrangements that may consist of an instructor and students sitting around a single large table. This seating arrangement can also be formed using individual desks. Students and instructors all face one another in this setup, which can support whole-class as well as partner dialogue.

However, assertions in global Categorization of Vision Impairment Status indicate that, vision impairments take many forms and exist in varying degrees, implying that, visual acuity alone may not be

good predictor of vision problems among people. Someone with relatively good acuity (20/40) can have difficulty functioning, while someone with worse acuity (20/200) might not have any real problems performing daily activities. The [5] classifies vision impairment into two groups, distance and near presenting vision impairment. Distance vision impairment group include (1) Mild – who exhibit visual acuity worse than 6/12 to 6/18, (2) Moderate – with visual acuity worse than 6/18 to 6/60 (3), Severe – in which visual acuity is worse than 6/60 to 3/60 and (4) Blindness – with visual acuity worse than 3/60. Near vision impairment group exhibits Near visual acuity worse than N6 or M.08 at 40cm. Classifications of visual impairment by the World Health Organization is based on the vision in the better eye with the best possible correction with glasses. In this classification, a person with 20/30 to 20/60 is considered mild vision loss, or near-normal vision. One with 20/70 to 20/160 is considered moderate visual impairment, or moderate low vision. 20/200 or worse vision loss is considered severe visual impairment, or severe low vision. Persons with 20/500 to 20/1000, are considered to have profound visual impairment or profound low vision. There are other persons with less than 20/1000, who are considered to have near-total visual impairment or near-total low vision. Those with no light perception, are considered total visual impairment, or total blindness. Other levels of visual impairment based on visual field loss due to loss of peripheral vision also exist. In the United States, for instance, any person with vision that cannot be corrected to better than 20/200 in the best eye, or who has 20 degrees or less of visual field remaining, is considered legally blind. However, the views of [6] suggest that, anyone with uncorrectable, reduced vision is visually impaired. Uncorrectable means vision that is not further improved by spectacles or contact lenses, and it does not mean vision when not wearing glasses [6]. Hence, this study analyzes reasons for making choices of seats in inclusive classrooms by students who seem to successfully study together in one class.

A publication by [18] on Global Prevalence of Presbyopia and Vision Impairment from Uncorrected Presbyopia employed systematic review, meta-analysis, and modelling, in Meta-analysis, and Modelling of status of people with vision impairment. The study found that over 1 billion people are forced to live with preventable or treatable vision impairment conditions. The paper ignored effects of living with diverse vision impairment conditions in inclusive classroom and did not consider that such conditions present participation barriers to educational experiences of students. This study unveils the participation barriers to educational experiences of students with vision impairment in inclusive classrooms. In a publication by [19] on The Lancet Global Health commission on Global Eye Health: vision beyond 2020, the study adopted Principal Component Analysis ((PCA) & Visual Field Analysis to classify visual impairment based on vision in the better eye with the best possible correction made with glasses. In this classification, a person with 20/30 to 20/60 is considered mild vision loss, or near-normal vision. One with 20/70 to 20/160 is considered moderate visual impairment, or moderately low vision. 20/200 or worse vision loss is considered severe visual impairment, or severe low vision. 20/500 to 20/1000, are considered to have profound visual impairment or profound low vision. Less than 20/1000, are considered to have near-total visual impairment or near-total low vision. No light perception, are considered total visual impairment, or total blindness. Other levels of visual impairment based on visual field loss due to loss of peripheral vision. Any person with vision that cannot be corrected to better than 20/200 in the best eye, or who has 20 degrees or less of visual field remaining, is considered legally blind. The study concluded that, once a person requires vision assistance or cannot see without assistance as hindrance, the person is visually impaired. However, the paper did not specify appropriate vision assistances required to overcome vision hindrances of people. Moreover, the classification of visual impairment of people based on vision

