Open Science for Universities based on UNESCO Recommendations

Open Science in Uganda

Presentation at UVCF Conference at ISBAT University, Kampala

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7th October 2022

Structure of the Presentation

01 Overview and Introduction

02 OA in University Education in Uganda

03 **Implications/Benefits and opportunities**

04 **What is needed?**

Overview & Introduction: What is Higher Education?

Types of —Public & Private

In Uganda postsecondary or higher education refers to **education that is post-"A" level**. Only students who have successfully completed "A" levels and passed their Uganda Advanced Certificate of Education are eligible to enter postsecondary institutions of higher education.

State of HE in Uganda per NCHE Statistics

- 54 Universities,
- 17 other degree awarding Institutions in Uganda
- 175 Other Tertiary Institutions in Uganda; some closed

Overview and Introd: General impact/observations of COVID 19 on HEIs (NCHE)

- HEIs failed to conclude their study programmes within the year or even graduate students
- Covid 19 proved that HEIs depend on tuition fees alone (unsustainable). budgets NOT MET
- Eligible population to study in HEIs grew 3.1% but overall enrolment declined by 3.8%.
- Overall, the total enrolment declined from 275,254 in 2018/19 to 264,908 in 2019/20 representing total decline of 3.8%.
- Growth Enrolment Ratio (GER) average of 6.8% over the last five years reduced to 5.3% in 2019/20.
- NCHE reports inadequacy of equipment, laboratories and qualified academic staff
- The Universities and Other Degree Awarding Institutions (ODAIs) were quick to adjust and implemented the emergency ODeL guidelines.
- The Other Tertiary Institutions (OTIs) however, could not support emergency ODeL due to lacked infrastructure and required skills.

Overview and Introduction

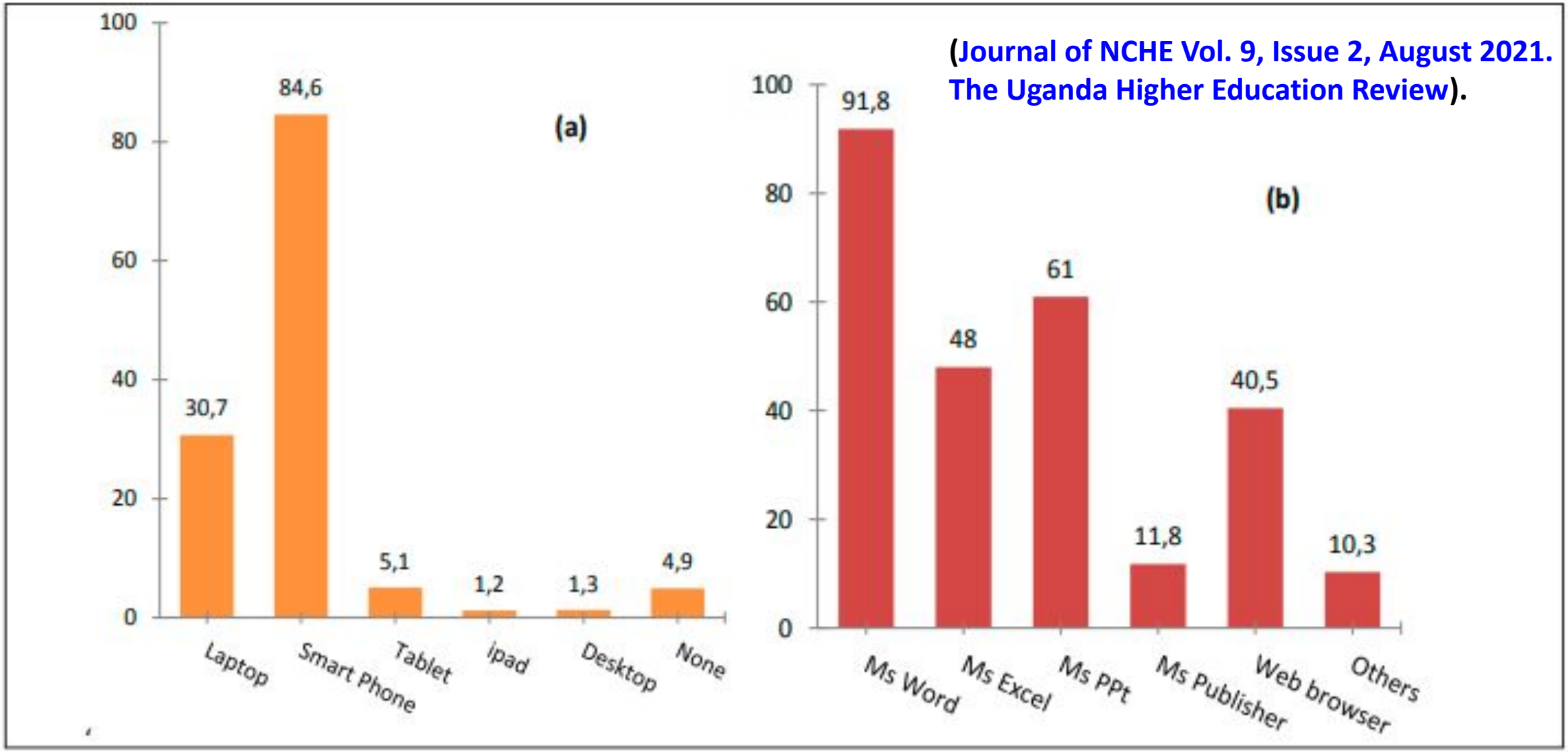
- Education is becoming highly technology-aided today and the trend is not reversing. The open access of information, education, etc is unstoppable

