



Uganda Teacher Rising project – Annual Report 2022 -2023

Teacher mentorship to improve STEAMie and learner outcomes in all subjects.

Aims

- **To improve the quality of teaching in participating schools**
- **Maximise learners’ progress.**
- **To improve learners’ and teachers’ ICT skills.**
- **To develop STEAMie project-based learning and income generation.**

Abbreviations

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| AET | Africa Educational Trust |
| CCT | Curriculum Coordination Tutors – ministry of education. |
| EDI | Explicit Direct Instruction |
| LP | Lead practitioner |
| NTP | National Teacher Policy |
| PTC | Primary Teacher College |
| STEAMie | Science, Technology, Engineering, Arts, Maths, and innovation with enterprise |
| TPD | Teacher professional development. |
| US-ACF | US Africa Children’s Fellowship |
| UTR | Uganda Teacher Rising |

Brief

Improving learner education and increasing opportunities for employment, entrepreneurship, and higher education for school students in Northern Uganda is essential to enable young people to drive social economic development. The Uganda Teacher Rising (UTR) project and its predecessor AET’s STEAMie training focus on school-based teacher professional development in STEM as well as general pedagogical development within a strong continuous teacher mentorship framework. STEAMie education is supported by a project-based approach resulting in genuine business and revenue raising outcomes for learners and schools. Quality STEM learning begins with quality pedagogy in our primary and secondary schools. The UTR project has now extended to incorporate teachers of all subjects in a competency-based approach to meet the demands of the new curriculum pedagogical delivery. Indicators conclude that a schools-based strong mentorship approach delivers significant improvement in teaching and learning outcomes. Our mentorship methodology now also incorporates primary schools. To scale up, UTR mentors, lead practitioners, will collaborate with CCTs from the local primary teacher training college, exchange best practices, and develop partnership working practises.

Introduction

Education for all (EFA) cannot be achieved without improving quality' (GMR2005, P17). The first five EFA goals are least achieved in countries where goal 6, quality of education, is lagging. The EFA definition of quality incorporates cognitive development including literacy and numeracy as well as life skills development.

Better education contributes to higher lifetime earnings and more robust national economic growth, and helps individuals make more informed choices about fertility and other matters important to their welfare (GMR2005, P17).

Many commonly used teaching styles do not serve children well: they are often too rigid and rely heavily on rote learning, placing students in a passive role. Many educational researchers advocate structured teaching – a combination of direct instruction, guided practice, and independent learning – in a child-friendly environment (GMR2005, P17).

From the moment they are born, children begin to explore and differentiate their surroundings. Young children are actually STEM researchers who want to explore and invent (Scientix 2022). Quality learning in primary education is essential for sustained learner development and engagement through to successful end of secondary school outcomes and beyond. Teachers must use questioning strategies to challenge students to think using higher cognitive processes so they will think deeply about concepts and ideas in order to solve STEM challenges (Bruce-Davis et al. [2014](#) cited in Kelly C. Margot and Todd Kettler 2019)

Background

From 2018-2020 AET provided schools based professional development to 8 Ugandan secondary schools in Ouke and Oyam districts initially followed by a project extension to 5 secondary schools in Dokolo and Kole Districts, with a focus on STEAMie pedagogy. Best trained teachers, lead practitioners, from the initial project schools were used to facilitate onward training and mentoring of teachers in the new project schools. This has enabled local expertise development and sustained rapid sharing at low-cost. LPs continue to receive mentoring in their new roles as trainers and teacher mentors.

At the end of the project life, an evaluation was commissioned to assess the performance of the project against key parameters/targets to present relevant information pertaining to project performance and generate recommendations that will be shared with key stakeholders of the project and used to inform future programming of similar or related projects.

Key indicator performance summaries are presented below.

- 71% of S4 students passed STEAMie subjects in 2019 with a credit or pass.
- 51% of the learners passed the science tests whereas 21% (27) passed the mathematics test.
- 56% of the learners were interested in pursuing STEAMie related careers.
- 81% of the learners from the enterprise groups earn money towards their saving plans.
- 96% of the STEAMie teachers use learner centred methods for instruction and promoting practical learning opportunities.
- 60% of teachers reported using appropriate learning aids for instruction.
- 64% of the teachers reported to have involved girls and boys equally in class.
- 52% of the teachers reported using technology to plan for and / or teach STEAMie lessons.