in the better eye with the best possible correction made with glasses dwells on subjective descriptions. This suggest that, once a person requires vision assistance of any kind or cannot see without overcoming a hindrance, the person is vision-impaired. But without vision assistance does not mean one could see and visual acuity alone may not be good predictor of vision problems among people. Hence this study provides models of specific predictors of vision statuses of students towards classifying their vision impairment in inclusive classrooms. Following the publication by [6] on classification of vision impairment using Principal Component Analysis ((PCA) & Visual Field Analysis on Classification of vision impairment based on visual acuity and visual loss or unaided vision, based on the [20]. Uncorrectable vision means, vision that is not further improved by spectacles or contact lenses, and does not mean vision when not wearing glasses. The study concluded that, anyone with uncorrectable reduced vision is visually impaired. However, the study avoids other possible predictors of vision problems among people by focusing on Visual acuity alone. The study ignored other predictors of vision impairment in their Classification scheme. The study did not consider that, it does not mean vision when wearing or not wearing glasses. This study predicts vision statuses of students towards classifying their vision impairment in inclusive classrooms for successful integration of pedagogical technologies in inclusive classrooms in Ghana which focuses on removing all barriers to participation in education for all.

The New Value of Research which is Innovation

This study analyzes relationships between vision statuses of students in inclusive classrooms and their seat preferences to address the theoretical and methodological gaps of absence of clear methodology for Classification of vision-impairment and Unclear predictor of vision problems among students. There is the need for this study to model clear predictors for classification of vision problems among students to inform policy so as to fill the research gap of absence of clear methodology for Classifying vision-impairment due to unclear predictor of vision problems among students. There is also the need for this study to model diverse vision problems and associated educational needs of vision-impaired persons in inclusive classrooms to inform policy and practice so as to fill methodological gap of unclear validation of variables that measure and explain vision statuses of students. The study focuses on classifying vision-impairment problems of students as vision statuses in inclusive classrooms in the Education System of Ghana (ESG) using analysis of relationships between vision assistances employed relative to vision statuses of students in inclusive classrooms and their seat preferences. The demography characteristics of students in inclusive classrooms in Ghana, the characteristics of student vision impairment problems in inclusive classrooms relative to student education barriers in inclusive classrooms the vision assistances employed by students to access education in inclusive classrooms that classify their diverse vision statuses as well as the seat choices made by students to access education in inclusive classroom directly or indirectly classify their vision statuses are examined.

This innovation is relevant for successful integration of pedagogical technologies in inclusive classrooms in Ghana which focuses on removing all barriers to participation in education for all students. This is useful because the integration of pedagogical technologies has brought about revolutionary changes in contemporary education. Students with vision impairment are expected to benefit from this technological revolution. This study employs theoretical perspectives from the Instructional Communication theory and constructivist theory of instruction among others to investigate the effects of this paradigm shift comprehensively.

THEORETICAL BASIS

The Theoretical Framework Underpinning Barriers to student participation in Education is explained in the Instructional communication theory which suggests that seating arrangements can impact how the instructors communicate with students and how students interact with one another, impacting engagement, motivation, and focus [12]. This means that, the set-up of the classroom space shapes instructor pedagogy, choice of activities, and on-task student behavior. For example, a classroom with seating affixed and directed toward a podium at the front of the room results in instructors spending more time in lecture and students demonstrating less active engagement. In contrast, roundtable seating arrangements lead to instructors and students engaging in more active learning activities, resulting in improved learning outcomes [15]. Studies demonstrate that students prefer more flexible seating arrangements [16]. In particular, students express a preference for classrooms with mobile than fixed chairs, and trapezoidal tables with chairs on casters than rectangular tables with immobile chairs. This points to the fact that, spaces designed in a student-centered manner, focusing on learner construction of knowledge and collaboration, can support student learning [17]. Although, in reality, many classrooms have been built using more conventional models for lecture and seminar-type courses, use of such conventional classroom model should not prevent instructors from considering more ways to modify seating arrangements and align those arrangements with demands of classroom activities to maximize student learning. This study focuses on contextualizing the reasons given by students for making choices of seat in the traditional classroom, relative to individual or group vision status.

