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Chapter

STEM Education and the Role of the HEAC in Uganda

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Abstract

The Higher Education Access Certificate programme, initiated in Uganda in 2016, is a bridging pathway for students who do not meet the conventional entry requirements for tertiary education. This study investigates the impact and implementation of the programme, particularly its effectiveness in increasing enrollment in STEM fields, and identifies best practices for implementation. The research involved a review of existing studies on STEM education alongside the collection of qualitative data through focus groups, case studies, and surveys, aimed at understanding the experiences and perspectives of programme participants. The findings indicate that HEAC, with a focus on science and innovation, has provided a valuable alternative route to higher education. Enrollment in HEAC certificate programmes has notably increased due to the programme's accreditation and adoption. Nevertheless, challenges have emerged, including concerns about graduation quality, bureaucratic approval processes, and tuition-related issues. The HEAC programme is recognized as a viable strategy for addressing educational inequalities and promoting Sustainable Development Goal 4 by offering underprivileged students an opportunity for further education and supporting socioeconomic development through STEM fields. The chapter underscores the importance of sustained funding and expansion of HEAC to ensure equitable access to high-quality education and the growth of a diverse STEM relevant workforce.

Keywords: bridging-pathway, education, HEAC, role, STEM, Uganda

1. Introduction

In 2015, the 191 United Nations states including Uganda, adopted the 17 Sustainable Development Goals (SDGs), popularly known as the Global goals of action which are designed to end poverty, protect the planet, and end discrimination against the Most-At-Risk-Populations (MARPs), more so the women and girls [1, 2]. The implementation and achievement of the 169 targets of the SDGs will ensure that by 2030 all people enjoy peace and prosperity. Because of the crucial role of education in socio-economic transformation, the SDGs has it as a stand-alone goal: number 4-ensures inclusive and equitable quality education and promotes lifelong learning opportunities for all. Emphasis, however, is laid on the significant importance of Science, Technology, Engineering and Mathematics (STEM) considered as the

driving forces of economic growth [3]. Studies and trends indicate gender gaps, gender inequality and disempowerment of girls and women in STEM subjects [4–6]. This results in the dominance of boys and men in science related employment fields [7, 8]. In Uganda, this is more pronounced in the poorly facilitated districts because of issues of insufficient materials and the faculty in the primary, lower secondary and upper secondary school levels. Consequently, the students get poor grades at advanced level.

On the other hand, Higher Education Access Certificate (HEAC) is a sub-component of Higher Education Access Programme (HEAP). HEAP, a 10-year programme, was started in 2016 and is implemented by Forum for African Women Educationalists Uganda (FAWEU) with support from Master Card Foundation (MCF). Both STEM and HEAC are interventions meant to increase the profile in the fields of Science, Technology and Innovation (STI) in the country, at different education levels. Whereas STEM targets girls at the lower secondary school level to embrace and advance in STEM subjects in the known male dominated fields, the target population of the HEAC are both male and female students who failed to attain the minimum requirements for admission to undergraduate degree or diploma programmes. The minimum is Uganda Advanced Certificate of Education (UACE) or its equivalent with at least one principle pass and two subsidiaries. Therefore, STEM and HEAC respond to the Comprehensive Agenda 2030 [9] for sustainable development hinged on its transformative principle-leave nobody behind. The resultant effect of this is that students are acclimatized in science subjects to develop and possess the relevant profiles. Faced with the odds from multiple subjects, STEM could be challenged at building girls' confidence and giving them the opportunities to see themselves through science subjects. Additionally, HEAC contextualizes learning of science subjects which contributes both student motivation [10] and making of meaning. The implication is that students are not spread over multiple disciplines to thin out concentration or downsizing the field on interaction. What is more, it widens the scope of shared views for deeper understanding, internalizing and transferring learned knowledge, skills and values to propel success in real life.

2. Policy initiatives to advance and promote STEM education

Over the years, there have been a number of policy initiatives in the country focusing on advancing and promoting STEM education. These initiatives aim at improving the curriculum, providing necessary resources, supporting teacher training and development, collaborating with international partners, and emphasizing research and development. For example, Uganda is shifting its curriculum away from reinforcing gender stereotypes and portraying females as inferior to males. Efforts are being made to create a more gender-inclusive curriculum. The Uganda Bureau of Statistics (UBOS) and the National Curriculum Development Centre (NCDC) are working to remove gender biases from mathematics and science textbooks. Practical learning through experiential methods, experiments, and projects is being introduced to make STEM subjects more engaging and useful.

Similarly, various policies and strategies are being implemented to provide STEM labs and educational institutions with the necessary tools and supplies for conducting experiments. Access to digital materials and technologies is being expanded to ensure that instructors and students have equal access to computers and the internet. Thirdly, initiatives have been put in place to provide STEM instructors with opportunities for professional development. These programs address social factors such as negative

gender stereotypes and biased teacher attitudes that favor boys over girls in STEM disciplines. Specialized training is also offered to enhance subject matter expertise. Additionally, the government increased the monthly pay for science teachers by 300 percent effective July 2021 to the equivalent of US \$1066 for a graduate and US \$800 for Grade V teacher. The aim is to attract and retain talented STEM educators in the related subjects.

Fourthly, the government is keen on promoting science, technology and innovation to create a knowledge-based economy. To achieve this, it collaborates with international organizations and foreign governments to access funding, expertise, resources, and best practices in advancing and promoting STEM education. For example, the Uganda Millennium Science Initiative, funded by the World Bank, is a notable example of this collaboration and partnership. In addition to the above, by recognizing the importance of research and development in STEM education, the government emphasizes a reliable method of gathering information on the outcomes of STEM education. The data collected aids in decision-making and improvements. In this agenda, monitoring and evaluation systems are vital for collecting data on STEM education outcomes and using it to continuously improve and adjust policies.

