Studia Politologica 34 ▪ 2025
ISSN 2081-3333
DOI 10.24917/20813333.34.11

Doreen Basemera[1]
Uniwersytet Komisji Edukacji Narodowej w Krakowie
ORCID: 0009-0009-4613-6601

Literacy and Laboratory: Exploring science education in Upper secondary schools in refugee settlements: Case of Nakivale Uganda

Introduction

"Education is the passport to the future,
for tomorrow belongs to those
who prepare for it today."
Malcom X.

To promote human rights and become a middle income country is the Government of Uganda's vision 2040. The aim is to create competitive modern economy, and improve on education sectors through prioritizing science education to all school going children especially in secondary education ("Policy Framework" 2020). Education response plan for refugees in Uganda guided by 2006 refugees' Act and regulation, protects refugee' right to education ("Education Response Plan for Refugees and Host Communities Uganda"). This aligns with the country's National Development Plan lll (NDPlll) and Ministry of Science and technology frameworks that supports science

[1] doreen.basemera@doktorant.uken.krakow.pl

education through promotion of science, technology, engineering, and mathematics (STEM). In order to promote human development though education, the government of Uganda has moved from theoretical classroom teaching to more practical skilling teaching. The Government through the ministry of Education and sports has introduced science based subjects compulsory to lower secondary education to all learner including refugees. For refugees, education training gives them an opportunities to compete for jobs and for self-reliance which is a myth to most refugee learners.

In this article, the terms "literacy and laboratory" in Upper secondary science education are used as follows: *Literacy is the ability of students to effectively understand, interpret, and communicate scientific information, which requires skills such as reading scientific texts, understanding graphic representations, and critically evaluating scientific claims*. Where as the term *Laboratory refers to the use of experimental settings and scientific investigations conducted in a specific place or environment.*

Promoting science education especially for vulnerable groups such as refugees is essential for social integration ("Paving Pathways for Inclusion" 2023) through skills, which promotes self-esteems, and overall well-being of individuals through inclusive learning (Kryukova et al 2023). Inspite the need for scientific education in the refugee settlement, it is given insufficient attention even though it is crucial for the refugees' future. This article looks at literary and laboratory science education and highlights the various challenges faced by refugee students in upper secondary school offering science combinations in the Nakivale refugee settlement schools. The study focuses on Nakivale refugee settlement as one of the largest and oldest refugee settlement in western Uganda, established in 1957 and accommodates thousands of refugees among which majority are school going children. Some of the students in Nakivale have performed well and got bursaries to support their education careers at higher institutions of learning such as Universities which is an indication for quality education in the settlement (Windle, Windle 2014). In spite of the settlement being the oldest in Uganda, Nakivale refugee settlement has two secondary schools thus, Nakivale Secondary School being the oldest established in 2009 and Rubondo Community Secondary School still newly constructed in(2019). The schools are home to thousands of refugees whose hope has been tested by suffering, yet still endures as they build new beginnings through education.

Although Uganda's progressive refugee policies supports education to all refugees, access to quality science education remains a challenge to settlements like Nakivale. Despite the governments' positive steps taken since 2021 to support science education in secondary schools, such as enhancing science teachers' salaries, equipping libraries with test books and laboratories with chemicals and other apparatus needed for practices (Namayanja 2022), this

has not been the case for Nakivale as teachers struggle to survive and there's still a gap with reported scarcity of teaching materials for students. This paper explored literacy and laboratory study in upper secondary education in Nakivale refugee settlement. Since Nakivale is one of the oldest refugee settlement and with a highest number of school going children. The paper focuses on three interrelated research questions thus; *How do refugee students in Nakivale Refugee Settlement embrace and engage with science education in upper secondary education classes?* 2)*How has students' literacy skills (reading comprehension, scientific vocabulary) influence their understanding of science concepts in upper secondary school?* and 3) *How has the availability and quality of laboratory facilities influence the effectiveness of science education for upper secondary school students in Nakivale refugee settlement?* The findings indicate that, there's still a lot to be done in refugee settlement if Uganda is to achieve the inclusive science education for all by 2040.

The paper is structured as follows: section two presents the theoretical framework for literacy and laboratory science education, section three, presents the methodology and data used. Section four and five presents the results of the literacy and science education and laboratory lessons for upper secondary school with science-oriented combinations, and discussions in light of the literature on science education in refugee settlements in Uganda. The last section presents the conclusions and recommendations.

The theoretical framework for literacy and laboratory science education

As part of science education developments, there has been emphasis on the inclusion of literacy skills in education settings. It is imperative to note that students offering sciences are able to communicate, interpret, and critically evaluate scientific information at their exposure. Literacy is an important component in the learning process since it prepares students to comprehend as well as explain scientific ideas in various methods of presentation. Following John Dewey experiential learning theory, the theory provides a framework for active experienced-based learning practices in schools. In his view, Dewey,proposed that education should be grounded in real-world experience and have to be active engagement for learners rather than being passive (Dewey 2025). For refugees to adopt well in the education system, it should be part of their lived experience rather than a walls and posters. Deweys theory clarifies it as he states that learning occurs through experience. For refugees especially in Nakivale students are believed to engage actively in problem solving and practical application of concepts to real world which explain education for life. However this would be achieved if the schools are

provided with quality equipment. His theory aligns with laboratory learning because it emphasises learning by "doing" which is a hands on learning technique emphasised in secondary schools in Uganda. This needs the provision of social environmental structures that enables students to interact with the real world and find solutions for real world problems. On the other hand, according to Hilton, the use of technology in teaching environment can enhance students capacities of understanding various representations in science subjects especially chemistry and physics hence enhancing learning proficiencies (Hilton, Hilton, 2010). Additionally, interdisciplinary multimodal approach strategies in other fields of science have been found to be useful in the creation of successful health care learning in addition to literacy in successful research collaborations and intercessions (Saritas, Ozcan, Aduriz-Bravo, 2023). Hence, by focusing on the use of multiple representations, use of science technologies and interdisciplinary teamwork, it is possible to enhance the students' scientific literacy as well as foster meaningful communication and understanding in laboratory science education. The term "Literacy in science education refers to the acquisition of reading and writing skills in the context of science education, with an emphasis on hands-on skills."