Constructivist theory is a prominent educational framework that emphasizes the importance of active learning and the learner's engagement with his or her environment. Individuals actively construct knowledge and comprehension through their interactions with the world, according to this theory. Constructivist theory functions as one underlying framework, emphasizing the active participation of students in knowledge construction. Under this theory, scalability of educational efforts is a crucial goal, which aligns with the constructivist theory's central tenet of student-driven engagement. Scalability empowers vision impaired students to actively partake in knowledge construction by expanding access to enhanced education, reinforcing the theory's emphasis on students as active agents in the educational process. Scalability closely corresponds with constructivist theory in the context of enhancing education of students. This is consistent with constructivist theory because it acknowledges that students, including those with vision impairment, actively construct their comprehension. By increasing scalability of educational efforts for instance, more vision impaired students will be able to access and interact with educational materials., resources, and tools via technology. This increased accessibility and interactivity adhere to the constructivist principles of active learning and participation. It facilitates a more expansive and interactive learning environment that enables vision impaired students to actively construct knowledge and comprehension, thereby enhancing their educational experiences and outcomes. In essence, scalability leverages constructivist theory principles to create a more inclusive and engaging learning environment for students with vision impairment. By emphasizing the content and depth of educational experiences, the Theory of Learning complements the Constructivist Theory. The interconnectedness of the theories within the framework exemplifies the comprehensive approach to improving education.

[21] used the Chain of Response Model as a theoretical framework to explain learners' barriers to participation in education based on classification of learners' barriers as situational, institutional and dispositional and the epistemological barrier. One can study the learner's study modules related challenges and support services, to examine the lack of achievement of scalability of numbers instead of scalability

of success rates in e-learning for instance. Both open and structured questions could be used to collect data from study participants who complete online questionnaire on voluntary basis. Other issues raised by the authors include the need for qualitative look into specific challenges that learners face with respect to learner support service provisions, modules interactivity, and those identified as difficult to follow and thus posing risks to the learners' success as well as tutor-learner contacts with the view of identifying whether the contacts are reactive or proactive and the need to address low tutor-learner interactions. For instance, experiments in a laboratory and most equipment and procedures used are designed for students with full eyesight. Weighing or measuring solids or liquids, monitoring indicator color changes or formation of precipitates, observing temperature changes, or even heating a beaker with a Bunsen burner appears to exceed the capabilities of a student without sight. However, laboratory equipment available for students without sight include; Voltmeters with audible readout, Liquid -level indicators, Electronic calculators with braille printout, X/Y plotters with braille printout, talking thermometers, talking calculators, Light probes that are used as part of readout devices, tones are emitted which increase in pitch proportionally to changes in light intensity, Braille labelers and Talking computer terminals among others. In addition, speech synthesizers and compressors are available to the student without sight which electronically convert pages of text into voice output. We may imagine the conception of some type of glasses or goggles for the vision-impaired student that can electronically analyze their surroundings and communicate images to the wearer of objects and movements in his immediate vicinity. The framework is useful for modeling vision impaired problems as predictors of student vision statuses which pose context-specific barriers to student participation in inclusive classroom education.

METHOD

Desk study was used to examine documents and reports on relative contexts as well as characteristics of vision-impaired students. Literature review of theories, concepts and principles supported desk studies towards preparations for fieldwork. From secondary data and literature reviews, research instruments were constructed to guide the fieldwork. The Field studies involved collection of Primary data. Experiences of students with vision impairment were measured as barriers to participation and vision assistances employed towards effective participation in inclusive classrooms. Interviews and questionnaires with checklists, focus groups discussions and observations of actual practices of students with vision impairment were measured during practical classroom education setups.