In summary, Uganda is committed to advancing STEM education through a number of all-inclusive policy initiatives. Some of these are tailored curriculum reviews, targeted resource budgeting and provision, teacher training, collaborations with international partners, and an emphasis on research and development. The aim is to foster a more inclusive, engaging, and effective STEM education system in the country.

3. Background information

3.1 The genesis of HEAC

The HEAC programme is the first of its kind in Uganda, initially championed by FAWEU with funding from MasterCard Foundation. It is in partnership with three Universities; Busitema University (BU), Gulu University (GU) and Mbarara University of Science and Technology (MUST). The other consortium institutions are Jinja School of Nursing and Midwifery, and Medical Laboratory Training School, Jinja. FAWEU is a non-governmental organization launched in February 1997 with a mission to promote gender equity in Uganda by influencing policies and nurturing positive gender practices and attitudes toward girls' education. FAWEU intends to have the HEAC program adopted and rolled out in 20 universities by 2025 to all 54 universities in Uganda with information on HEAC.

HEAC is a pre-entry bridging programme accredited by the National Council for Higher Education (NCHE) in Uganda. Its duration is a structured one-academic year comprising two semesters lasting 34-weeks including the examination period. The HEAC is an intensive full-time programme, designed to bridge the knowledge gap of students who might not have assumed knowledge required for a professional course or who might not have been confident with their preparation for university and tertiary level education study. It is designed with the assumption that the applicant has some basic knowledge of the subjects for which they are being bridged. The programme is a preparation stage to enable access to university and tertiary education programmes. It runs for two semesters (1 year), and focuses on preparation of candidates in specific subjects that provide generic academic skills to succeed in higher education levels of the desired programmes. Upon successful completion of the programme, and

depending on their performance, the candidates will be given the opportunity to access specific degree/diploma programmes of their choice in university and other tertiary education.

The overall aim of the HEAC Programme is to provide entry opportunity for candidates who performed dismally at UACE. Also, they do not have appropriate qualifications based on current National admission criteria for higher education. Furthermore, those students with foreign qualifications but who do not merit admission to programmes at higher institutions of learning in the Ugandan Education system can also benefit. The targeted learners include UACE holders with at least two subsidiary passes or its equivalent. At least one of the subsidiary pass shall be from a principal subject. Students whose foreign secondary school qualifications are not considered equivalent to UACE but permit admission into Higher Education in the foreign country. Such students shall have passed at least five subjects with a minimum overall grade of C (equivalently a Ugandan grade 5). In addition, foreign students whose studies were not conducted in English show proof of proficiency in the English Language from English proficiency centers accredited by NCHE.

3.2 Differences and synergies of STEM and HEAC

Both STEM and HEAC are core practical approaches to learning with a focus on students retaining more information and understanding concepts in science subjects. Whereas STEM draws its population from students who enroll for the first 4 years of lower secondary school education leading to UCE, HEAC on the other hand targets students who narrowly missed on the university entry mark for various science programmes; and it is an intensive programme. As NCHE [11] points out, the programme also targets students from other countries whose secondary school qualifications are not considered equivalent to UACE but permit admission into Higher Education

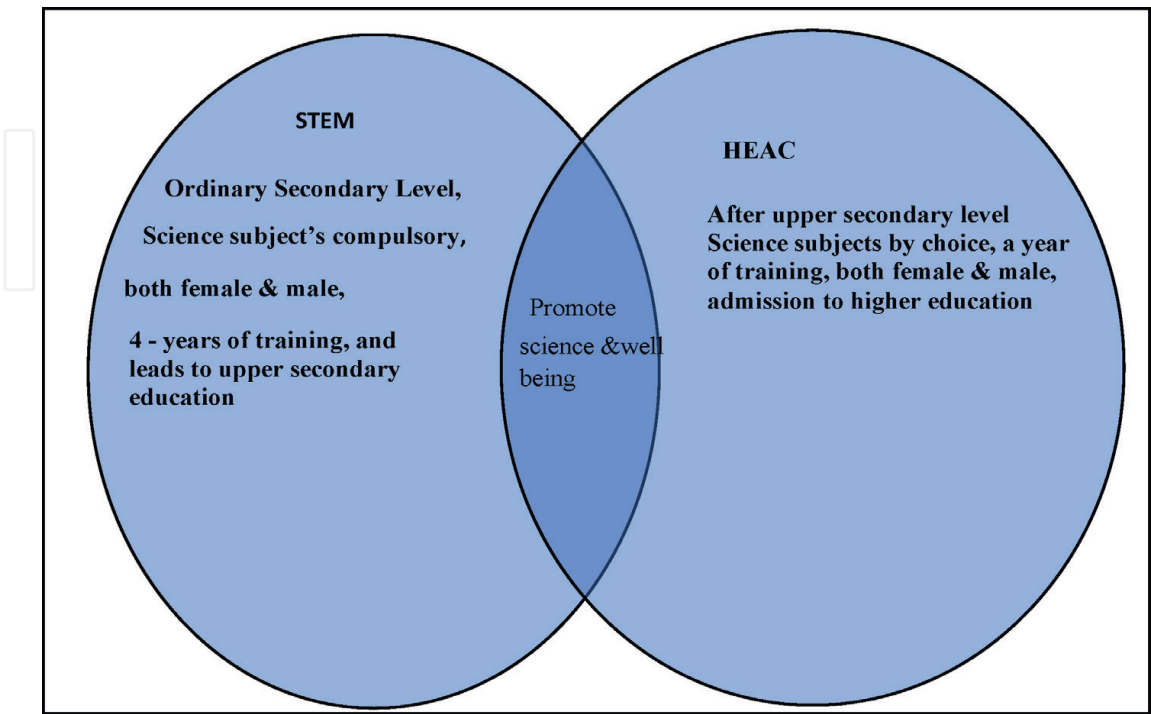


Figure 1.
Linkages and differences between STEM and HEAC.