Following Joseph Schwab view on scientific literacy education as an inquiry based theory, it shows that inquiry based learning advocates for students to be able to process their way of thinking and interpreting knowledge rather than being only passive collectors of facts (westbury 2014: 744–745). Literacy is key for learning especially in refugees learners who faces problems of changing curriculum, language barrier and psychological trauma.

In sociocultural perspective, literacy is not a natural aptitude but instead, social activities that differ with cultures (Abrahams 2016: 403–413). In this framework, science learning should be contextualised to culture and relevance in the life of learners as this makes them understand the materials taught. Details of the instructional strategies include; use of examples that students can relate to their everyday realities; group discussions; and use of examples that suites the various cultures present (Upadhyay 2009). The critical thinking framework also highlights the notions of reasoning, critical analysis, and justification in the context of science and literacy.

Science literacy education is a process of combining the empirical principles from different frameworks of learning into a developmental progression of activities that are relevant and contextually based. However, it is imperative to enhance the theoretical frameworks and apply solutions in the framework of teaching strategies used in class.

By employing the principles of constructivism, learning is articulated as the process by which new information is incorporated into an existing knowledge framework. This perception of learning is in agreement with the

general idea of employing laboratory activities to bring change in the learner's existing ideas and promote their cognitive developments (Bodner 1986: 873). Refugees learners in order to grasp well ideas in science learning, the predict-observe-explain (POE) model should be adopted. This approach helps students to discuss ways of constructing the inquiry-based lab investigations through basic knowledge, making expectations and later result into practical understanding of the experiment. This sequence forces the student to engage their rational abilities and check for any holes or errors in their thinking. For refugee learners, the theories guide them to move from wall classroom to practical thinking way which is more in the science based education.

Methodology and data use

The research adopted the qualitative design as it focused on inquiries that thought understanding of the learners experiences in offering science combinations in upper secondary school (A'level). As qualitative research focuses on collecting and analysing non- numerical data, the research employed purposive sampling to its respondents as it was mainly for a group of respondents(thus upper class students , offering science based combinations, their teachers, head teachers, PTA representatives , and used convenient sampling for few parents). The data was collected through semi-structured interviews with different key respondents, focus group discussions (6–12) respondents and observation checklist were employed. Data was analysed using excel and In vivo soft ware for better quality understanding. The choice of this analytical approach is motivated by the desire to gain a comprehensive understanding of participants' perspectives and experiences regarding literacy and laboratory science education in Upper secondary classes of refugees in Nakivale refugee settlement. A total of 45 respondents were purposively selected for this study, including 30 students offering science combinations in upper classes thus (senior V) and (seniorVl). SeniorV students were selected to share there experience as new students who were fresh from lower level where sciences were compulsory and seniorVl students were selected to give their experience as they are candidate class about to sit for final exams, 07 parents were conveniently selected especially those with students offering science combinations to share their views. For the key informant interviews, 08 individuals were purposively selected, these were; head teachers for the two schools, science teachers, parent's teacher representative(PTA), representatives from the Office of the Prime Minister (OPM) and relevant non-governmental organizations' representative (Finns church responsible for education in refugee settlement) . Data collection for this study was conducted from March to April 2024. Ethical considerations such as informed

consent, confidentiality, and participant anonymity were strictly adhered to during data collection, and OPM approval and ethical clearance letter were obtained from the office of the prime minister in Kampala Uganda before the commence. The research was conducted in a sensitive manner and ensured that participants felt comfortable expressing their experiences and perspectives.

Findings and interpretation of results

Conducting a study with refugee learners is a sensitive undertaking as majority have high expectations of being helped either financially or materially. The purpose of this study is to explore how refugees students have adopted literacy and laboratory studies to enhance science learning. The two schools have many students and the governments commitment to support the ongoing teaching and learning is quite limited. The schools are still privately community-owned though with thousands of learners, the support got from international organizations is not enough to accommodate all learners. The involvement of the community is key as it emphasizes coexistence.

Table.1 General information

Respondents	Number	Methods
OPM (representative)	1	Personal interviews
NGO Finns church representative FCA)	1	Personal interviews
Head teacher	2	Personal interviews
Parents PTA representative	2	Personal interviews
Science teachers	2	Personal interviews
Parents for science students (upper classes)	7	Focus group discussion
Students	30	Focus group discussion
Total	45	

Source: primary data (2024).