Following the Covid two-year schools lock-down in Uganda, AET could no longer fund ongoing training and expansion to new schools. The Education Stream Foundation, the founder of which created the UTR lead practitioner mentorship TPD methodology, with support from US-ACF and Brunel University, London is continuing the initiative with further expansion into primary schools.

Methods and rationale

Selected teachers from partner schools are initially exposed to a variety of key pedagogical concepts and implementation strategies during a one-day workshop, delivered by local senior LPs. These strategies are modelled through activities and tasks so that the teachers can replicate the methodologies in their own classrooms. The core elements of the pedagogy is shown below.



UTR Pedagogy 21st Century Learning



- **Collaborative learning** - pairs, groups, planning, questioning, assessing.
- **Accelerated learning** –review, recall, reflect, feedback, knowledge schema, .
- **Thinking for learning** – metacognition, critical thinking, bloom's taxonomy.
- **Assessment for learning** - self, peer and teacher timely feedback.
- **Differentiation** – targeted challenge, inclusion.
- **Girls Education** – leadership opportunities , maximise progress.
- **STEM** – project based, STEAMie cycle: planning, making, marketing, sell.
- **Effective teacher behaviour** - circulate, Listen, feedback, facilitate.
- **Effective learner behaviour** – keen, pace, collaborative, independence.
- **ICT for learning** - communicative media, varied devices, calculate, code

Teachers are followed up with regular mentorship cycles of lesson observations and quality feedback by our team of senior lead practitioners. Our continuous schools-based approach peer teacher planning and peer observation leads to steady teacher improvement. To demonstrate progress teachers complete action research and a reflective evidence-based portfolio over a one-year period. Our online google learning observation tool tracks and analyses project specific teacher progress criteria. It promotes and monitors gender progress and promotion of STEAMie learning. Using these mechanisms alongside with evidence based data from lesson observation tools, surveys and appraisals, teachers can attain level 1 certification. Level 2 can then be achieved through mentoring and onboarding new teachers to attain level 1 skills and certification. Our senior level 3 lead practitioners monitor and support all stages of development. See picture 1 below:

UTR - Teacher Professional Development

1. Four tier certification- The Lead Practitioner (LP) programme
2. The development of teachers through continuous observation, feedback & mentoring.
3. STEAMie pedagogy support.



Picture 1 –levelled and certified teacher professional development.

Lead Practitioner Certification standards:

Level 1: New teacher training - Complete initial training, effective practice of UTR pedagogy and *complete portfolio*. Acquiring Lead practitioner (LP) status upon successful completion.

Level 2: Lead practitioner training (LP) - Coaching and mentoring new teachers in UTR pedagogy to attain level 1 standard and thus LP status.

Level 3: Senior lead practitioner training - *Mentoring* new LPs to attain level 2 standard. Support planning and implementation of whole school training.

Level 4: Specialist leader in education - Developing LP training model and supporting STEM pedagogical training development across *multiple schools and districts*.

Pedagogical emphasis is placed on learner centred methods in teaching and assessment. Rapid learning pace and progress for all learners is stressed with differentiated metacognitive tasks and activities in line with blooms taxonomy. In lessons teachers need to model concepts clearly, check for learning with a three-step live feedback process. Peer learning and assessment is also emphasised to enable teachers to successfully engage and assess every student's progress in often large Ugandan classes. Rosenshine's Principle of instruction and EDI features heavily into this pedagogy. Applying cognitive load theory to STEM education requires teachers to provide knowledge and learning activities in manageable chunks. For efficient learning to occur, learning systems should consider the limitations of working memory, especially as it relates to prior knowledge (D Bounajim 2021)



Picture 2 – Lesson observation followed by quality feedback.



Picture 3 – Live 3-step teacher feedback and peer feedback/learning.