Out of a population 13,950 students from 32 educational institutions involved in inclusive classroom education in 3 regions, Eastern, Greater Accra, and Central regions of Ghana, multi-stage sampling technique, together with stratified sampling of only students undergoing education in purposively selected inclusive classrooms totaling 1532 persons capable to voluntarily answer the questionnaire in person or online was done to obtain representativeness and unbiased attitude to the use of subjects for the study. The idea of purposive sampling approach is consistent with the concept of open sampling, and helped in selecting specific interviewees and observational sites within vision-impaired student groups in indiscriminate ways. Hence, all purposively selected groups of vision-impaired student category were justified as statistically representative cluster exposed to current educational practices and processes. The [22] procedure for selecting samples were used to verify sample size whereby, given the population of participants for the different subjects, appropriate sample sizes were obtained from the established Tables. The sampling design is consistent with open sampling. Open sampling is non-probability sampling that allows open coding where indices for the study were represented by any defined variable to obtain cultural

data [23]. Open sampling selects culturally specific interviewees or observational sites within a target group in indiscriminate ways to allow the collection of as much data as possible in order to obtain the desired outcome of in-depth descriptions. Within vision-impaired student groups the approach gave the desired outcome of in-depth descriptions in addition to surveys. To be able to collect data from a large, geographically spread of groups of students, for representativeness, the stratified random sampling technique was used to ensure representation across all the 32 schools selected across the 3 regions. This approach divided the population into strata, and then purposefully selected participants from each school. This method helped to capture diversity of perspectives. Focusing on students provided insight into their constraints [24] ensuring findings are relevant to addressing both immediate and systemic challenges. The large population facilitated collection of robust data, enhancing generalizability of the results. Quantitative methods employed interview guides with questionnaires and checklists. Qualitative methods employed observation checklists, focus groups discussions guide questions, application of theoretical and conceptual frameworks to obtain data on contextual experiences of vision-impaired students.

Theoretical concepts and structural models were employed in explaining relationships between variables. Descriptive Statistics of One-Sample Statistics were employed. Describing functions analysis was used as a mathematical tool to analyze the class as a nonlinear system by approximating the class behavior with a linear function. This method helped to simplify the analysis of the inclusive class as a system that exhibits nonlinear characteristics, enabling the use of linear control techniques to predict system response and stability in causal relationship. Descriptive Statistics of One-Sample Statistics, describing functions analysis & Structural equation model (SEM) were used to track vision status of each student as determinants of vison assistances required to overcome specific vision problems of students profiled as participation barriers in inclusive classrooms. The approach was used to model diverse vision assistances employed by students as solutions to their vision problems in a cause and effect relationship that classify and predict participation barriers for vision-impaired students in inclusive classrooms. Additionally, the approach was used to describe seat preferences of students as solutions to their vision problems in a cause and effect relationship that classify and predict participation barriers for vision-impaired students in inclusive classrooms. Descriptive and non-parametric statistics organized data into tables, categories and models.

RESULTS AND DISCUSSION

To classify vision-impairment problems of students as vision statuses in inclusive classrooms in the Education System of Ghana (ESG)', First, Demographic Characteristics of Research Participants are provided in Table 1. Table 1 shows that; research participants were students who appeared in three major categories of mainly Seemingly Full Sight (SFS) (60%) Partial Sight (PS) (31.6%) or Non-Sight (8.4%). This shows that, majority of students in the inclusive classrooms appeared sighted (91.6%). Vision-impairment problems of students who participated in the study were classified in terms of vision statuses in inclusive classrooms in the Education System of Ghana, as 60 % seemingly full sight students and 40% partial or full non-sight students. t-statistic of 0.47 and p-value of 0.64 showed no significant difference, indicating that every student had kind of vision problem. This result suggests that each student faced some kind of vision impairment problems irrespective of age and sex.