The study indicates several key individuals who played important roles in promoting education in Nakivale refugee settlement. The respondents were purposely selected because of the roles they play at the refugee settlement. These included the representative of the Office of the Prime Minister office (OPM) The involvement of the office of the prime minister is to know how many schools are in settlement, the learners, incoming groups and those who have dropped out. The office takes full responsibility of the

management of the settlement. The office mediates between the government and the international organizations(UNHCR). the representative of the Parents Teachers Association (PTA) the head teachers, the representative of the non-governmental organization (NGO) Finns church, and parents representatives. Each of these individuals made a valuable contribution to the study in line with literacy and laboratory to promote science education. The OPM representative gave statistics regarding the overall student enrolment in the Nakivale refugee settlement. Representatives from non-governmental organizations(NGOs) provided updates on their respective initiatives in the domains of service provision, humanitarian assistance, and community development projects, where Finn's church organization played a significant role in ensuring that students attain education. Finn Church Aid (FCA) has been able to provide crucial support and educational opportunities not only to new refugee arrivals but also to host members school going children in the Nakivale Refugee settlement. Their support has helped some students to get bursaries to further their education. The involvement of the PTA representatives was to give insight into the activities of the schools. Two parents were selected to give their views and experiences related to teaching and learning at Nakivale, their views were vital for the development of the schools. The head teachers, as they are the custodians of the students in schools, play a role in giving data related to overall school and also in particular science education in their respective schools. The teachers especially those who teach science combinations, provided information on how literacy and laboratory science studies are being perceived by students and what hinders science education in the upper classes. The parents, as the one who supports the education system, played a role in explaining the hindrance of enforcing science education in upper secondary schools. Students play the vital role in this study as they are engaged in the learning process.

AGE BRACKETS

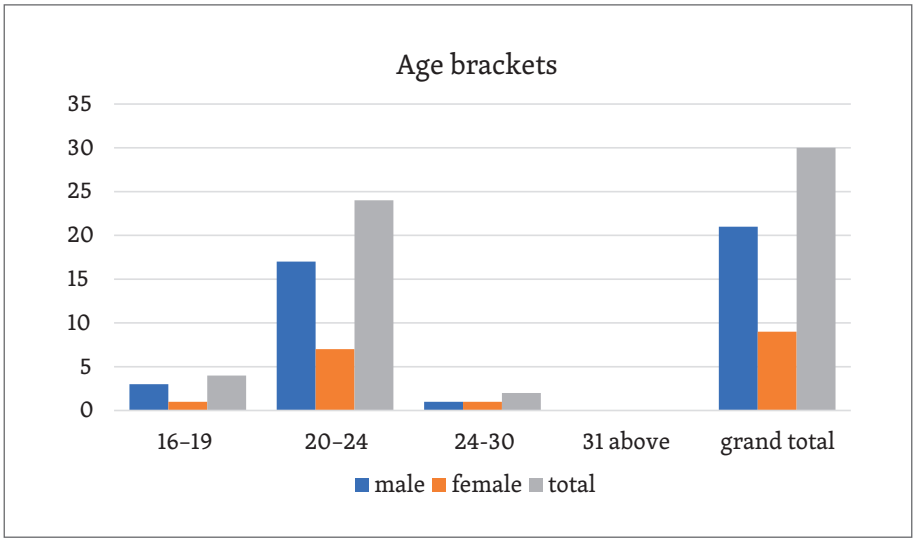
It is important to consider the age brackets of students especially those who are offering science combinations in upper secondary school classes of S.5&S.6 respectively. The students were from two schools thus Rubondo community secondary school and Nakivale secondary school. The age brackets helped in understanding and comprehending the use of literacy and laboratory in education. **It is important to note that the age brackets of key informants were not recorded as they were independent on the study**

Table. 2 .The age brackets for students in Upper classes offering science combinations.

Age brackets	Male	Female	Total
16–19	3	1	04
20–24	17	7	24
25–30	1	1	02
31 above	0	0	00
Total	21	9	30

Source: primary data (2024).

The demographic age bracket is for students offering science combinations in upper classes of Senior 5 and Senior 6 respectively. The age brackets indicates that the majority of students are in the middle age that can comprehend the teaching of science education. The age bracket (20–24) is the group with higher number of students who seems to be less destructed by the environment settings and who are able to concentrate and read for better results. This is the average age bracket that is more serious with education. The age bracket of (16–19) is quite young, where concentration is and this is the age bracket that is more playful. The age bracket of (25–30) are responsible students who can comprehend the scientific information given to them. This age bracket is well know for maturity and understanding when it comes to grasping the content.



Graph 1. Representing age group
Source: primary data (2024).

It is also noted that those in the age bracket of (31 and above) tend to be more focused as they are mature enough to comprehend interpret the scientific terms that can be used in science education. This is also the age bracket with responsibilities that at times hinder concentration.

The age brackets of students offering science combinations in upper classes shows a huge difference between boys and girls. It is noted that the majority of students offering science combination are boys which still shows that the girls are still stigmatized to handle science subjects. Majority of the students fall in middle age of youth(20–24) who can read, interpret, understand and comprehend the literacy knowledge. Those in lower age bracket (16–19) seem to be more playful, not to understand the concepts well. The age group of (25–30) is for mature students with high responsibilities that can affect them to read. The Demographic age brackets shows that majority of the students are still in youthful age, the age that can embrace science education more easily . The implication of this age distribution send a message to educators to pay more attention to students who offers science combinations and also to understand why the girls are not interested into offering sciences combination in upper classes, so as to grasp the concepts and put into practice what they have learnt. Refugee policy should prioritize fair access to high-quality education for young refugees especially those interested in science education. It is also imperative to note that gender representation is low, when comparing male and female offering science combinations, the numbers show less female. This shows that there's still gender disparities and stereo types when it comes to girl child education.