in those countries. Additionally, it prepares students to equally compete with the direct entry students once admitted on higher education study courses. The differences notwithstanding, in our study, STEM and HEAC promote science, technology, innovation and well-being as presented in **Figure 1**.

3.3 How FAWE Uganda supports the process of HEAC adoption and implementation

HEAC is now institutionalized and can be sustained by the accredited institutions. FAWE offers technical support to the Universities interested in adoption of the HEAC bridging program. First, FAWEU together with subject experts from the partner institutions has developed standard curriculum for different academic tracks that can be adopted by institutions of higher learning. Secondly, there is popularization of HEAC in all Universities in Uganda to increase adoption and acceptance. Also, it supports accreditation of the courses by the NCHE. Fourthly, it advocates for Ministry of Education and Sport, curriculum development bodies, higher education standards bodies, professional bodies, employers, and employment bodies to recognize students who graduate via the HEAC route. Other support areas are; institutional support for Universities to adopt HEAC including; adoption of the curriculum to meet the Universities requirements and standards; training of HEAC tutors/lecturers in the implementing Universities; embedding gender responsive pedagogy in the training of lecturers, rolling out the extended orientation program for students enrolled in HEAC programs; provision of learning materials including textbooks and equipping laboratories of partner institutions; identifying focal point persons in the institutions to support the roll out and implementation of HEAC in the universities; mentorship training for the staff managing the HEAC students; and convening HEAC

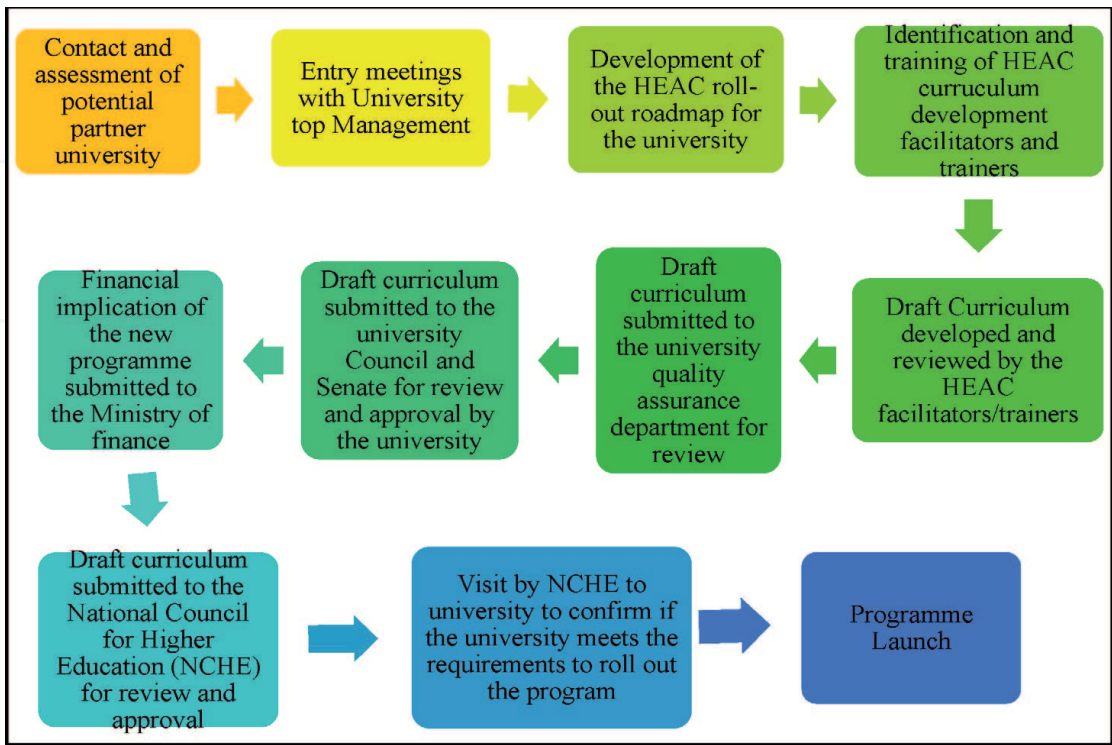


Figure 2.
Roll-out process in a university setting (adopted from FAWE(U) working documents).

stakeholders review meeting to discuss progress. Furthermore, FAWE addresses stigma and negative attitudes toward students enrolling through bridging by holding awareness sessions with universities, employer groups, communities and on national radios and televisions plus other mass media outlets.

3.4 The HEAC roll-out process in a university setting

From the review of the documents, we analyzed the process followed while implementing the HEAC. In **Figure 2** below, we present the roll-out process in a University setting.

4. Methodology

This section outlines the steps for investigating the efficacy and impact of the Higher Education Access Certificate (HEAC) in promoting STEM education and increasing access to higher education. The research objectives include: examining the potential benefits and challenges of implementing the HEAC, evaluating the effectiveness of the HEAC in increasing enrollment of underrepresented groups in STEM disciplines, and proposing strategies for optimizing the implementation and impact of the HEAC.