In UTR STEAMie is incorporated as project-based learning. STEM pedagogy is trans-disciplinary, offering students the ability to use project based learning to address real-world problems (Molly Ring, 2019, p13) . Students often don't see the relevance of some of subjects they are taught. Consequently, they often lose interest, underperform, or even drop out of education. The allurement of earning an immediate income for their families instead of formal education can then be compelling.

There appears to be no real idea of STEM as a subject or disciplinary area (Tikly, L. Joubert, M. Mbogo , A. Bainton, D, Cameron, L & Doyle, H, 2018, P8). UTR's STEAMie multi-disciplinary projects-based learning have an end goal of a real business enterprise and earnings opportunity for the learners. This is extremely motivational for teachers and learners. Before production and sales, to earn a profit for themselves or their schools' learners must go through a business planning process engaging with business and marketing tools and business mathematics learning. They must also learn the science of their product, use science and engineering skills to make the product. Marketing the product will require art design and literacy skills.

In short, a true STEAM entrepreneur will use and need all skills immediately. As an example, making soaps is very profitable, and involves learning significant chemistry plus many opportunities for maths and other subject and enterprise learning mentioned above. Making cakes, fixing computers represent other such options for STEAMie learning. Coding and other forms of ICT development have also been tried but don't lead to immediate revenue generation but can and will do in the near future. These projects are very low cost with good profit and very good learning outcomes. Liquid soap, clay pots, straw mats, slippers using recycled car tyres are examples of products made and sold locally.

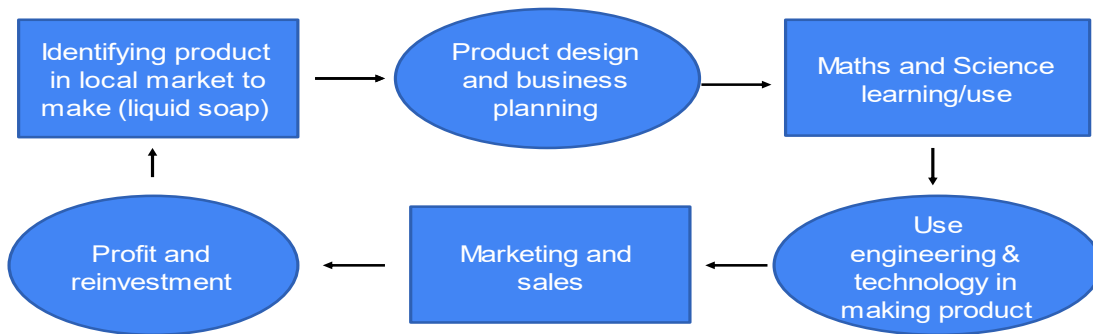


Picture 4 – Liquid soap production in Iguili girls secondary school in Dokolo, Uganda.



Picture 5 – Making grass mats and clay pots in a primary school in Dokolo, Uganda.

