

THE EDUCATION STREAM FOUNDATION

England & Wales · Charity number 1199759

Details

Status Registered

Legal form CIO

Registered 2022-07-22

Register [View on the Charity Commission register](#)

Contact

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Woodford Avenue
Ilford
IG4 5NP

Phone 07846147239

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Activities

Objects: TTHE OBJECTS OF THE CIO ARE TO ADVANCE EDUCATION FOR THE PUBLIC BENEFIT FOR TEACHERS AND STUDENTS IN SCHOOLS AND COLLEGES IN DEPRIVED REGIONS OF UGANDA AND OTHER DEPRIVED REGIONS IN AFRICA AND THE WORLD, IN PARTICULAR BUT NOT EXCLUSIVELY BY: A.IMPROVING THE QUALITY OF TEACHING AND LEARNING THROUGH THE PROVISION OF TRAINING, MENTORING AND EDUCATIONAL SUPPORT B.DEVELOPING LOCAL EXPERTISE TO CASCADE TRAINING THROUGH A MENTORSHIP MODEL. C.WORKING CLOSELY WITH LOCAL EDUCATION PROVIDERS FOR TEACHERS AND STUDENTS. D.SUPPORTING SCHOOLS AND EDUCATIONAL INSTITUTIONS AND ORGANISATIONS THROUGH THE PROVISION OF GRANTS

Activities: 1. To provide in-service training to primary and secondary teachers via quality mentorship by trained local teachers .2. To incorporate STEM project based learning.3. Other inputs that would improve the learning capacity of beneficiaries.In Uganda and internationally

Classification

- **How:** Makes Grants To Individuals, Provides Other Finance, Provides Services, Provides Advocacy/advice/information, Acts As An Umbrella Or Resource Body
- **What:** Education/training
- **Who:** Children/young People, Other Charities Or Voluntary Bodies

Geography

- Uganda

Finances

Period end	Income	Expenditure	Assets	Employees
2025-03-31	£8,122	£3,999	-	-
2024-03-31	£1,313	£2,380	-	-
2023-03-31	£10,392	£7,158	-	-

Trustees

Name	Role	Appointed
Warren Bannister	Chair	2022-07-27
Ajay Haque		2023-01-29
Dr Ruth Aman		2024-06-01
Dr Zeenat Soobedar de Villeneuve		2022-09-10
Kanom Bibi		2022-07-27

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Accounts



Uganda Teacher Rising project – Annual Report Jan 2025

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

Aims

- To improve the quality of teaching in participating schools through school-based TPD, delivered by local mentors, upskilling teachers in rural Ugandan schools to become leading practitioners (LPs), and new mentors.
- To develop a mentorship TPD cascade model to generate high-quality, rapid, scalable, and sustainable teacher learning and enhancement that is then shared with the ministry.
- To improve learners' and teachers' STEM and ICT skills, including developing low-resource STEAMie project-based learning income-generating businesses, making products for sale in the local community.

Abbreviations

AET	Africa Educational Trust
EDI	Explicit Direct Instruction
LP	Lead practitioner
NTP	National Teacher Policy
STEAMie	Science, Technology, Engineering, Arts, Maths, and innovation with enterprise
TPD	Teacher professional development.
UTR	Uganda Teacher Rising

Brief

Improving education, employment, entrepreneurship, and higher education opportunities for students in Northern Uganda is crucial for driving socio-economic development. The Uganda Teacher Rising (UTR) project, building on AET's STEAMie training, has demonstrated significant improvements in teaching and learning through a school-based mentorship model.

The Education for All (EFA) initiative highlights that quality education is fundamental to achieving its broader objectives. Without improvements in teaching quality, progress in literacy, numeracy, and life skills development remains limited. Quality learning, particularly in primary education, is essential for long-term student success (GMR 2005).

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).

Recent progress.