- **Online education and Competence-based curricula will be real thing**. significant shift in learning - incorporate virtual reality and multiple perspectives (Paradigm shift).
- By 2040 (**Vision Uganda 2040**), world learners **may no longer need** physical schools and 4-walled classrooms to get education. Homes, common rooms, compounds or dedicated community spaces, offices will do.

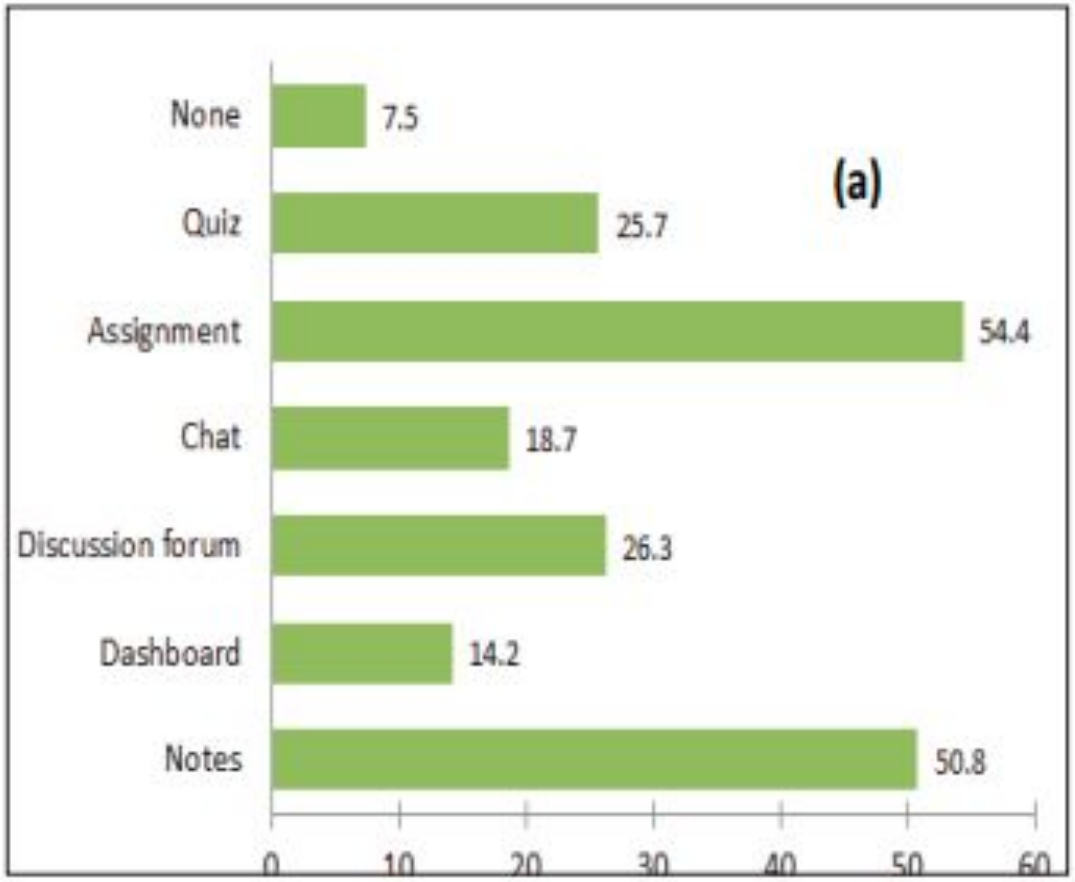
EAC/DEMO	UG	KE	TZ	RW	BU	SS	DRC
TOT POP	46,205,893	55,864,655	63,852,892	13,173,730	12,696,478	11,544,905	108,407,721
PGR (%)	**3.27**	2.12	2.78	1.74	**3.63**	**4.91**	3.14
LE (YRS)	**68.96**	**69.69**	**70.19**	65.85	67.42	59.16	61.83
TLA	241,038	580,367	947,300	26,338	27,830	644,329	2,344,858
TFR/UER	**5.36/ 15.6**	3.29/12.9	4.39/3.9	3.33/ 20.5	5.03/2.9	5.32/38.6	5.63/8.7
INTERNET%	20	28	22	27	9	7	14
m/PHONE/100	57.37	114			56		46