Embracing Science Education

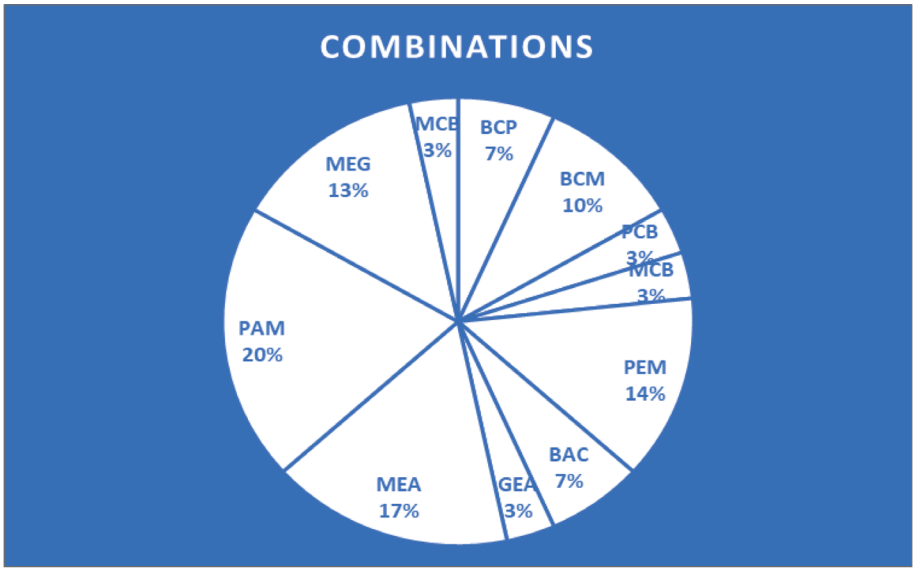
Science education is embrace in all secondary school in Nakivale refugee settlement. However, when it comes to science combinations in upper classes of senior 5 and senior 6,choices are made for students to offer either Arts or Sciences. Those choose pure science combinations are referred to other schools because of lack of capacity of teachers to handle bigger classes which at times becomes complicated for students and hence limited to certain combinations. The table below shows students and their combinations.

Table. 3 Science combinations

Combinations	No of students
BCoP(Biology, computer , phyisics)	02
BCM(Biology, chemistry, Mathamatics)	O3
PCB(Physics, chemistry, biology)	01

MCB(Mathamatics, chemistry, biology)	01
PEM(physics, entrepreneur, mathematics)	04
BAC(Biology, Agriculture, chemistry)	02
GEA(geography, entrepreneur, Agriculture)	01
MEA(mathematics, entrepreneur Agriculture)	05
PAM(physics, agriculture, Mathamatic)	06
MEG(mathematics, entrepreneur Geography)	04
MCB(mathematics, chemistry, biology)	01
Total	30

Source: primary data (2024).



Graph 2. Representing students combinations in percentages
Source**:** primary data (2024).

The combinations indicate that, both students and teachers embrace science education. As the country promotes STEI and STEM which is science in technology, Engineering and entrepreneurship,(STEI) and STEM, science technology engineering and Mathematics , with the combinations mentioned above, the country will be able to achieve its vision 2040 in supporting science education. The challenge is that there few students who offer science combinations. The highest percentage of 20% students is Physics, Agriculture and mathematics. It is being noted that the headteacher in Rubondo plays two roles as a head and a teacher, hence teaching physics and Mathematics. The list combinations with 3% shows the gap in studying.

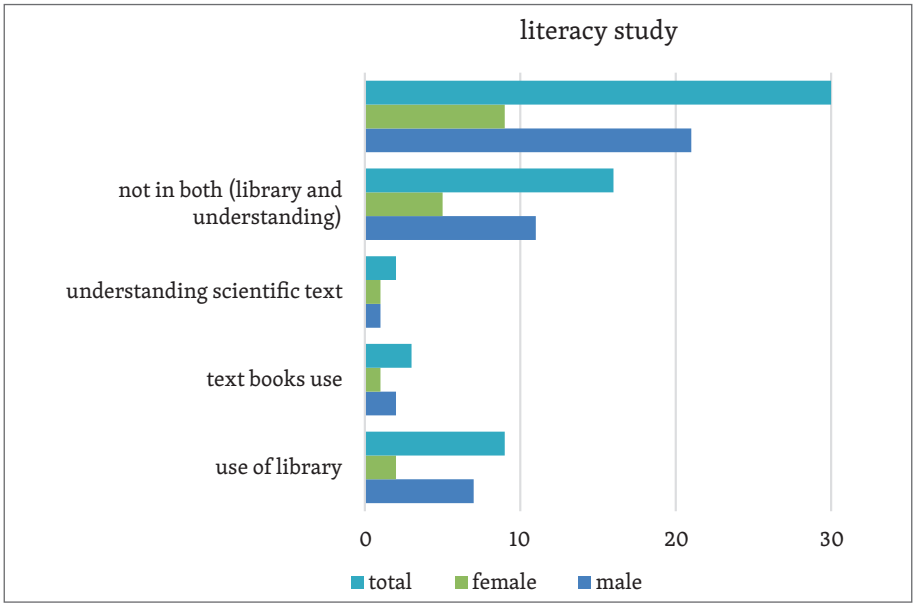
Literacy learning

The study gives a detailed information on literacy study especially in upper classes which are candidate classes. The findings reveals that few students can read, understand and comprehend the scientific information given to them even though they chose those combinations. This is rather important for refugee learners and schools to support the teaching and learning of science education. In order to improve science education, the use of libraries, and reading texts is important. It is right to understand why students do not read and comprehend the science literacy given to them, because they lack materials.

Table 4 Indicating literacy study

Literacy study	Male	Female	Sub-total
Use of library	07	2	09
Text books use/reading scientific texts	02	1	03
Understanding/reading the scientific text	01	01	02
Not understanding the scientific texts	11	5	16
Total	21	09	30

Source: primary data (2024).



Graph 3.
Source: primary data (2024).

Even though there's an indication of library use that can support in literacy understanding of scientific texts, a higher number of students do not understand what they read and few visit the library. Text books usage is low, this indicates that there are fewer text books or they are not up to-date materials. Also shows that female participation in library use is limited. This could also mean the time the library is open and the responsibilities the student have back home.