Since 2023 the UTR project has partnered with a cluster of schools in Kyotera district in Central Uganda. Over the past 12 months, we have added two schools to the project, bringing the total to five in 2025, all of which are receiving ongoing continuous mentorship. In 2026, we plan to add two more schools to our ‘community of practice’ in the Kyotera district, and a further two/three schools each year after that. We have provided start-up funds and training for making and selling liquid soap, bar soap, sandals, and tailoring. The soap businesses have progressed well, and the tailoring project has produced washable sanitary pads for dozens of girls, whilst generating income to expand the projects further into the community. The sandals and brick-making projects require further development. Our approach is to use local skilled tradespeople as mentors to get each project started and then rely on teachers' innovation to sustain it. Access to local materials and tools needed for production can be a challenge in the rural areas where we work.

We have also had successful engagement with the district education authority, who are keen for the project to expand to as many schools as possible.

Charity Finance

To date, the charity has been funded through private donations. Projections show that, when sustainability is achieved, the project cost per school could be less than \$100 per year. This equates to around 40 cents per child per year, attributed to locally developed and sourced training needs at local costs. Table 1 shows the cost projections at the cost efficiency level. The cost per school steadily drops as more schools are added and can be less than \$100 when the training is managed locally, thereby eliminating international expenses.

Table 1- Projected cost structure.

5000 UGX = £1; 3700 UGX = \$1				Schools	3	6	10	15	23	34
Item	Unit cost	No.	Freq/year	Total cost UGX	USD	USD	USD	USD	USD	USD
Stationery	10,000	10	1	100,000	81	162	270	405	608	912
Local LPs/School/biannual data	25,000	1	2	50,000	41	81	135	203	304	456
LP allowance/ 3school cluster termly	300,000	1	3	900,000	243	270	378	495	743	1,115
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Travel / Subsistence UK vist & team					2,573	2,766	3,005	3,301	3,669	4,126
Annual cost \$					3,100	3,442	4,005	4,675	5,729	7,217
Cost per school \$					1,033	574	400	312	255	214

2024-2025 accounts: Income: £8122. Expenditure: £3999.

- *There are adequate reserves in the bank account to meet the year's deficit.*
- *There is already a significant increase in income for the current financial year*

Methods and Rationale

Our methods have evolved from whole-day workshops, requiring teachers to be away from the classroom to a less intrusive system. Our team now immerses itself in partner schools for three days, carrying out joint observations with staff, followed by feedback and general dialogue to agree on ways to enhance the learner experience and ease teacher challenges in a large classroom context. During this visit, short end-of-day workshops are held to deliver UTR teaching pedagogy rationale and ICT and STEAMie training.

The core elements of the pedagogy are 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

The continuous school-based mentorship model, over a planned period of two years, ensures steady teacher improvement by integrating lesson observations and peer collaboration. This structured approach supports teachers in refining their pedagogical skills while promoting STEAMie learning and gender inclusion. Using these mechanisms and evidence-based tracking teachers can attain leveled certification seen in Picture 1.

UTR – Teacher Professional Development Certification

Level 1: UTR teacher training - Complete initial training, demonstrating effective practice of UTR pedagogy and *completing reflective portfolio* and action research.

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

Level 3: Senior lead practitioner training - *Mentoring* new LPs to attain level 2 standards. 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*.



Figure 1 –levelled and certified teacher professional development.



Figure 2 – Lesson observation followed by quality feedback.



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

STEAMie

UTR's STEAMie multi-disciplinary project-based learning approach has a goal to produce real business enterprises with earnings opportunities. This is extremely motivational for teachers and learners. Learners must go through a business planning process, engage with business and marketing concepts, and use business mathematics learning even before making the product for sale. They must also learn the science of how their product is made and use engineering skills to make it. Marketing the product will then require art design and literacy skills.

A Kalisizo school teacher and mentor recently said 'The STEAMie project is doing very well at Kalisizo primary school. We managed to get a profit of 300000 Uganda shillings in 2024 and we now are aiming to get more profits in the new year.'

Pictures 4 and 5 show liquid soap and shoe-making training of young learners. Picture 6 reveals the STEAMie cycle framework described above and Picture7 show ICT training at one of our new schools

Primary Students Making Soap



STEM projects- making and selling soaps whilst learning science maths and business skills.



Figure 4 – Soap production and training at St Agnes Primary School, Kalisizo Uganda.