An extensive review of existing literature on STEM education, higher education access policies, and initiatives related to increasing diversity in STEM fields was conducted. The researchers utilized academic databases, journals, and reputable sources to ensure the reliability and credibility of the literature review. Best practices and challenges related to the HEAC as an alternative access pathway to promoting STEM were identified.

The research employed a qualitative approach to gather comprehensive data [12]. Qualitative insights were collected through focus group discussions and case studies [13]. A comprehensive survey instrument was developed to gather data on students' perceptions, attitudes, and aspirations regarding STEM education and the HEAC. The survey included questions related to demographics, educational background, motivations, and barriers faced by students in accessing higher education.

Focus group discussions were conducted with students, educators, policymakers, and representatives from relevant organizations to gain qualitative insights into their perceptions and experiences with the HEAC. Institutions or universities that pioneered implementation of the HEAC were selected for case studies. Data were collected on enrollment trends, student success rates, and the impact of the HEAC on underrepresented groups in STEM.

Quantitative data from surveys and case studies were analyzed using statistical tools to derive meaningful insights. Qualitative data from focus groups were subjected to content analysis techniques to identify themes and patterns [14]. The findings from different data sources were compared to triangulate results and validate conclusions. The study acknowledges certain limitations, such as potential biases in survey responses, limited generalizability of findings from specific case studies, and constraints in accessing comprehensive data from all institutions implementing the HEAC.

Ethical guidelines were followed throughout the research process to ensure the confidentiality, anonymity, and informed consent of the participants [15]. Institutional review and approval were sought where necessary.

5. Key results

5.1 Eligibility for a HEAC programme

Eligible students for admission to HEAC program are those who did not meet the national minimum statutory requirements for direct entry into university for degree or diploma courses. Additionally, foreign students whose qualifications are not considered equivalent to the Uganda's national qualification, but which allow university entry into their country-of-origin national exam. The HEAC programme is also designed to enroll holders of vocational qualifications and expose them to rigorous theoretical foundations that will enable them to pursue desired diploma or degree programs.

5.2 HEAC value proposition

Previous bridging programs were narrow in focus in that they allowed students to make up for gaps in their A-level results specific courses that they had failed. For example- a learner who did not pass mathematics could do a bridging course in mathematics to allow them attain a grade that would enable them qualify for university. The HEAC course is more generic and provides open access to a diverse range of courses dependent on the subjects selected in the bridging course. The students are eligible to join not just the university where they are taking the bridging course but any other that recognizes HEAC's accreditation by NCHE.

Following accreditation by NCHE, the HEAC program is more easily accepted and recognized by other institutions as harmonization of curriculum and training of lecturers ensure a standard quality across the different universities. HEAC too helps address the disparities and inequalities existing in education by providing "second chances" to students who are disadvantaged by external circumstances beyond their control. Thus, the bridging program enables students' transition into university better prepared than those who join directly from secondary schools. The certificate course prepares them to cope with life at university as well as they rediscover their potential in science subjects. The skills and knowledge acquired by the students are not just in academics but the training also includes twenty-first century skills and other basic skills that prepare students for higher education and the world of work. Hence, the HEAC programme is synonymous with increasing the student's population at the partner universities and access to the Higher Education system.

5.3 HEAC as model on the input and output aspects

The programme is clear on who it enrolls, the type of training offered, the level of knowledge gained across universities and the ultimate process output aspects as is shared in **Figure 3**. In light of this, the HEAC implementation process is very involving.

5.4 HEAC as an alternative entry route, sustainability and progress

In this study, we analyzed three HEAC programmes accredited by NCHE. These are the programmes being implemented by the universities. Our interest was to document the category of the certificate, eligibility criteria, the programme contents and the linkage to STEM in terms of the subjects. We present our results in **Table 1** below.

The results in the above table reveal that HEAC plays an important role in the continuity of STEM.