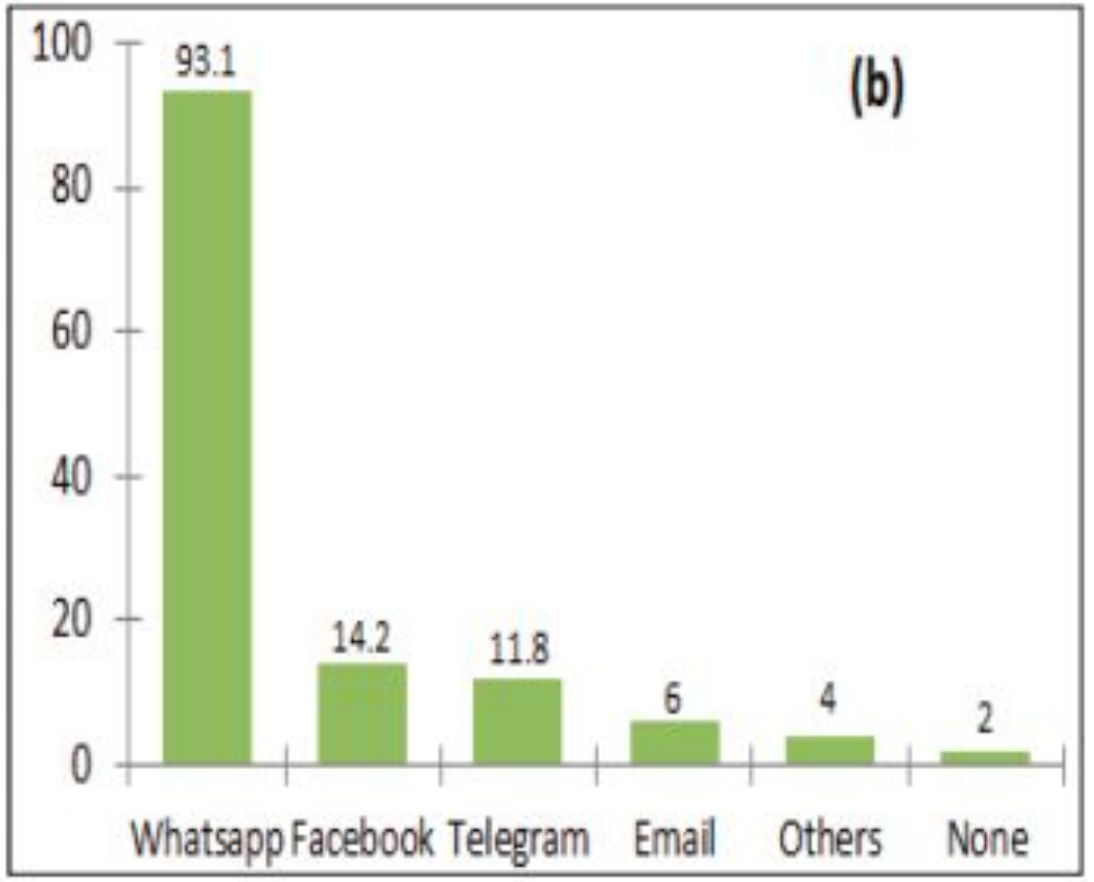
Demographic Comparisons of Uganda within EAC; over 70% youths under 30yrs. Land size Ug is 2.4 KE, 3.9 TZ; Internet users %=**4/7**

(Journal of NCHE Vol. 9, Issue 2, August 2021. The Uganda Higher Education Review).