Laboratory use

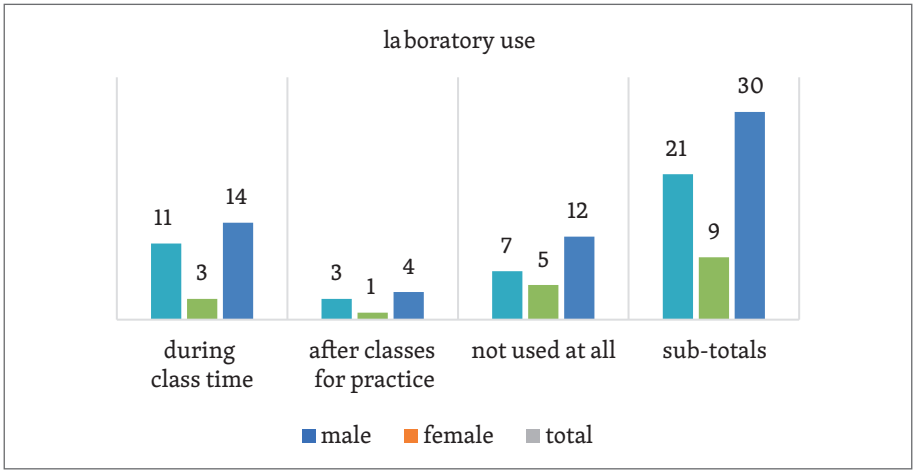
The table indicates the use of laboratories in both secondary schools during and after classes for practice with teachers.

Table 5

Laboratory use	Male	Female	Total
During class time	11	03	14
After classes for practice	03	01	04
Not used at all	7	5	12
Total	21	09	30

Source: primary data (2024).

The table above shoes the use of laboratory among students, Majority indicate that they use the laboratories during classes only which indicates limited time for usage.



Graph 4.
Source: primary data (2024).

The graph above indicates that majority of students use the laboratory during class time, very few use it for personal use. This indicates that, they have limited time for the laboratory usage.

Discussions of the results

The United Nations High Commission for Refugees (UNHCR), the international body charged with providing education for refugees by the 1951 Refugee Convention, and the 1989 Convention on the Rights of the Child respectively, advocates for education as Fundamental right and gives guidelines to ensure and promote basic education for female and male refugees and other people who pose a problem (UNHCR 1996: 48–56). This is a priority matter and part of the search for lasting solutions and improving their capacity for security and protection (UNHCR 1996; Davidson, Silkane 2023). Uganda has taken several positive steps to provide education to its citizens, refugees and migrants. Initiatives include the implementation of a science promotion policy that makes science subjects compulsory at the secondary level, efforts to provide resources such as laboratory equipment and textbooks to support schools, and recent salary increases for science teachers to attract and retain qualified educators. In addition, the government has prioritized science education in secondary schools through investment and support, although challenges such as inadequate facilities and teacher quality remain. Additionally, there is a shift in the curriculum toward critical thinking and problem solving, with the goal of improving science instruction and student achievement Kiconco, Karyarugokwo 2022: 297–306.

According to Uganda's Vision 2040 document, great progress has been made in improving the literacy of its citizens. In 2010, literacy levels were up to 73%, all attributed to universal primary education (UPE) and universal secondary education (USE) The number of primary school enrollments has increased, as has the number of secondary schools. The country's Vision 2040 committed to continuing to support UPE and USE as they are fundamental human rights. The National Development Plan (NDP III) recognizes the importance of investing in human capital development as this contributes to the country's development. It is believed that well-educated, skilled and healthy human resources are essential to promote development. The country believes that investment in science, technology and innovation (STEI) could be a crucial area for the country as it seeks industrialization and sustainable development, this also involves refugees as well. Investing in this area

will ensure that there is an available, appropriate and sufficient workforce to work in these industries. The goal of industrialization is to increase production, productivity and technological growth.. The integration policy in Uganda allows refugee to be part of this strategy and participates fully in the education programs.

Embracing Science education

Science education in refugee settlements, like any other secondary school in Uganda, is embraced by both students and teachers. However, due to limited resources, purely scientific combinations are not considered worthwhile by students. Kiconco highlighted the challenges faced by refugee settlements that include science education, challenges such as inadequate facilities and lack of trained staff (Kiconco, Karyarugokwo 2022: 297–306). This is no different from the Nakivale refugee settlement, which offers science classes. The data shows that fewer students are offering combinations that lead to pure science. Compared to students who offer PAM and MEA, there are very few students who offer PCB, PCM and BCM. During our interaction with the students, it was noticed that students in Nakivale SS are asked to offer combinations that mainly include Agriculture and Mathematics as they lack teachers for other subjects. Respondent *"When we report and show interest in other science subjects, we are asked to offer Agriculture combinations as there is a shortage of teachers for other subjects if we refuse, we are referred to get another school which is impossible for us. (Respondent Student 1)*. This can be seen in the graph above where 20% (the highest number of students) offer PAM and 17% offer MEA as a combination in Nakivale SS. In Rubondo SS. students are encouraged to offer combinations with chemistry. This is because the Head teacher is the chemistry teacher. Although pure sciences are encouraged in Rubondo SS, the school lacks laboratory equipment. *"I love chemistry because the teacher is good, he explains everything, only that we lack equipment for practices, at times we are asked to go to Nakivale but due to time we fail, and also Nakivale is not well equipped but at least they have a laboratory " (Student respondent2)*. Science education is important to the Ugandan government as it plans for vision 2040. During the interaction with the head teachers and Finns church Aid responsible for education enhancement. The Finns Church Aid (FCA) Representative informed that there are arrangement with the schools to support students who show interest in science subjects. The head Finns church Aid (FCA) in Nakivale refugee settlement explained that students who perform well are identified and given support to complete their studies. *"We are to support refugee students dreams, those who wish to continue with sciences and perform better in class, we make sure we support them by giving*

bursaries or even change schools for better results." (Respondent 3 NGO). It is noted that even though the government puts efforts to promote science education in secondary schools, at the lower levels where sciences are compulsory, students have not been helped to perform better where the ratio of teacher student is high and limited tools to use hence leading to fewer numbers at Higher levels and many dropouts.