Table 1 Demographic Characteristics of Students

Variables	Description	Frequency	Percent (%)
Sex	Male	754	49.2
	Female	778	50.8
Age	Under 15years old	148	9.7
	15–18 years	449	29.3
	Above 18 years	935	61.0
Year of study	One	441	28.8
	Two	638	41.6
	Three	453	29.6
Vision status	Seemingly Full sight	919	60.0
	Partial sight	484	31.6
	Non-sight	129	8.4

Source: Survey Data 2023

Second, Participation Barriers to Access to Education by Students are provided in Table 2. In Table 2, students faced diverse Participation barriers to access to education including Physical Unavailability, Conventional classroom Seat Arrangement, Logistical Challenges, and Inadequate Classroom Infrastructure at varied levels respectively. Non-sight students faced all participation barriers equally. Challenges with conventional classroom Seat Arrangement (1532), Physical Unavailability (1532), Inadequate Classroom Infrastructure (1428) & Logistical Challenges (1301) at t-statistic of 0.47 and p-value of 0.64, showed no significant difference. Thus, Conventional classroom Seat Arrangement combined with Physical Unavailability characterize main education barriers in inclusive classrooms.

Table 2 Participation Barriers to Access to Education by Students

Participation Barrier	**Number of students affected by barrier to access education**	**Vision Status of Students**		
		Seemingly Full sight students	**Partial sight students**	**Non-sight students**
Physical Unavailability	1532	919	484	129
Logistical Challenges	1301	910	172	129
Inadequate Classroom Infrastructure	1428	900	256	129
Conventional classroom Seat Arrangement	1532	919	484	129
Physical Unavailability	1532	919	484	129

Source: Survey Data 2023

Third, Seat Choices made by Students to Overcome Classroom Participation Barriers are shown in Table 3. Table 3 provides Seat choices made by students in inclusive classrooms including front, middle, back, or window seats, seats close to work board, use of first column seats, any seats + electronic recorders, seats used by human recorders, any seats due to use of specified spectacles. Classroom seat selection or preferences by students were mainly based on participation barriers requiring uses of electronic and human

recorders or any seats due to use of specified spectacles. Students seek vision assistances in inclusive classrooms to overcome different kinds of education barriers such as
Conventional classroom Seat Arrangement & Physical Unavailability using Classroom seat selection, uses of electronic and human recorders & vision aid.
Hence, diverse seat choices indicate and determine the vision status of the student as predictors.

Table 3 Seat Choices /Preferences made by Students in Inclusive Classrooms

Seat Choice Made by Students	Frequency	% Students	% Male	% Female
Front rows seats	385	24	4	20
Back rows seats	190	12	8	4
Close to work board rows seats	50	4	1	3
Middle rows seats	293	18	10	8
Any rows seats	494	34	20	14
First column seats	104	7	4	3
Window site seats	6	1	0	1
N= 1532	1532	100		

Source: Survey Data 2023

Assistances Employed by Students in Inclusive Classrooms to Overcome Participation Barriers are shown in Table 4. Table 4 details assistances employed by students to overcome individual or group participation barriers to inclusive classroom education. The assistances include taking Front seat, Back seat, finding seat Close to work board, choosing Middle seat, using any seat relevant to Uses of spectacles, using human recorder seat, using electronic recorder seat, using First column of seat or Window seat. Although diverse assistances were employed to overcome participation barriers the t-statistic of 0.47 and p-value of 0.64, showed no significant difference, indicating that each student employed some kind of assistance to overcome their personal participation barriers caused by individual vision impairment problems. This shows that every student experienced some kind of vision impairment problem evidenced by the diverse vision assistances employed by students in inclusive classrooms with no significant difference. The results emphasize that, Students employ vision assistances in inclusive classrooms to overcome different kinds of education barriers including effects of Conventional classroom Seat Arrangement & Physical Unavailability, by selecting Classroom seat and based on uses of electronic and human recorders & vision aid to overcome classroom barriers to education. The different assistances employed by students coupled with the diverse seat choices are dictated by the vision problems of individual or group of students to indicate the vision status of the student and thereby classifies vision impairment of the student as predictor. Predictors of vision assistances employed by students in inclusive classrooms directly classify vison statuses of students. This finding is in line with [19] on Global Eye Health: vision beyond 2020 that any person who employs any form of Vision Assistance to overcome participation barrier is vision-impaired.