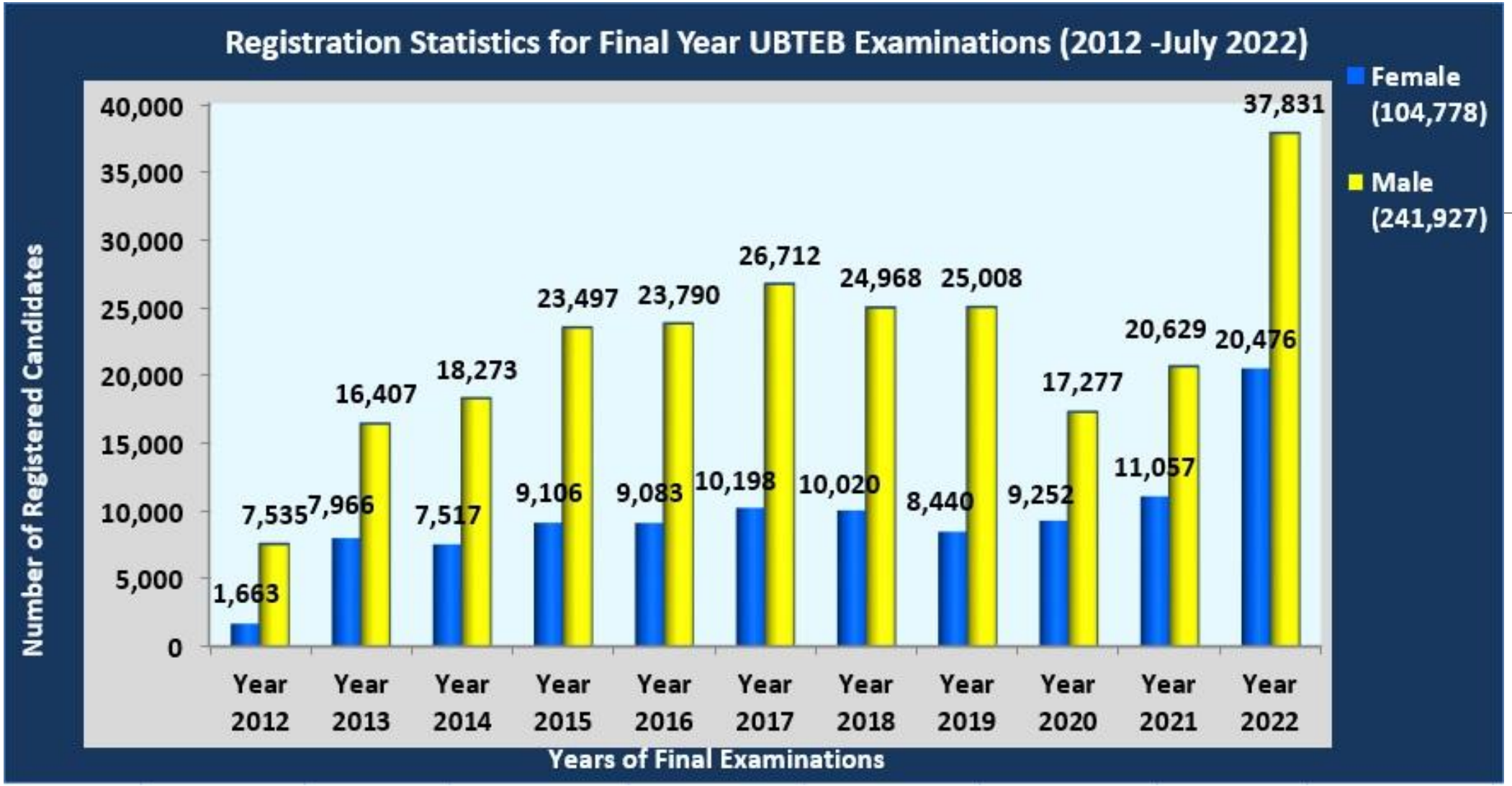
a): Percentage of students who owned different ICT tools; (b) Percentage students with knowledge of different basic computer applications