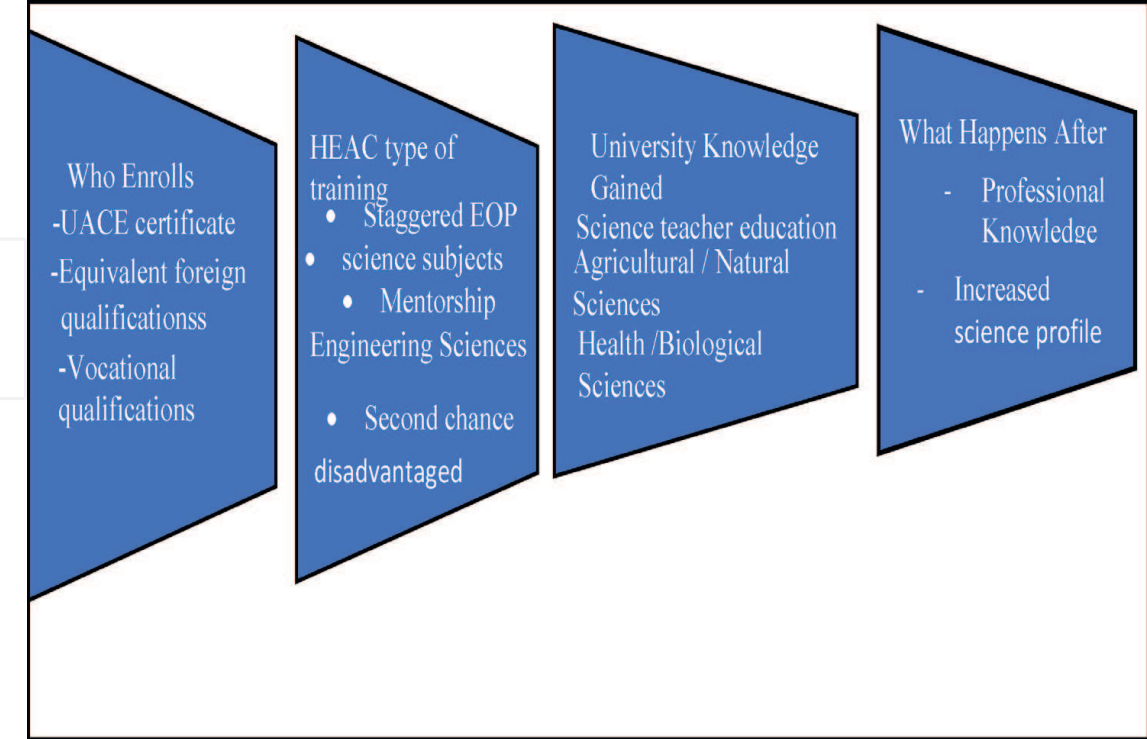


Figure 3.
HEAC model on the input and output aspects.

Results of this study indicate that the HEAC programme has been accredited by the NCHE, Uganda as a fifth entry route to enroll for Diploma or degree programmes, the other routes being “Direct” or A-Level, Diploma, degree and Mature Age Entry. The programme has become institutionalized and can be sustained by institutions through admission of private students and has already attracted privately sponsored students and those sponsored through other scholarships. HEAC has attracted privately sponsored by parents and other well-wishers. Gradually, the professional bodies are recognizing the HEAC programme.

HEAC bridging programme has been developed and institutionalized at a total of nine universities, namely: BU, MUST, GU, Kabale University, Muni University, Lira University, Bishop Stuart University, Kyambogo University and Mountains of the Moon University. To date, 697 students have enrolled on the HEAC program in five universities, namely BU, MUST, GU, Kabale University and Muni University. FAWEU is supporting Mountains of the Moon University and Lira University to redefine and customize the new curriculum in preparation for its rollout.

Four new universities, namely: Ndejje University, Soroti University, Kyambogo University and Uganda Christian University have also adopted the HEAC program. This brings the total number of partner universities implementing HEAC in Uganda to 13. For example, all the 53 HEAC students of the first cohort from BU were admitted to university-level study programs-2 on Medicine and Surgery, Education (13), Agricultural mechanization (3), Agro processing (2), Agricultural science (16), Fisheries (1), Nursing (12) and Anesthesia (4). This information has been consolidated in **Table 2** below.

The above are impressive figures for a new programme and concept within higher education. Upon completion of the certificate, the students have the requirements for admission to the various degree and diploma programmes in higher institutions of learning.

Programme	Eligible undergraduate programmes	Contents, linkage to STEM and duration	
		HEAC generic courses	HEAC specific courses (duration:-34 weeks including the examination period)
HEAC in chemistry & mathematics	Chemical engineering, teacher education—chemistry & mathematics, applied sciences—chemistry & mathematics, computer sciences, information technology	Information literacy, communication skills, basic mathematics, twenty-first century skills, development studies, computer skills	Mathematics -mathematical courses, introductory calculus, introductory linear algebra; Chemistry -inorganic chemistry, physical chemistry, organic chemistry; Linkage to STEM -Science, Technology, Engineering & mathematics
HEAC in biology & chemistry	Health sciences, teaching education—biology, chemistry, physical education, agricultural sciences, environmental sciences, Forestry, veterinary medicine, laboratory sciences, biological sciences, applied health programme, sports sciences & applied sciences	Information literacy, communication skills, basic mathematics, foundation physics, twenty-first century skills & computer skills	Biology -biology sciences, fundamentals of biology; Chemistry -functional biology, ecology, organic chemistry-inorganic chemistry, physical chemistry; Linkage to STEM -Science, Technology, Engineering & biology
HEAC in physics & mathematics	Engineering sciences, teaching education—physics & mathematics, statistics, Computer science, information technology	Information literacy, communication skills, computer skills, twenty-first century skills, development studies	Mathematics -basic mathematics II, Introductory to calculus mechanics, foundation chemistry; Physics -optics, waves, heat and thermos dynamics, introductory to linear algebra, electro magnetism and applied electronics, atomic, particles, modern physics; Linkage to STEM -Science, Technology, Engineering & mathematics

Table 1.
Current accredited HEAC programmes.

Location	Accreditation status	Year programme started	First enrolment student numbers		
			Female n(%)	Male n(%)	Total
BU	Accredited	2018	25(34.7)	47(65.3)	72
MUST		2020	30(41.7)	42(58.3)	72
GU		2019	8(20)	32(80)	40
KAB		2020	25(36.8)	43(63.2)	68
Grand totals			88 (35.0)	(65)164	252

Table 2.
HEAC first enrolment numbers in universities (Source: Universities & FAWEU records).