Table 4 Forms of Assistances Employed by Students in Inclusive Classrooms to Overcome Participation Barriers

Assistances Employed by Students	Frequency	% Students	% Male	% Female
Front seat	385	24	4	20

Back seat	190	12	8	4
Close to work board seat	50	4	1	3
Middle seat	293	18	10	8
Any seat is okay	252	16	11	5
Uses spectacles seat	145	10	4	6
Uses human recorder seat	81	6	4	2
Uses electronic recorder seat	16	2	1	1
First column seat	104	7	4	3
Window seat	6	1	0	1
N= 1532	1532	100		

Source: Survey Data 2023

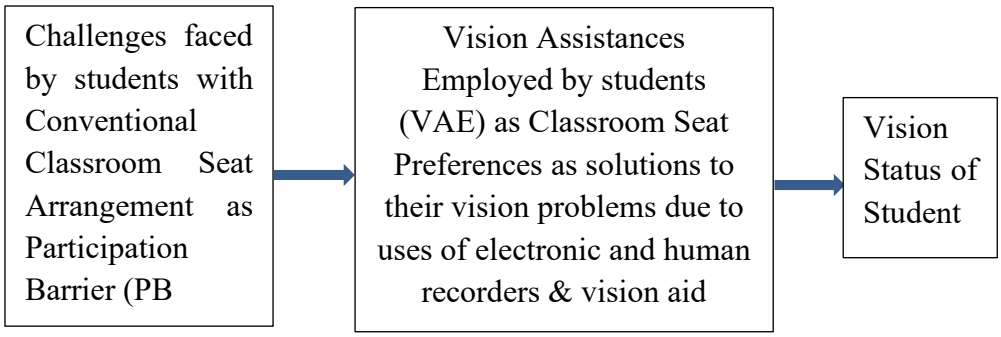
Forth, Modelling the Predictors of Vision Statuses of Students, from Table 1, Table 2, Table 3 & Table 4; Predictors of Vision Statuses of Students for modelling classification of vision statuses of students are clearly evidenced. Those include Challenges faced by students with conventional classroom Seat Arrangement as Participation Barrier, which cause students to employ diverse or specific Vision Assistances in forms of Classroom seat selection or Preferences in a cause and effect relationship.

Hence, major Predictors of Vision Statuses of Students are:

1. Challenges faced by students with conventional classroom Seat Arrangement as Participation Barrier (PB),
2. Vision Assistances Employed by students (VAE) and
3. Classroom Seat selection or Preferences by students (SP).

The cause and effect relationships are represented by the structural model in Figure 1.

Figure 1 Structural relationship between Participation Barrier, Vision Assistances Employed and Seat Preferences that classify Vision status of Student



Source: Author Concept: Survey Data, 2023

The cause and effect relationships are represented by:

- Vision Assistances Employed by students (VAE), is directly proportional to Participation Barrier (PB) to be overcome by student.

This is given by:

VAE ∝ PB (1).

This is equivalent to seat preferences / selected by all students, Seemingly Full Sight (SFS) Partial Sight (PS) and Non-Sight (NS) students.

- **PB is equivalent to Seats Preferences (SP) by all SFS, PS & NS Students**

Seat Preferences (SP) by students include front, middle, back, window, any seat, and so on, …. close to work board, any seat ok, seat beside electronic recorder, beside human recorder, due to spectacles, use of first column seat and so on).

PB = k [conventional classroom Seat Arrangement (made up of front, middle, back, window, any seat, close to work board, any seat ok, by electronic recorder, by human recorder, spectacles, first column seat, and so on) (2).

VAE = k(PB) (3).

k is constant that reflects the kind of assistance sought by each student due to peculiar vision problem of student that poses participation barrier to the student in inclusive classroom.

The cause and effect relationships between Seat Preferences (SP) and Participation Barrier (PB) are represented by;

- **SP ∝ PB**

PB = k (SP for front, middle, back, window, any seat, and so on, …. close to work board, any seat ok, by electronic recorder, by human recorder, spectacles, first column seat and so on).