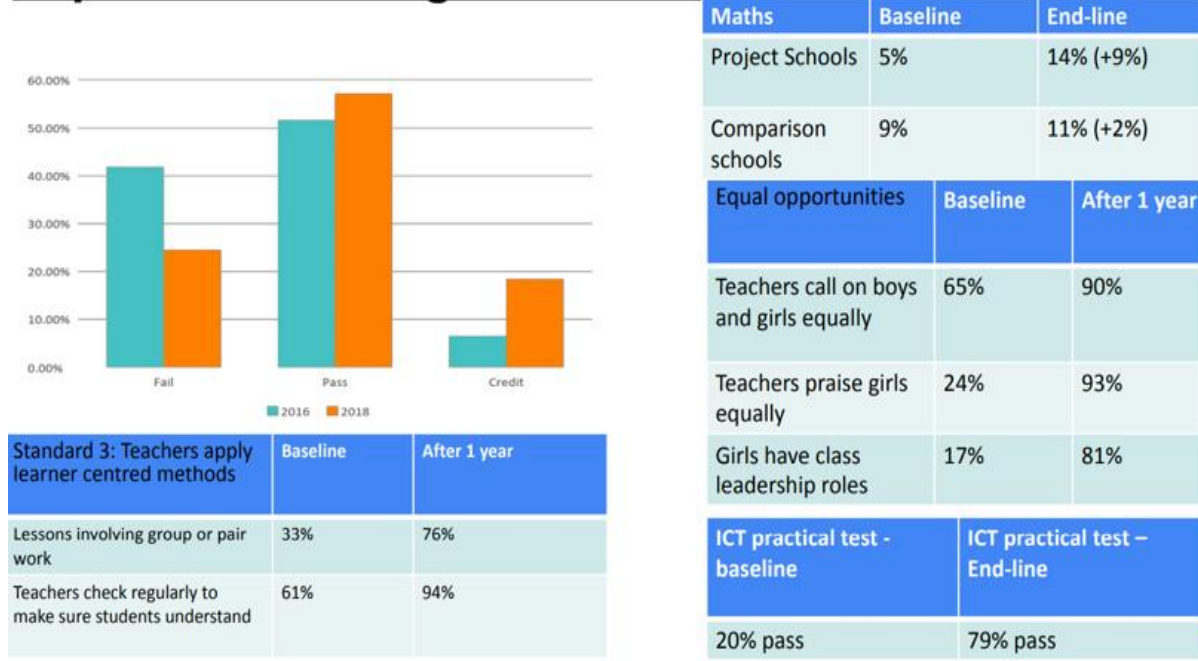
STEAMie cycle for learning



Experiential learning - Highly motivational for learners and teachers

Picture 6- STEAMie cycle for learning show a project based learning approach.

Impact on learning outcomes



Picture 7-progression data of partner schools.

The data above demonstrate the rapid progress made by learners in our partner schools in the initial phase. With local expertise now of our LPs it is expected that the rate of progress in schools will be much more rapid and through LP mentoring we can train new teachers in significantly less time and use of resources.

Conclusion

This low-cost, rapidly scalable, training model demonstrates immediate and notable visible impact on learning and teaching using continuous mentorship by local skilled LPs. Teachers and learners enjoy the process and benefit significantly from this approach. Local STEAMie business learning partnerships are next on our horizon with intent to support school communities' income streams.

Communities and nations are keen to develop STEAMie education. However, education departments globally believe that this requires a lot of investment in technology and resources. Furthermore, there is often no cross

curricular connection made and particularly little or no link with real business and enterprise. This project-based learning approach is very low cost, profit oriented and engaging for schools, teachers and pupils who can benefit materially from innovation and enterprise. Teachers and students can identify products in the local market that can be studied, tested in a rigorous scientific manner, and set about production for sale.

The general and STEAMie pedagogical approach uses local grown lead teachers to train and mentor newly onboarded teachers. Subsequently it is very low cost and rapidly scalable creating and expanding the much-needed base of skilled teachers and new trainers – lead practitioners. It delivers all elements of the new curriculum requirements.

Challenges and recommendations

- A significant number of teachers have found Action research difficult to implement. We have developed a scaffolded template to guide them through the stages. Mentoring through these stages are essential.
- The quality of portfolio completion in the first round shows improvement requirement. It is recommended that senior LPs are given additional consultant training to support quality completion.
- Some headteachers and deputy head teachers are less engaged. It is recommended would be to incorporate alternative senior school member to internally monitor teachers' progress instead.
- Primary teachers have low ICT skills and STEAMie skills to deliver objectives. It is recommended that such teachers are provide bitesize chunks of ICT training regularly during LP visits and communications with them should use ICT based methods to encourage and embed ICT skills. Furthermore, primary schools can be teamed up with partner secondary schools to exchange best STEAMie practice and develop appropriate skills.
- Identify new contextually local STEAMie projects that serve pupil learning and entrepreneurship.
- Impact on a large scale is limited and resource intensive. It is recommended to deepen our links with CCTs so work with existing teacher education machinery to get maximum reach to upskill many teachers locally and nationally.
- Teachers will want to focus on their own upgrade as required by the National Teacher Policy. It is recommended to harmonise the UTR program with diploma and bachelor's practicum requirements.

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