5.5 How students apply to benefit from the HEAC program

Students apply to study courses offered by the HEAC program at the university of their choice following an application call published in the institution’s recommended

No	Institution	Academic year	Female n(%)	Male n(%)	Total enrolment	Accreditation status by NCHE
1	Mbarara University of Science and Technology	2020/2021	30(41.7)	42(58.3)	72	Accredited
		2021/2022	39(48.8)	41(51.2)	80	
		2022/2023	COVID-19 affected the enrolment. There was no Advanced level in 2021			
2	Gulu University	2020/2021	6(20.7)	23(79.3)	29	
		2021/2022	14(29.2)	34(70.8)	48	
		2022/2023	8(20)	32(80)	40	
3	Busitema University	2019/202	25(34.7)	47(65.3)	72	
		2020/2021	28(42.4)	38(57.6)	66	
		2021/2022	49(35.5)	89(64.5)	138	
		2022/2023	26(46.4)	30(53.6)	56	
4	Kabale University	2020/2021	25(36.8)	43(63.2)	68	
		2021/2022	39(46.4)	45(53.6)	84	
		2022/2023	7(21.2)	26(78.8)	33	
	Muni University	2022/2023	9(42.9)	12(57.1)	21	
5	Uganda Martyrs University, Nkozi	2021/2022	9(52.9)	8(47.1)	17	
Overall totals			275(37.1)	469(63.2)	742	
HEAC curriculum development trainings (staff trained)			Female	Male	Total	
1	Mountains of the Moon	2022	12(37.5)	20(62.5)	32	
2	Soroti University	2022	12(38.7)	19(61.3)	31	
3	Ndejje University	2022	21(40.4)	31(59.6)	52	
4	Lira	2022	9(34.6)	17(65.4)	26	
Overall totals			54(38.3)	87(61.7)	141	

Table 3.
HEAC student registered over academic years 2019/2020—2022/2023.

media or its website. Submitted applications are screened and successful candidates are enrolled as indicated in **Table 3**.

Records in universities indicate that 700 candidates responded to the MUST call on HEAC, 1000 applied at Busitema University and 800 applied at Gulu University. We note from the initial enrolment in **Table 3**, the HEAC programme started off on a good note. Moreover, all those that were admitted passed with good grades. Students on the HEAC programme are assessed academically through assignments, tests, essays, projects and written examination.

5.6 Balancing theory and practice

Through HEAC, university education is extended to students without the requisite educational qualification for direct entry. As HEAC students transit into a degree programme, it is envisaged that respective course organizers furnish the University with monitoring, academic performance and attrition rates information in comparison with students who enrolled through other entry routes. Facilitators/lecturers align what they have to deliver to fit the programme level standards and expectations as they bring students on board.

Support is extended to HEAC students through the Extended Orientation Programme (EOP), authentic role modeling, mentoring and constantly addressing their challenges. The relevance of the access programme to the country as one of the higher education entry routes worth embracing is showcased in order to increase admission chances into the higher education system. Rekindling HEAC students' hope to pursue university education improves their self-image and boosts their confidence levels in their academic endeavors. Implementing the HEAC programme in a university setting exposes students to understand and relieve a university natural setting and study with ease. Career guidance sessions conducted as part of psycho social support stimulate and sustain HEAC students' interest to pursue university degrees in preferred science fields.

5.7 HEAC programme opportunities

This study has also consolidated the programme opportunities. Overall, the HEAC is an exceptional bridging programme in Uganda that is intended to give students who do not match the minimal standards for direct admission into university degree or diploma programmes an opportunity to enroll. Similarly, BU, GU and MUST, are the three universities in which the programme is implemented in partnership. Thus, the HEAC programme can now reach a wider audience because of such partnerships. Additionally, it seeks to close the knowledge gap for students who are uncertain about their university readiness or who do not possess the presumptive knowledge needed for professional courses. Candidates can enroll in particular degree and diploma programmes in the university and post secondary education system upon successful completion of the HEAC. Moreover, the programme is designed to cater for a number of different groups of learners, such as holders of the UACE who have completed and obtained at least two subsidiary passes, vocational students, international students who possess qualifications comparable to the UACE, and international students who possess qualifications that allow them to enroll in post secondary education in their home countries.

Another opportunity of the programme is the increasing access to STEM Programmes. HEAC encourages research and innovation by providing opportunities for students who narrowly missed the cutoff points for university admission to a variety of science programs. Additionally, it facilitates underrepresented groups' entry to STEM fields. More so, Universities interested in implementing the HEAC program can receive technical assistance from FAWEU, which includes course accreditation and curriculum creation. Additionally, Professional associations, the Ministry of Education and Sports, and other institutions now recognize and acknowledge HEAC. This programme is being adopted by more Ugandan universities, which will improve access to higher education. Assignments, tests, essays, projects, and written exams are

used to evaluate the academic progress of HEAC students. Studies are being carried out to assess the effectiveness and influence of the HEAC initiative in advancing STEM education and broadening the pool of candidates for higher education. Both a qualitative and quantitative method is used in this study. The chapter outlines problems with the HEAC programme identifies challenges associated with it and suggests fixes, including improving graduates' perceived quality, increasing awareness, and offering sufficient course materials.

Finally, Goals 4 and 17 of the Sustainable Development Agenda (SDGs) are aligned with the implementation of the HEAC. These goals center on lifelong learning, inclusive and equitable quality education, and tackling inequities and inequalities in education. HEAC students receive mentoring, more clarifications, and practical experiences from universities and personnel. Universities can expand their sources of incoming students by putting the HEAC programme into practice. The overall goals of the HEAC programme are to close the achievement gap, advance STEM education, and give students access to post secondary education, with a focus on science and innovation. It also shows a dedication to raising Uganda's educational standards.