PB ∝ VAE (4).

Hence,

SP ∝ VAE (5).

VAE = k (front, middle, back, window, any seat, …. + close to work board, any seat ok, by electronic recorder, by human recorder, spectacles, first column seat, and so on,……..).

The models (4 & 5) indicate that, SP ∝ PB ∝ VAE

Therefore,

- **Vision-Impaired Statuses (VIS) ∝ PB, SP or VAE of a student is given by;**

VIS = k (VAE) (6)

Hence, educational classification of vision statuses of students is determined by:

1. Challenges of students face with conventional classroom Seat Arrangement as Participation Barrier,
2. Vision Assistances Employed by students in inclusive classrooms and / or
3. Classroom Seat selection or Preferences by students.

Since each student faced individual challenges with conventional classroom Seat Arrangement as Participation Barriers which caused them to employ individual specific Vision Assistances in inclusive classrooms and / or Select Preferred Seats, each of all the student research participants have vision problems and are therefore vision impaired. The empirical evidence on Vision Impairment Problems among students provide new knowledge that unveils the Defective vision of students that has not been given adequate attention by students and education stakeholders. In view of this neglect, students face physical unavailable barriers to education. The establishment of predictors of Vision problems of students by this study therefore requires attention towards educational classification of vision impairment to help students overcome physical unavailable barriers to education in inclusive classrooms. This study bridges critical empirical gap by analyzing essential vision impairment problems among students that affect effective education of students in inclusive classrooms. The study establishes predictors of Vision problems of students that require attention towards educational classification of vision impairment to help

students overcome barriers to education in inclusive classrooms where seat choices made by students directly informs student education barriers and determine educational classification of vision statuses of students. Classification of Vision Statuses of Students in Inclusive Classrooms by this study fills a theoretical gap by examining vision assistances employed by students as basis for classifying vision impaired statuses of students in inclusive classrooms. It expands on cognitive load and Constructivist Learning Theory, emphasizing accessibility as key to meaningful classroom education engagement. The finding allows to propose inclusive educational frameworks that are functional, navigable, and equitable for all students. This study supports the assertion by [18] on global status of people with vision impairment that, over 1 billion people are forced to live with preventable or treatable vision impairment conditions. The study extends findings from [5] on vision statuses that, visual acuity alone may not be good predictor of vision problems among people because someone with relatively good acuity (20/40) can have difficulty functioning, while someone with worse acuity (20/200) might not have any real problems performing daily activities. The study fulfils the call [25], [26] on Magnitude of eye conditions & vision impairment among school children in Kenya & Albania upon finding that, vision loss can affect people of all ages and suggested testing vision of all school children to enhance their education. The study confirms and corroborates with findings by [6] on world vision status that; anyone with uncorrectable, reduced vision is visually impaired, without vision assistance does not mean one could see, and visual acuity alone may not be good predictor of vision problems among people. The findings of this study therefore provisions innovative methodology for validating Classification of vision-impairment using clear predictors of vision problems among students, thereby filling Methodological gap for classifying vision-impairment problems of students as vision statuses in inclusive classrooms in the Education System of Ghana (ESG).

CONCLUSION

Predictors of Vision problems of students require attention towards educational classification of vision impairment to help students overcome physical unavailable barriers to education, thereby specifying predictors of characteristics of every student vision problem in inclusive classrooms. Predictors of vision problems of each student in inclusive classrooms directly informs predictors of student education barriers in inclusive classrooms. Predictors of vision assistances employed by students in inclusive classrooms classify vison statuses of students reflecting predictors of seat choices by students in inclusive classrooms towards determining specific vision statuses of students. Findings of this study advance policy and practical understanding of inclusive education of vision impaired students for sustainable education. The study bridges relevant gaps towards enhancement of Inclusive Classroom Education for Vision Impaired Students and provides focus to theoretical, practical and policy relevance for integrating appropriate and specific educational enhancement efforts towards inclusive Classroom Education for Vision Impaired Students.

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