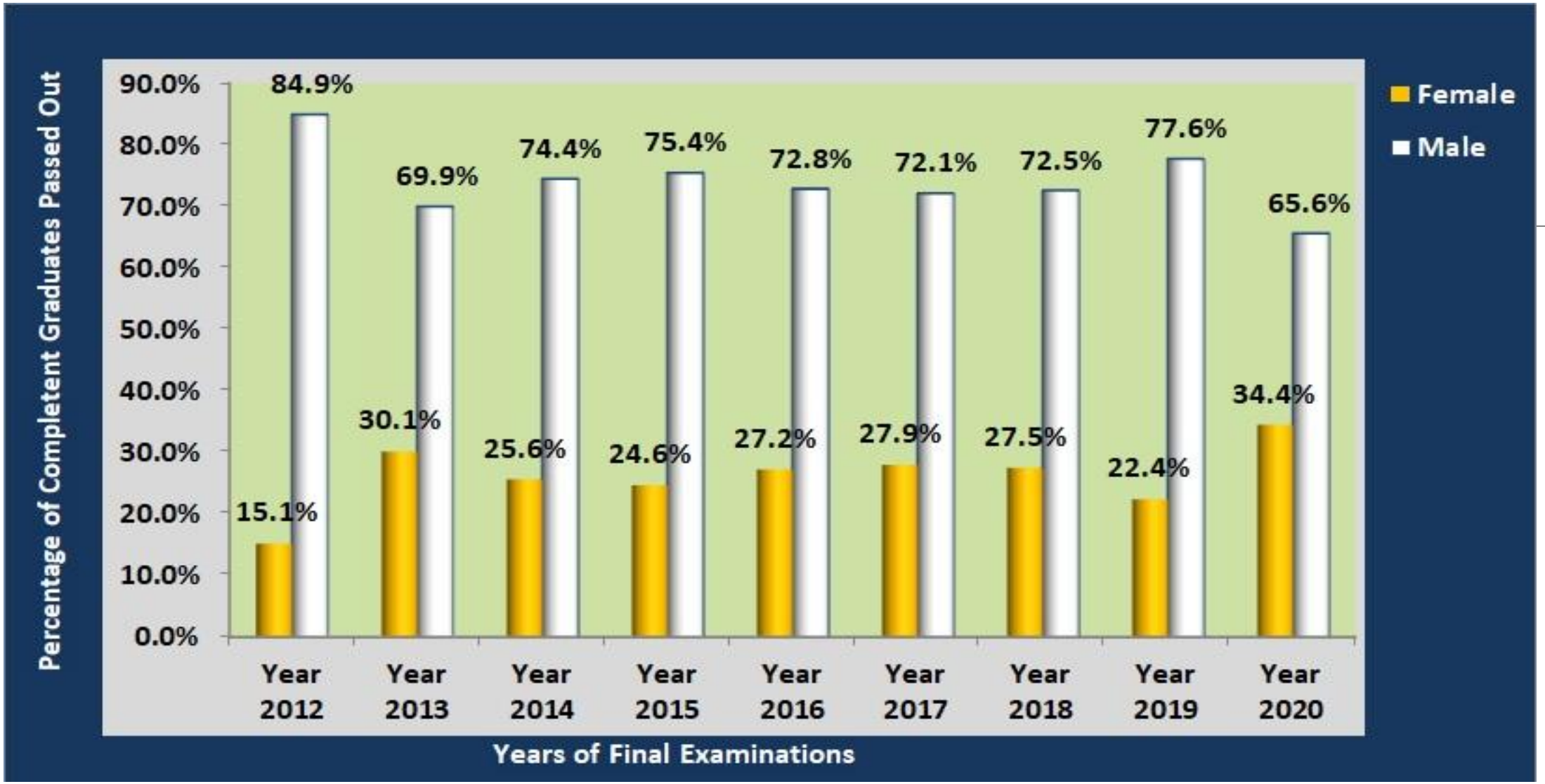




Percentage of students who (a) have used various LMS features and (b) are using different online media platforms (Journal of NCHE Vol. 9, Issue 2, August 2021. The Uganda Higher Education Review).

Learners (85.7%) were willing to study online and (14.3%) not willing.


Registration Statistics for Final Year UBTEB Examinations (2012 -July 2022)
Female (104,778)
Male (241,927)
Number of Registered Candidates
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1,663
7,535
7,966
16,407
7,517
18,273
9,106
23,497
9,083
23,790
10,198
26,712
10,020
24,968
8,440
25,008
9,252
17,277
11,057
20,629
20,476
37,831
Year 2012
Year 2013
Year 2014
Year 2015
Year 2016
Year 2017
Year 2018
Year 2019
Year 2020
Year 2021
Year 2022
Years of Final Examinations



UBTEB COMPLETION RATES DROP OUT RATES OF FEMALES ARE HIGHER THAN MALES

Open science?

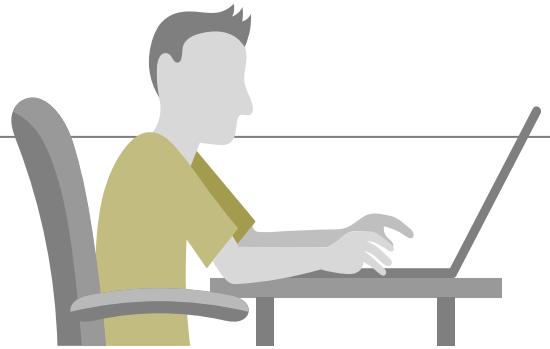
Open Science Access (OA); refers to online availability of scholarly information to everyone, free of most licensing and copyright barriers- for the benefit of global knowledge flow, innovation and socio-economic development (UNESCO 2021) .

- 10/17 SDGs 2030 require constant scientific input.
- SDGs must be achieved globally-remove restrictions.
- Disseminate research outputs to all.
- UNESCO Advocates for the fundamental role for OA for SDGs.