5.8 HEAC programme challenges

This study also documented the programme challenges. Some Universities have expressed concerns over the perceived quality of graduates attaining degrees through the HEAC route and were afraid that the professional bodies like the Uganda Engineers Association, Uganda Dental Practitioners and Uganda Nurses Council would not recognize qualifications of students who did not attain degrees via direct entry to the universities. This is addressed through awareness creation on HEAC. The acceptance of the HEAC programme by the Ministry of Education and Sports has also improved the programme's acceptance by professional bodies. The slow pace of the internal approval processes of the developed HEAC curriculum by the Universities' Council and Senate is addressed by soliciting buy-in from the universities' top leadership before rolling out the programme. Transition to the University degree programmes challenges met by the HEAC students are linked to lack of tuition and other related academic requirements for enrollment and completion. Lack of adequate HEAC reference materials (textbooks and lab equipment) to support the programme is ameliorated by the partner Universities being provided with basic learning materials to start the programme. There are also plans to engage the HEAC technical team, National Curriculum Development Centre and the NCHE to develop more learning materials for the HEAC program. Stigmatization of the HEAC students by some lecturers at the partner Universities, is managed through provision of psycho-social support and mentor-ship as well a continuous engagement and sensitization of the academic staff about the programme. Arising from this study, we suggest:

- i. NCHE and the HEAC technical working group in collaboration with NCDC strengthen their activities to rectify inadequate learning and provide reference materials to support the programme.
- ii. Limited knowledge about the existence of the programme in some communities in the country should be minimized through continuous sensitization and trainings.

- iii. Publicity of and by significant organizations and institutions paves way for gradual acceptance of the programme by some professional bodies.
- iv. Tuition challenges to transit to university degree programmes after completing the program could be addressed through extending government sponsorship slots to the HEAC graduates.
- v. Adherence to a standardized HEAC Curriculum across the Universities be adopted as a precaution against some universities running the programme without a standard HEAC
- vi. Strengthening staggered orientation extension programme and mentor-ship is suggested to help HEAC students overcome stigmatization issues.

5.9 Lessons learned from HEAC implementation

Implementation of HEAC does not only anchor in SDG 17 of ending poverty, protecting the planet, and addressing discrimination against MARPs but also SDG 4 of ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. Science, Technology, Engineering and Mathematics are highlighted as crucial driving forces for achieving these goals. Moreover, they are a strong-bond for advancing the industrialization sector. On the other hand, HEAC is a bridging programme in Uganda, accredited by the NCHE and designed to provide entry opportunities for students who did not meet the minimum requirements for direct entry into the University. The HEAC programme aims at bridging the knowledge gap for students who might not have sufficient cognizance required for university professional courses, increasing science profiles among scholars, and addressing disparities and inequalities in education by providing second chances to disadvantaged students. While HEAC was championed by the FAWE-U with funding from the MCF, it has been institutionalized in five Ugandan universities so far.

The programme targets students with qualifications such as Uganda Advanced Certificate of Education (UACE) holders with at least two subsidiary passes, vocational qualifications and equivalent foreign qualifications. HEAC provides open access to a diverse range of courses in partner universities and prepares students for higher education and the workforce. The programme has been recognized and accepted by professional bodies and the Ministry of Education and Sports. All those involved, in both teaching and laboratory staffs are encouraged to spare a few minutes to encourage students during some lecture/practical hours. As implementation of HEAC takes off, teachers/facilitators provision of additional explanations and individuals/groups discussions enhances students' comprehension and unlocks focused interpretation of subject content. Organized workshops directed to orient laboratory and other teachers/facilitators motivate staff and students to hold mixed and separate regular meetings, conduct effective and constructive HEAC teaching and hands-on activities.

Studies are yet to be conducted to access the HEAC products and their performance. Sketchy results though indicate that the HEAC students transitioning into university are better prepared than those who join directly from secondary schools. Interestingly, the graduates of HEAC display their zeal to maintain their worth of admission to regular degree programmes. Moreover, those universities implementing the HEAC programmes are widening their source of enrolment.

5.10 Strategies to scale up for the HEAC

FAWE-U has declared her stand to support the adoption of HEAC by all universities in Uganda in addition to expanding the programme to other countries in Africa, to develop standardized curriculum, and promoting inclusion of marginalized groups. The under-signed are some of the strategies FAWE-U envisages to scale up HEAC. First, to continue supporting adoption of HEAC by all 54 universities in the country. The immediate target has been all 12 public universities in the country. FAWE-U is also working with the private universities to support the adoption of HEAC. Currently FAWE-U is rolling out HEAC in Rwanda, an East African Community Country with a pilot at INES-Ruhengeri University. Furthermore, FAWE-U intends to support 10 MasterCard Foundation partner universities in Africa to adopt HEAC in their programmes. Another strategy is to roll out the HEAC program in eight other countries in Africa by 2030 namely: the Democratic Republic Congo-DRC, Mali, Ethiopia, Senegal, Burkina Faso, Ghana, Kenya and Nigeria. A standard curriculum is being developed that meets international standards is being developed and is to be tailored to national curriculum requirements of different countries. Lastly, strategies are being worked upon to strengthen the inclusion component of the HEAC program to encourage the enrolment of marginalized groups including more women, refugees/IDPs and youth with disabilities.

5.11 Emerging issues

First, this study indicates that the HEAC curriculum was reviewed by the National Council for Higher Education together with the FAWE-U technical working group in Uganda. Relatedly, a new draft HEAC Curriculum which bridges both Arts and Science programs was developed. Thirdly, the new draft Programme will be presented to the key stakeholders for validation. Another emerging issue is the adherence to a standardized HEAC Curriculum across the Universities adopting the programme.