Literacy study in science education

High school literacy studies for refugees pose a significant challenge because students are unable to read, understand, and comprehend scientific information, and library use is limited, yet these students are in high school education. The few who understand what they read are due to the discussions they usually have after school, and these are students who are in boarding school. in his writing, Dickson emphasis on boarding and day school shows that boarding school perform better than day. " Boarding schools can enhance self-regulated learning through peer social support, which is crucial as students adapt to a new environment without parental support, this peer interaction positively influence students ability to plan and evaluate their learning strategies, leading to improved academic performance outcome" (Ode 2019: 17–23) . For refugees learners this is vital for their academic excellence. However, it is not possible for some students in Nakivale. *"if I could afford being in boarding school, I would be able to engage in evening or night reading or even use the library, but look, I only come in the morning and at 5pm I have to return home to look for money to pay the school dues. Education is expensive here in Uganda compare to my country Congo where I come from"* (respondent 4)

The study involved interacting with students about library use. Students at Rubondo Community Secondary School did not have a library as the school is still new, it opened in 2019 and the first students admitted to senior 6 will be in 2024. The school lacks infrastructure. Those who use the library are mainly from Nakivale SS, whose operating hours are also limited. Those participating in the day program do not have access to library use. *"We don't have a library but a book bank where there are limited academic books and our parents can't afford to buy them. "(respondent 5)*. This is further explained by Norman in his work quality education and resources availably, in his view, absence of scholarly learning resources, such as textbooks, library space hinders the quality of education, especially among vulnerable people especially refugees (King 2013). *"We rely on our friends' books and discussions for those who can stay late at night, but the school gate is always closed at 6pm, making it difficult for us to stay there while we are day students" (respondent 6)*

Participation in literacy instruction requires more support from teachers to engage students in discussions and encourage them to read. As we note that passing and understanding science, especially mathematics, requires more practice with your tutor to understand the formulas well. This is not the case in the Nakivale refugee settlement, which has a high proportion of students and teachers and high teacher turnover. The few students overwork themselves and sometimes don't have enough time to practice. It was found that only one subject teacher teaches all classes from senior one (lower secondary to senior 6 upper secondary) and by the time he teaches the upper secondary, he's already exhausted and not performing to his expectation. *"We are only few teachers who can bare the conditions of refugees, Iam teaching because I was one the refugee also, so I know what it means. We are very few teachers in the whole school teaching mathematics for example I teach from senior one to senior 6. The school can not hire and retain teachers because of poor pay,"(-respondent 7)* The narrative from the teacher indicate how exhausting it is to handle bigger classes alone, while the renumeration is so low. In most cases they don't teach and let students learn on their own. *"Sometimes we go half a term without learning a particular subject, the teacher tell you, he is focusing on S4 students and the pay is low, they encourage us to read on our own , making it difficult to teach ourselves. "(Students answer respond 8).*

The high fluctuation of teachers hinders high-quality training. The Ugandan government has increased the remuneration of science teachers at all levels. However, some private schools such as Nakivale Refugee Settlement, which has private secondary schools in the community, cannot afford the salaries of their staff, which is why most staff usually teach on a voluntary basis and are poorly paid compared to government schools. *"We thank our teachers who work despite the poor pay. We can't pay them like public schools, so we can't recruit more teachers. Those who stay do so voluntarily and with the support of NGOs to support learning,"(parents response 9)* The interaction with teachers and parents showed the concern of lack of scholarlastic materials such as textbook, while visiting the book bank which is being used as a min library, most books found there are for years back and very few copies. The teachers indicated that they always ask parents to support their children with some books which are upto date but it could not be possible because of the parents poor living statuses. Those who can use the book bank (mini library) can stay close to the schools, which is also expensive as most parents cannot afford the higher cost of boarding school accommodation. The interaction with parents is that they rely on the provision of textbooks and reading materials by NGOs, which may not be sufficient for all students. *"We cannot afford to buy textbooks because we ourselves find it difficult to pay school fees." We rely solely on the books provided by the school and its supporting organizations.*

*"(Parent narrative respondent 9)*with less reading materials it is very hard for students to grasp and understand the science concepts given.

Laboratory functionality and use

When teaching sciences, the effectiveness and usage of laboratories for practical subjects is key to learners for hands on. This is not the case in Nakivale refugee settlement where learners face challenges of using apparatuses . In schools like Nakivale refugee settlement and Rubondo, it is evident that the use of laboratories was limited to students, Rubondo has a non-existent facilities while in Nakivale secondary school they lacked equipment and apparatuses are not in use. Scholars like Savier & Nyoto note that the use of laboratories is valuable for improving students conception of understanding and motivation into sciences especially biology and provide a safer and more cost-effective way to engage students(Suseno 2022). The Nakivale refugee settlement lacks laboratory equipment to support science education. As can be seen from the results, few students have used the laboratory, others have never seen an apparatus, suggesting that science subjects are theorized than being more practical. *"I had a dream of becoming a doctor in future, being a surgeon, but how cn that happen if I've never even bisected a rat, or even know the equipment they use. My dream is already shattered"* (students respondent 10) When we spoke to principals and teachers they agreed how difficult it is to let learners use laboratories when they don't have equipment. *"We have the space, but not the equipment, and some of our teachers are not properly trained to use the equipment. That's why we apply more theory than practicals, we even encouge students to offer Agriculture which may require the use of a hoe, everyone can afford a hoe." (Head teacher respondent 12)*. The absence of laboratory equipment and lack of physical space further elaborates the poor performance of students in science subjects. To achieve the goal of promoting science education at all levels, schools should be equipped with appropriate apparatus to use. In Nakivale SS, students indicated that they use the laboratory especially in physics classes but do not practice with their teachers after class. During our engagement with teachers, it was noted that the due to student-teacher ratio, the teachers opt not to engage in practices because they will be rushing to go to other classes to teach. *"We are very few teachers, who teach throughout all classes, by the time you conclude the class you are very exhausted you cannot continue with practical and Moreso, we don't want to be looked down by students that we don't have the equipment to use, we do not have laboratory attendants and the numeration is too low, hence less motivation."* (*Science teacher respondent* 13)