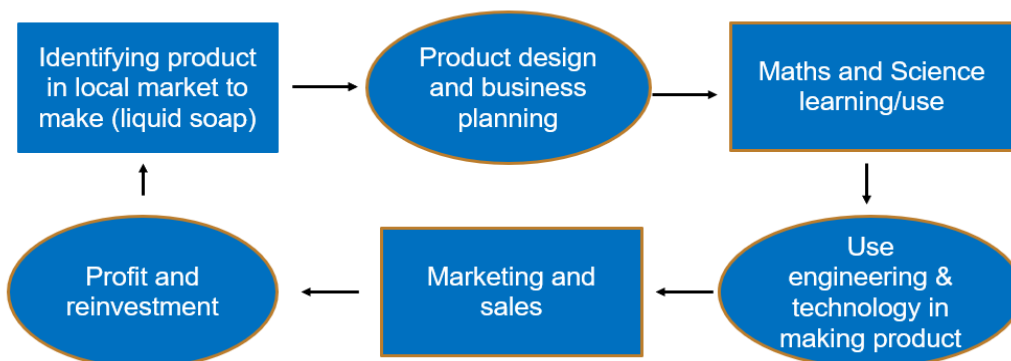
Figure 5 – Students learning to make sandals Kalisizo Primary School, Uganda.

Bricks - PjBL



Figure 6 – Students learning to make bricks at St Agnes Primary School, Kalisizo Uganda.

STEAMie cycle for learning



Experiential learning - Highly motivational for learners and teachers

Figure 7- STEAMie cycle for learning shows a project based learning approach.



ICT Training in small groups (MS Office)

Figure 8- ICT training of teachers in St Andrews Primary School.

Focus group review and analysis (2024)

It's clear that the new UTR project has made significant progress in equipping teachers with learner-centered teaching methods, ICT skills, and STEM training—especially live marking and collaborative learning—are making a big impact on both teachers and learners. The shift towards teacher facilitation rather than solely direct instruction has brought benefits like instant feedback, improved student engagement, and stronger classroom relationships. Feedback from teachers, head teachers, and mentors shows improved student and teacher motivation, and practical skills development. However, some challenges remain, particularly regarding managing differentiation in large classroom contexts, time constraints, and access to STEM resources.

Key Takeaways & Benefits:

- Live marking saves teachers hours of post-lesson marking and provides immediate feedback, though it requires careful time management.
- Collaborative learning boosts student communication skills, participation, and motivation, with expert learners assisting in assessment.
- Differentiation using Bloom's Taxonomy is helpful but challenging for teachers unfamiliar with its levels.
- STEM training has had both educational and financial benefits, with teachers and learners gaining skills to generate income.
- ICT training has helped teachers stay connected and continue learning through platforms like WhatsApp.
- Head teachers support the methods, noting that they improve relationships between teachers and learners while making assessments more efficient.

- Cost structure can fall below \$100 per school year, by developing local mentorship skills, thus making this training model very efficient and scalable.

Challenges & Suggested Improvements:

- Live marking can be time-consuming – Consider rotating marking across the week or limiting it to specific exercises.
 - Expert learners helping with assessment may face jealousy – Rotating roles ensures fairness, and teacher supervision helps prevent misinformation.
 - Differentiation is difficult for some teachers – More training on Bloom’s Taxonomy and leveled questioning could help.
- Group work participation varies – Teachers should monitor closely and encourage all students to contribute.
- STEM material accessibility is a challenge – Schools will need to locate better supply chains
- Portfolio language is complex – Simplifying terminology could make it easier for teachers to engage with reflective tasks.
- Teacher motivation is key – Certification could help, but there’s concern about corruption. Fair allowances to support private costs incurred in training is essential.

Conclusion

The overall response is very positive, and while some adjustments are needed, teachers, head teachers, and learners are seeing real benefits. Expanding training and mentorship—while addressing concerns like differentiation, time management, and material access—will help sustain these improvements.

Local STEAMie business & learning enterprises are developing well and already supporting school communities’ with added income streams.