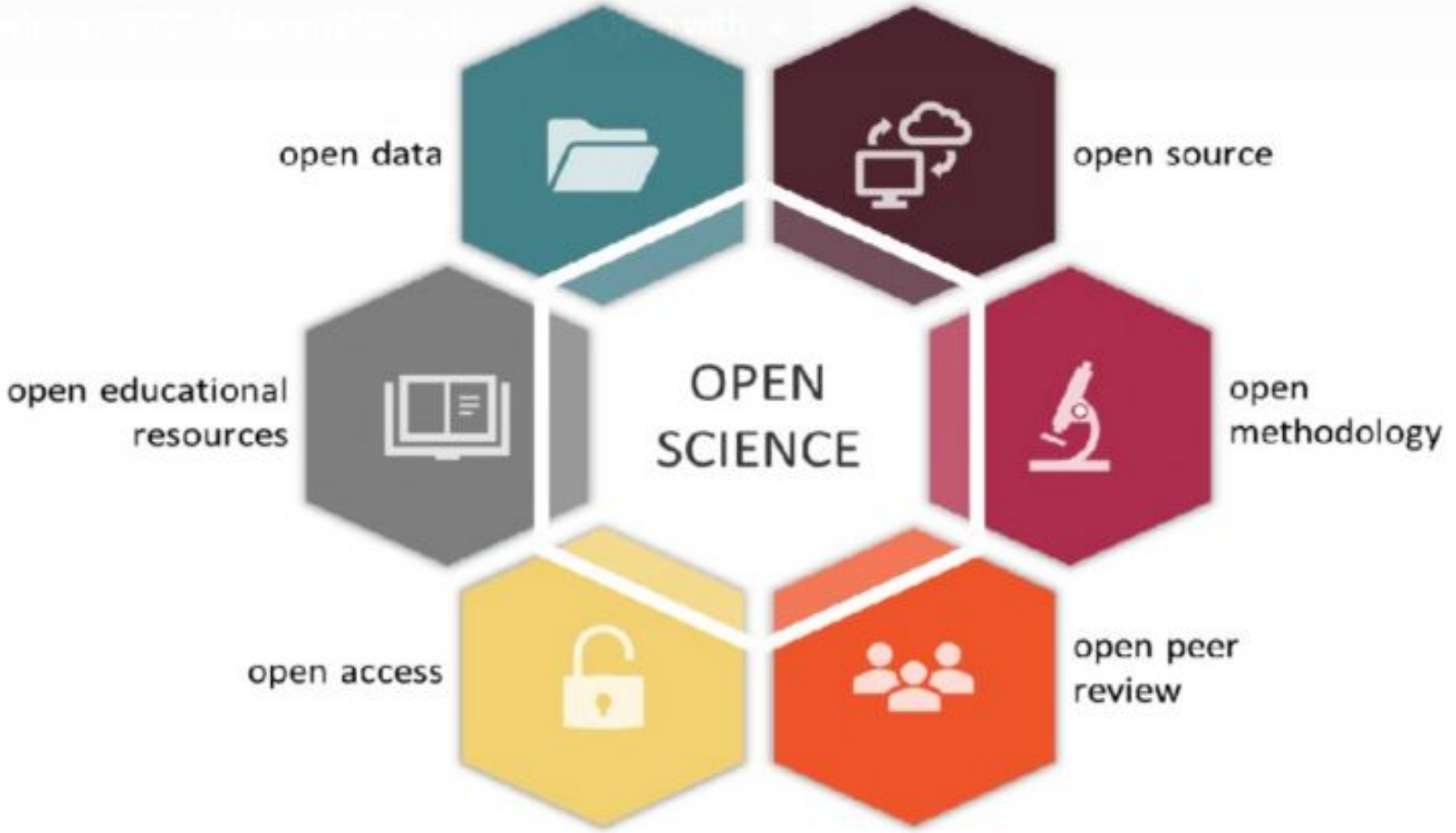
1. Strategy on the open access to Scientific information and Research. 36th Session of the Gen. Conf.
2. UNESCO Recommendations on Open Science; Paris France, 9-24th November 202141st Session (remove existing inequalities in STI in Africa (LDCs,LLDCs, SIDS). Gender equality, COVID 19 health crisis, leaving no one behind to OA, Science a common good, etc)

As science is evolving, research practices, resources & tools opening up & going beyond a publication-based model, to a new open environment of research data, libraries, key stakeholders ought to transition to Open Science (David Bukenya, 2021)

Open Science



- Uganda: According to UCC, Uganda has 63.9% mobile penetration and the National Information Technology Survey found that at an individual level 70.9% individuals owned a mobile device, only 16 % owned a smartphone that can be used for e-learning.
- Guides: NDPIII, Uganda Vision 2040, SDGs, Africa Agenda, IUCEA, WB, MCF, MOES, MOH)
- NCHE Emergency ODEL 2020 Universities are teaching online but not all
- Multiskilling of learners and multitasking
- **Agriculture vs Population for Africa** is the thing-food! food!
- ICT and Technology Transfer (**Vehicle to use**)



Source: *The six core principles of Open Science which guide the Open Traits Network*

Power of Science

Science is the engine of prosperity. The cars and trains that got us here today, our smart phones, the energy that lights this chamber, the clothes we wear, the food we eat: All of these were developed and improved through research and science.

We need Science, more and better science, not for its technology, not for leisure, not even for health or longevity, but for the hope of wisdom which our kind of culture must acquire for its survival – Lewis Thomas

Science can fuel/fire our imagination! Science is humankind's greatest enterprise

Adopted from UNESCO Ms. Shamila Nair-Bedouelle, Assistant Director General for Natural Sciences, UNESCO , 28TH April 2022

Open Science for the People, Planet & Prosperity

Open Science has the potential of increasing the quality of science and making the entire scientific process more transparent, collaborative and inclusive.

Open Science is increasingly recognized as a critical accelerator for the implementation of the Sustainable Development Goals.

By making science more connected to societal needs and by promoting equal opportunities for all (scientists, policy-makers and citizens), Open Science can be a true game-changer in bridging the science, technology and innovation gaps between and within countries and fulfilling the human right to science.