6. Conclusion

Criteria for gaining access to university education has been broadened from the traditional UACE results to include HEAC for students initially without the requisite educational qualifications for direct entry to universities. The current admission requirements to higher education programmes is at least two principal passes for degree programmes and one principal pass and two subsidiaries for a diploma programme. Initially STEM subjects were being emphasized. The implementation of the HEAC coupled with support to the candidates such as EOP, role modeling, mentoring and constantly addressing candidates' challenges have provided the opportunity to prove the relevance of the access programme to the country. As one of the higher education entry routes which integrates STEM subjects, it needs to be embraced to increase opportunity for scholars into the higher education system especially those from disadvantaged backgrounds.

Authors' Contributions

Charles Tushabomwe-Kazooba conceived the study idea, participated in the study design, data collection, analysis and interpretation, and manuscript drafting and

revision. Imelda Kemeza participated in drafting data collection tools, data acquisition, analysis, and interpretation, manuscript drafting and revision. Calvin Okello supported conception of the idea, manuscript drafting and critically reviewed the manuscript. All the authors made further edits. The final manuscript was read by all authors who then gave their approval.

Disclosure

The authors have no conflict to disclose in this study.

About the authors of this chapter

Currently, Associate Professor *Charles Tushabomwe-Kazooba* is the Deputy Vice Chancellor, Finance and Administration of MUST. For over 39 years, he has been instrumental in higher education in the areas of teaching, research, consultancy, business service delivery and in fostering university education for sustainable development. He is a respected researcher, academician, grants writer of winning proposals and is a holder of a PhD in sustainability accounting. He has contributed immensely to the intellectual life of University education on top of giving service to the community. He is an experienced educator and leadership development facilitator.

Dr Imelda Kemeza is an accomplished and passionate educationist, researcher, and publisher, dedicated to advancing knowledge and transforming education. With over two decades of experience, Imelda is a visionary educationist who has made a profound impact on the sector. Her career focuses on improving learning outcomes and promoting inclusive education through innovative teaching methods and curriculum development. As a prolific researcher, her groundbreaking studies on pedagogy, educational technology, and student engagement have influenced global education policies and practices. Additionally, her work is widely recognized in prestigious journals and international conferences, inspiring educators, researchers, academicians and learners alike.

Calvin Okello is the Coordinator of HEAC at FAWE-U. He has over 10 years' experience of championing delivery of high-quality services to beneficiaries and takes the lead in planning, budgeting, and implementing the program. He also provides technical support, manages and builds networks, prepares reports, establishes communication and reporting structures, supervises staff, identifies training needs, organizes meetings with stakeholders, provides technical support for advocacy strategies, assists in developing communication strategies, collects and documents success stories and information, and ensures safety of assets. Calvin Okello plays a crucial role in ensuring the success of HEAC.

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References

- [1] United Nations. 17 Sustainable Development Goals. 2015. Available from: <https://sdgs.un.org/goals> [Accessed: October 20, 2023]
- [2] Emas R. Brief for GSDR 2015 the Concept of Sustainable Development: Definition and Defining Principles. Florida International University; 2015. Available from: https://sustainabledevelopment.un.org/content/documents/5839GSDR%202015_SD_concept_definiton_rev.pdf. [Accessed: August 13, 2023]
- [3] The Republic of Uganda. The Uganda Vision 2040. (n.d). Available from: <http://www.npa.go.ug/wp-content/uploads/2021/02/VISION-2040.pdf>. [Accessed: August 04, 2023]
- [4] Hill C, Corbett C, St. Rose A. Why So Few? Women in Science, Technology, Engineering, and Mathematics. Washington, DC: American Association of University Women; 2010
- [5] Hill C, Corbett C. Graduating to a Pay Gap: The Earnings of Women and Men One Year after College Graduation. Washington DC: American Association of University Women; 2012
- [6] Diekman AB, Steinberg M. Navigating social roles in pursuit of important goals: A communal goal congruity account of STEM pursuits. *Social and Personality Psychology Compass*. 2013;7(7):487-501. DOI: 10.1111/spc3.12042
- [7] Alam A, Tapia IS. Mapping Gender Equality in STEM from School to Work. 2020. Available from: <https://www.unicef.org/globalinsight/media/1361/file> [Accessed: July 27, 2023]
- [8] Makarova E, Aeschlimann B, Herzog W. The gender gap in STEM fields: The impact of the gender stereotype of math and science on secondary students' career aspirations. *Frontiers in Education*. 2019;4:60. DOI: 10.3389/feduc.2019.00060
- [9] United Nations. Transforming Our World: The 2023 Agenda for Sustainable Development A/RES/70/1. (n.d). Available from: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>. [Accessed: October 19, 2023]
- [10] Allchin D. Problem-and case-based learning in science: An introduction to distinctions, values, and outcomes. *CBE—Life Sciences Education*. 2013;12(3):364-372
- [11] NCHE. Minimum Standards for Higher Education Certificate Programme in Uganda. Kampala City, Uganda; 2020. Available from: <http://www.unche.or.ug>
- [12] Berg BL. Qualitative Research Methods for the Social Sciences. 4th ed. Long Beach, CA: Allyn and Bacon, California State University; 1989
- [13] Ochieng NT, Wilson K, Derrick CJ, Mukherjee N. The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution*. 2018;9:20-32. DOI: 10.1111/2041-210X.12860
- [14] Tümen-Akyıldız S, Ahmed KH. An overview of qualitative research and focus group discussion. *Journal of Academic Research in Education*. 2021;7(1):1-15. DOI: 10.17985/ijare.866762
- [15] Eungoo K, Hee-Joong H. The importance of anonymity and confidentiality for conducting survey research. *Journal of Research and Publication Ethics*. 2023;4(1):1-7