References

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Accounts

Title : Transactions								
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Report generated on : 28/01/2026 11:12 AM								
Account Number : 00035504								
Start Date : 01/04/2024								
End Date : 01/05/2024								

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10/04/2024	10/04/2024	-206.7	3794.41	ATM CASH KCB NDEEBA NDEEB 1000000UGX@0.000207				

03/04/2024	03/04/2024	-40.96	4025.86	POS GUARANTY TRUST BANK (51.50USD@0.795340 Mr W Bannister				
20/03/2025	20/03/2025	-39.87	9287.3	POS GT UGANDA 51.50USD@0.774175 Mr W Bannister				
03/04/2025	03/04/2025	-25.8	9227.19	POS ALDI 77 776 Mr W Bannister				
08/04/2024	08/04/2024	-24.75	3991.11	POS LIDL GB LONDON - NEWB Mr W Bannister				
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16/07/2024	16/07/2024	96.33	3448.63	FP STRIPE Stripe Payments UK15/07/2024	#####	-5	3352.3	Monthly Account Fee
14/06/2024	14/06/2024	98	3350.57	FP June Donation Ekaterina Afanasye				
11/09/2024	11/09/2024	98	3659.63	FP E Afanasyeva Ekaterina Afanasye				
11/10/2024	11/10/2024	98	4074.4	FP E Afanasyeva Ekaterina Afanasye				
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03/02/2025	03/02/2025	7000	9766.09	FP Charity 2024				

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- There is already a significant increase in income for the current financial year

Methods and Rationale

Our methods have evolved from whole-day workshops, requiring teachers to be away from the classroom to a less intrusive system. Our team now immerses themselves for three days in partner schools carrying out joint observations with staff, followed by feedback and general dialogue to agree on ways that can enhance learner experience and ease teacher challenges in a large classroom context. During this visit, short end-of-day workshops are held to deliver UTR teaching pedagogy rationale and ICT and STEAMie training.

The core elements of the pedagogy are 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

The continuous school-based mentorship model, over a planned period of two years, ensures steady teacher improvement by integrating lesson observations, peer collaboration. This structured approach supports teachers in refining their pedagogical skills while promoting STEAMie learning and gender inclusion. Using these mechanisms and evidence-based tracking teachers can attain leveled certification seen in Picture 1.

UTR – Teacher Professional Development Certification

Level 1: UTR teacher training - Complete initial training, demonstrating effective practice of UTR pedagogy and *completing reflective portfolio* and action research.

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

Level 3: Senior lead practitioner training - *Mentoring* new LPs to attain level 2 standards. 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*.



Picture 1 –levelled and certified teacher professional development.



Picture 2 – Lesson observation followed by quality feedback.



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

STEAMie

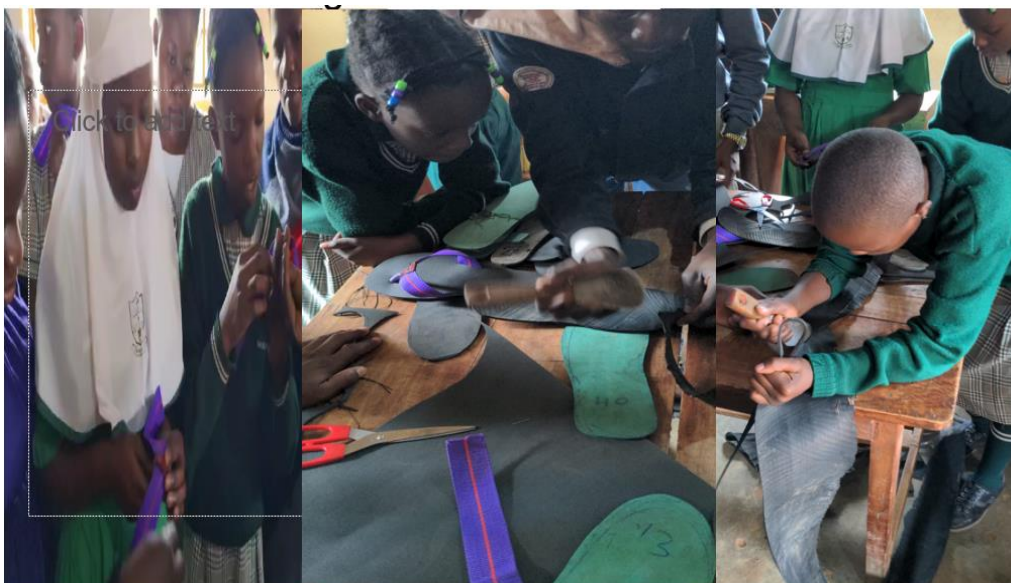
UTR's STEAMie multi-disciplinary project-based learning approach has a goal to produce real business enterprises with earnings opportunities. This is extremely motivational for teachers and learners. Learners must go through a business planning process, engage with business and marketing concepts, and use business mathematics learning even before making the product for sale. They must also learn the science of how their product is made and use engineering skills to make it. Marketing the product will then require art design and literacy skills.