Key Pillars of Open Science

Open Scientific Knowledge: scientific publications, research data, software, source code and hardware available in the public domain or under the copyright that has been released under an open license

Open Science infrastructures: scientific equipment or sets of instruments, knowledge-based resources such as collections, repositories, archives and scientific data, open computational and digital infrastructures, needed to support Open Science and serve the needs of different communities

Open engagement of societal actors: citizen and participatory science and other extended collaboration between scientists and societal actors beyond the scientific community, opening up practices and tools that are part of the research cycle and by making the scientific process more inclusive and accessible to the broader inquiring society

Open dialogue with other knowledge systems: recognition of complementarities between diverse epistemologies, including indigenous knowledge systems

Update from 41st General Conference of UNESCO

- At the 41st session of the General Conference of UNESCO (November 2021) 193 Member States unanimously adopted the UNESCO Recommendation on Open Science
- Developed through a regionally balanced, multistakeholder, inclusive and transparent consultation process, this landmark international agreement defines shared values and principles for open science and identifies measures to make science more accessible, the scientific process more inclusive and the outputs of science more readily available and relevant for society
- The assistance, support and promotion by the FOs in developing and leading to the successful adoption of the Recommendation is well acknowledged and appreciated

Structured Categories: key objectives (Key areas of action)

1. Promoting a common understanding of Open Science.
2. Developing an enabling policy environment for Open Science.
3. Investing in Open Science infrastructures, services and capacity building for Open Science.
4. Invest in training, education, digital literacy, capacity building, to SH, researchers.
5. Transforming scientific culture and aligning incentives for Open Science.
6. Promoting innovative approaches for Open Science at different stages of the scientific process.
7. Promoting international cooperation on Open Science.

Why OEA?

- **Faster Adaptability**: OE & OA, children adapt to technology, flexible & machine learning at a much younger age.

- **Inclusiveness**: marginalized communities, racially-discriminated groups, gender, etc.
- **Freedom to choose:** Power to choose, pursue multiple subjects, do courses of passion.
- **Reduction of cost**: Going abroad not necessary.
- **Stress on Skill Development**: Focus on developing skills, students focused, easy and efficient goal setting without pressure.
- **No Entry and Exit Barriers**: A free entry and exit system, no compulsion on choosing a specific course, valuable courses and degrees, free of cost.
- **Vision**: The UNESCO in the Universal Declaration on Democracy in 1997 easy for "Flexible life-wide learning," and lifelong learning, key to globalization and personal growth.

Crosscutting Issues and PARADIGM SHIFT

1. Gender issues need urgent handling vs 4IR (Vulnerable persons (women, girl-child, rural youths, refugees, disabled persons empowerment. **Gender divide)**

2. ICT- ODeL be made compulsory for HEIs to advance and lecturers to be retooled and break stereotypes and stigma
3. Access to ICT infrastructure- Need for Ministry of ICT, MOES, Dialogue.
4. HEIs financing – mainly fees in Uganda need to rethink. Endowment fund.
5. Academic websites need for Zero Rating
6. Smart boards, computers & smart Phones new exercise and pencil/pen.
7. University rankings are based on **open education access**.
8. Institutional Repositories (National shared goods).

Target audience and partners for OA in Uganda

OA targeted audience is the government and scientific community from academia and industry, policymakers and funders, industry, civil society organisations and the education community; **Development partners for meaningful MOUs**.

Key players:

- Ministry of Science and Technology and Ministry of Education (MOSTI)
- Uganda National Council of Science and Technology (UNCST)
- Research and Education Network for Uganda (RENU)
- Universities (NCHE, MOUs)
- Research institutions – RUFORUM, NARO, etc
- National Information Technology Authority (NITA, ICT, UCC)
- Libraries: LIBSENSE, EIFL, Consortium of Uganda University Libraries (CUUL)

Key activities for OA in Uganda

1. Promotional Activities
2. Stakeholder meetings and engagement
3. Symposium/conferences at national level
4. Talks in Universities and faculty mainly, virtual groups created
5. Policy formulation and/or modification (open data, intellectual
6. property). Policy activities-Lead MOSTI, etc.
7. Creation of online Open Science courses; practice hubs, Identification and Creation of key infrastructure, Hardware and software plan.

Develop recommendations for Open Science practice in Uganda (Today in UVCF)

Practical Ways of doing this in Uganda!

1. **The Ashesi** , Ghana, Education collaborative, **Cavendish Univin Uganda** is the leader. Focus: "Accelerating Entrepreneurship and Graduate Employability for the Regional Development."

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2. The National Museums, Igongo Museums collaborations with the Swiss Organisations for Conserving our Medicinal heritage (**Profiling, production, use and database-China utility model needed**). Covidex, Vaccines, etc.
3. MasterCard Foundation Tripartite MOUs and MOUs we signed in Benin and MOSTI, need activation and funding.
4. **RUFORUM** opening space for further studies to build capacity for universities in Uganda is excellent
5. **Forum for Women Vice Chancellors** (Prof. Mary Okwakol, mentorship of next line-up leaders). Need for affirmative action in Uganda Government, MOES.
6. **Trinity Western University Canada (TWU)** and BSU collaborations and the FAR Centre experience.
7. **Mak RIF projects** to Makerere University is creating impact. Let the Universities access more (public and private). Also **PRESIDE MOSTI**
8. **Exhibitions**, **Incubation hubs, innovations centre, research agendas**,
9. **NCHE Open Exhibitions targeting OA** and community outreaches become **Regional**

Benefits/opportunities of Open Science to Uganda

1. **Increase of scientists pay presidential pronouncement**. More students will aspire to do science based courses.
2. **Creation of MOSTI under presidents office**, key in pushing for resources and policy regimes.
3. **Lower secondary curriculum** review towards skills based and science oriented curriculum. Competence based curriculum.
4. ***UBTEB CBA, CBC, Competence based Assessment-Bring UBTEB on board-*** *Modularized. Students can join world of work with one module* and certificate is being awarded. CBT, REAL LIFE assessment & curriculum.
5. **Universities we need to modularize our curriculum. Students after semester one or TWO semesters are given certificates of competence?????**.
6. **Mandatory internship in the industry for 1 full year like Ghana**. Human power (manpower) gaps will be eliminated, skills will be enhanced, jobs will be created.
7. **Entrepreneurship across all courses for all students in TVET**, Colleges and Universities and ODAIs, OTIs –lifelong learning.