Conclusions and recommendations

The study aimed at assessing Science education in upper secondary schools in Nakivale refugee settlement in Uganda. It examined how the students accepted science education, how literacy level affected the way they perceive science, and whether the availability of laboratory facilities made a difference in their learning. The findings shed light on difficulties and possibilities associated with the education of refugee students and their attempts to grasp scientific information. Through the identification of these challenges and opportunity as outlined in the study, it is important to note that the Government of Uganda in her transition stage to fully take in refugees as their own visitors, should plan a head to engage different stakeholders into the management of schools in refugee settlements, Nakivale worked as a case that will represent most refugee settlements in Uganda.

Recommendations

As per the study, the recommendations should be for different stakeholders. it is recommended that the stakeholders should work towards effectively provide science education for all the students in Nakivale refugee settlement to enable them to bring change and meaning in their future activities.

For the policy makers, the government of Uganda should engage stakeholders at the lower levels and address the challenges that are coming through little renumeration of teachers salaries, the government through ministry of education should consider making Nakivale ss a public school not a private community owned school. More so, to have a positive impact on science education, the government of Uganda should integrate refugee science programs into STEM initiatives. This will later help the promotion of sciences in non privileged. communities like refugee settlements .

NGO's should support and fund teachers training programs and also equip schools with necessary requirements that will support the learners in science subjects.

Parents should encourage their girls to engage more into science education. Also schools should promote girls participation through mentorship or scholarships.

All in all, empowering refugee students through science education is not only a development strategy but a humanitarian imperative. Therefore we call upon all humanitarian actors to support the struggle.

Bibliography

Abrahams Ian. 2016. „Minds-On Practical Work for Effective Science Learning." W *Science Education,* Keith S. Taber, Ben Akpan (red.), 403–413. Rotterdam: SensePublishers. https://doi.org/10.1007/978-94-6300-749-8_29.

Akpan Ben. 2016. „Science Education in a Future World." W *Science Education,* Keith S. Taber, Ben Akpan (red.), 331–346. Rotterdam: SensePublishers. https://doi.org/10.1007/978-3-319-32351-0_17.

Bodner George M. 1986. „Constructivism: A Theory of Knowledge." *Journal of Chemical Education* 63 (10): 873. https://doi.org/10.1021/ed063p873.

Davidson Agnese, Vineta Silkane. 2023. „Exploratory Study on Latvian Secondary School Teachers' Understanding of the Concept of Scientific Literacy." W *To Be or Not to Be a Great Educator,* Linda Daniela (red.), 189–208. Riga: University of Latvia. https://doi.org/10.22364/atee.2022.12.

Gee James. 2014. *Social Linguistics and Literacies.* London: Routledge. https://doi.org/10.4324/9780203814444.

Hilton Annette, Geoff Hilton. 2017. „Digital Technologies in the Science Classroom and Beyond." W *Teaching Secondary Science,* Geoff Woolcott, Robert Whannell (red.), 375–393. Cambridge: University Press. https://doi.org/10.1017/9781316882535.020.

Kerry-Moran Kelli J. 2021. „A Dilemma for the Teacher Educator: Navigating the 21st Century Literacy Landscape." W *Sense-making: Problematizing Constructs of Literacy for 21st Century Education,* Marilyn J. Narey, Kelli Jo Kerry-Moran (red.), 37–53. Cham: Springer. https://doi.org/10.1007/978-3-030-68117-3_3.

King Norman A. 2013. „Investigation of Factors Hindering Quality Education in Secondary Schools in Mbeya, Tanzania." *International Journal of Learning and Development* 3 (6): 52. https://doi.org/10.5296/ijld.v3i6.4843.

Kryukova Nina I., Natalia E. Rastorgueva, Elena O. Popova, Valeria L. Zakharova, Jhanna I. Aytuganova, Goliya I. Bikbulatova. 2023. „Examining the Implementations Related to Teaching Science to Students with Disabilities." *Eurasia Journal of Mathematics, Science and Technology Education* 19 (8): em2306. https://doi.org/10.29333/ejmste/13427.

Milliam Kiconco, Karyarugokwo Dominic. 2022. „A Critical Analysis of the Compulsory Science Education Policy at the Secondary Level of Education in Uganda." *Advances in Social Sciences Research Journal* 9 (8): 297–306. https://doi.org/10.14738/assrj.98.12895.

Namayanja Proscovia, Edwin Akugizibwe, Damian Kajunguri, Ronald Katende, Edson Tumuhimbise Bazeyo, et al. 2022. „Factors Affecting Students' Performance, Enrolment and Retention in Science Subjects in Secondary Schools in Uganda: A Case Study of Kigezi Region of Uganda." *The Uganda Higher Education Review* 10 (1): 212–228. https://doi.org/10.58653/nche.v10i1.13.

Norris Stephen P., Linda M. Phillips. 2003. „How Literacy in Its Fundamental Sense Is Central to Scientific Literacy." *Science Education* 87 (2): 224–240. https://doi.org/10.1002/sce.10066.