Benefits/opportunities of Open Science to Uganda..ctd

1. **Gender inclusion. More girls are going into ICT vs Computer Science** which is a good thing- narrowing the sciences gap by gender (MRU, Mak. BSU, etc.)
2. **Hackathon Pitching skills and ICT products Development**-Tabitha case; St. Francis chapel presentations, games and digital use in Church MDD case, some churches, **screens all over and one preacher** all over the country and beyond. Why note one Professor/Lecturer 5 universities!
3. Use ICT and digital tools to share scarce resources (sharing lecturers through MOUs, **Who should be the leader in this-private sector more vulnerable now?**
4. **Niches of Institutions be clearly defined** and supported. **SMACK Agric. S2**, class.
5. Let's benchmark and get the best out of this!
6. **General Science courses be developed for all students in any discipline for the entire country (National Level)**. (intregration of knowledge-, agro-processing, value addition, innovation, pitching, bio-chemical and physical concepts, laws and policies, regional intrgration, treaties integrated with ICT designs and modelling).
7. **Retooling Lecturers**! Develop and Implement **HE certificate/diploma for Teaching Staff**.

PONDER ON THIS! WHAT DIRECTION?

1. Produce and USE IPR and patenting regimes need to be functional and working for our IK and Innovations.
2. RENU - RNE cost need to reduce considerably.
3. Climate Change controls and mitigation (**shared space**)
4. Where is the place for **Basic Research**?
5. Online jobs and jobs restructuring-

6. **Entrepreneurship in HEIs will increase????**

7. **Primary Teachers degree holders?**
8. **What about technical education?** Fit For Purpose- **FFP Model WB-UBTEB**
9. **Technology! Robotics, AI, IoT, open world, shall we be spared!**

LSC. Teaching practical on poultry and vaccinations and treatments done practically by students of S.2.

Redefined duty of Teacher/Educators

- **“knowledge-givers”, gradual to “facilitators or mentors” in the realm of pedagogy. (teach life skills)**

- Teacher a motivator, coach, curriculum designer and mentor. Content organizer!

- In all these God still has a place in shaping mankind path and the World!

Natural products developed at Ethnobiology laboratory

NDP3 Industrialization. Education 4.0 Vs 5.0 [TE, RE, CE, INN, IND]

Commercial Essential Distiller and gardens

Out grower-Farmers gardens

Challenges faced by local innovations in Uganda

- Lack of appropriate infrastructure and facilities:
- Intellectual property Issues:
- Data ownership:
- Poor ICT Technology and network infrastructure:
- Power shortages and frequent road shading.
- Economic:
- Political instability:
- Public-private partnerships:

Natural products development at Ethnobiology laboratory, BSU

The products range from **cough syrup, Herbal jelly, pure essential oils, floral water, liquid detergents** and more. Supporting grants include;

1. The world bank funded NARO-CGS (**ZCGS/4/144/16**),
2. SGCI/UNCST grant (**UNCST/SGCI-II/2021/004**) **BSU REC ACCREDITED**
3. MAK-RIF grant (award reference number **MAKRIF/DVCFA/026/20 and MAK/DVCFA/151/202)**
4. PHARMBIOTRAC accelerator grants(**PH/2019/SG/02**) on addition to
5. In-house staff development grants **(2015-2018)**.

The project sustainability is guaranteed by a professional team, 10 acre mother garden and a fast –growing out growers` scheme.

European Commission - Digital Agenda defines 5 policy actions

1. Fostering and **creating incentives for Open Science**, by fostering Open Science in education programs, promoting best practices
2. Removing barriers to Open Science: a review of researchers' careers so as to create incentives and rewards
3. Mainstreaming and further promoting open access policies with regard to both research data and research publications;
4. Developing research infrastructures for Open Science, to improve data hosting, access and governance,
5. Embedding Open Science in society as a socio-economic driver

Recommendations to The world Academy of sciences (TWAS) and African Academy of sciences (AAS)

1. Create incubation centers and startups in universities to allow staff and students to innovate and develop products.
2. Funding for research and networking
3. Community Engagement, Innovations, Industry branding
4. Create more centers of excellence
5. Promote academic staff on innovations not academic papers only.
6. Teach ethics, Integrity, honesty, royalty

Thank you for listening

Thank you UVCF for the opportunity to share, Audience for listening, Ladies and Gentlemen

Bishop Stuart University, Our God Reigns

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