Ode Dickson. 2019. „Effects of School Type (Day School and Boarding School) on Secondary School Students' Academic Achievement in Social Studies." *International Journal of Education (IJE)* 7 (1): 17–23. https://doi.org/10.5121/ije.2019.7102.

Sarıtaş Davut, Hasan Özcan, Agustín Adúriz-Bravo. 2023. „On the Practice of Integrated STEM Education as 'Poiesis'." *STEM Education Review* 1. https://doi.org/10.54844/stemer.2023.0408.

Sharma Meenu, Priyam Ankit. 2023. „Importance of Education in This Challenging World." *SMART MOVES JOURNAL IJELLH* 11 (3): 9–19. https://doi.org/10.24113/ijellh.v11i3.11408.

Suseno Nyoto, Riswanto Riswanto, M.B. Salim, Dedy Hidayatullah, I.G. Rasagama. 2022. „How to Manage an Effective Laboratory for Science Learning in Schools?" *Jurnal Penelitian & Pengembangan Pendidikan Fisika* 7 (2): 191–200. https://doi.org/10.21009/1.07211.

Upadhyay Bhaskar. 2009. „Teaching Science for Empowerment in an Urban Classroom: A Case Study of a Hmong Teacher." *Equity & Excellence in Education* 42 (2): 217–232. https://doi.org/10.1080/10665680902779366.

UNHCR. 1996. „UNHCR Policy on Refugee Children." *Refugee Survey Quarterly* 15 (3): 48–56. https://doi.org/10.1093/rsq/15.3.48.

Walberg Herbert J. 1991. „Improving School Science in Advanced and Developing Countries." *Review of Educational Research* 61 (1): 25. https://doi.org/10.2307/1170666.

Internet Sources

Education Response Plan for Refugees and Host Communities Uganda. Accessed November 10, 2025. https://globalcompactrefugees.org/sites/default/files/2019–12/Uganda-%20Education%20response%20plan%20for%20refugees%20and%20host%20communities%2C%202017-2020_0.pdf.

Paving Pathways for Inclusion: Towards Evidence-Based Policy-Making for Refugee Education. UNESCO eBooks, 2023. Accessed November 10, 2025. https://doi.org/10.54675/vtkx4352.

Policy Framework. 2020. Accessed November 7, 2025. https://www.greenpolicyplatform.org/sites/default/files/downloads/policy-database/UGANDA)%20Vision%2040.pdf.

Problematyka czytania i pisania oraz zajęcia laboratoryjne: badanie edukacji naukowej w szkołach ponadgimnazjalnych w osiedlach dla uchodźców: Przypadek osiedla dla uchodźców Nakivale w Ugandzie

Streszczenie:

Podsumowanie: Niniejsze badanie dotyczy wykorzystania umiejętności czytania i pisania oraz laboratoriów w nauczaniu przedmiotów ścisłych w szkołach średnich w obozach dla uchodźców w Nakivale. Umiejętność czytania i pisania obejmuje zdolność uczniów do skutecznego rozumienia, interpretowania i przekazywania informacji naukowych, natomiast laboratoria obejmują warunki eksperymentalne i badania naukowe. Badaniem objęto dwie szkoły średnie: Nakivale Secondary School i Rubondo Community Secondary School. W badaniu wykorzystano badania jakościowe przeprowadzone wśród 45 celowo wybranych respondentów. Zastosowano projekt

badawczy obejmujący dyskusje w grupach fokusowych, częściowo ustrukturyzowane wywiady i techniki obserwacyjne. Wyniki wskazują, że edukacja naukowa w klasach wyższych jest daleka od osiągnięć w obozie dla uchodźców Nakivale ze względu na brak w pełni wyposażonych laboratoriów i bibliotek. Stosunek liczby uczniów do liczby nauczycieli jest wysoki, a nauczyciele przedmiotów ścisłych otrzymują niższe wynagrodzenie niż nauczyciele w szkołach państwowych, co prowadzi do dużej rotacji kadry nauczycielskiej i mniejszego skupienia. W badaniach zaleca się, aby rząd Ugandy wspierał szkoły, ponieważ nadal są one prywatne i przyjmują tysiące uczniów-uchodźców. Sale laboratoryjne powinny być wyposażone w aparaturę, chemikalia i inne związki wspomagające nauczanie i uczenie się, a biblioteki powinny być dobrze zaopatrzone w książki naukowe, aby usprawnić proces uczenia się.

Abstract

This study investigates the use of literacy and laboratory in science education in upper secondary schools in Nakivale refugee settlements. Literacy involves students' ability to comprehend, interpret, and communicate scientific information effectively, while laboratory involves experimental settings and scientific investigation. Two secondary schools were included in the study: Nakivale Secondary School and Rubondo Community Secondary School. The study employed qualitative research of 45 respondents who were purposively selected. The research design, involving focus group discussions, semi-structured interviews, and observation techniques, was employed. The findings indicate that science education in upper classes is far from its achievement in Nakivale refugee settlement due to the lack of fully equipped laboratories and libraries. The student-teacher ratio is high, and teachers for sciences are paid less than those in government-aided schools, leading to high teacher turnovers and less concentration. The research recommends that the Government of Uganda support the schools, as they are still privately owned and accommodate thousands of refugee students. Laboratory rooms should be equipped with apparatuses, chemicals, and other compounds to aid teaching and learning, and libraries should be well stocked with science books to enhance learning.

Słowa kluczowe: umiejętność czytania i pisania, laboratorium, edukacja naukowa, szkoła średnia II stopnia, uchodźcy, Nakivale

Keywords: literacy, laboratory, science education, upper secondary, refugees, Nakivale