A Kalisizo school teacher and mentor recently said 'The STEAMie project is doing very well at Kalisizo primary school. We managed to get a profit of 300000 Uganda shillings in 2024 and we now are aiming to get more profits in the new year.'

Pictures 4 and 5 show liquid soap and shoe-making training of young learners. Picture 6 reveals the STEAMie cycle framework described above and Picture7 show ICT training at one of our schools

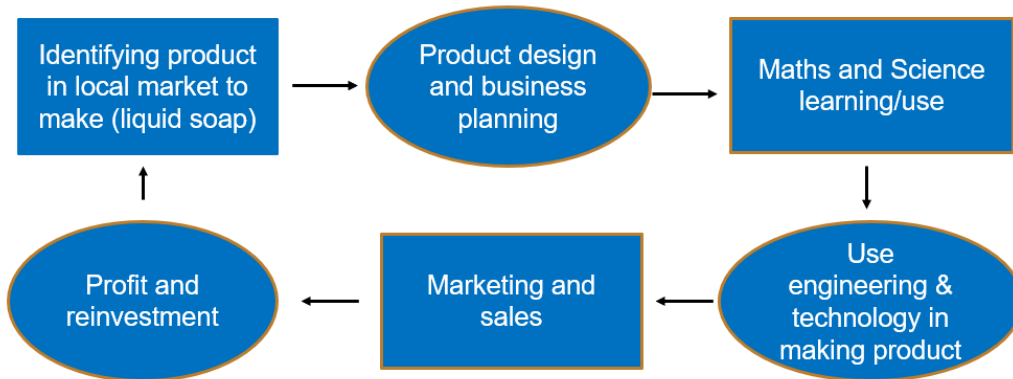


Picture 4 – Liquid soap production and training at St Agnes Primary School, Kalisizo Uganda.



Picture 5 – Students learning to make sandals Kalisizo Primary School, Uganda.

STEAMie cycle for learning



Experiential learning - Highly motivational for learners and teachers

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



Picture 7- ICT training of teachers in Kirumba Primary School.

Focus group review and analysis (2024)

It's clear that the new UTR project has made significant progress in equipping teachers with learner-centered teaching methods, ICT skills, and STEM training—especially live marking and collaborative learning—are making a big impact on both teachers and learners. The shift towards teacher facilitation rather than solely direct instruction has brought benefits like instant feedback, improved student engagement, and stronger classroom relationships. Feedback from teachers, head teachers, and mentors shows improved student and teacher motivation, and practical skills development. However, some challenges remain, particularly regarding managing differentiation in large classroom contexts, time constraints, and access to STEM resources.

Key Takeaways & Benefits:

- Live marking saves teachers hours of post-lesson marking and provides immediate feedback, though it requires careful time management.
- Collaborative learning boosts student communication skills, participation, and motivation, with expert learners assisting in assessment.
- Differentiation using Bloom's Taxonomy is helpful but challenging for teachers unfamiliar with its levels.
- STEM training has had both educational and financial benefits, with teachers and learners gaining skills to generate income.
- ICT training has helped teachers stay connected and continue learning through platforms like WhatsApp.
- Head teachers support the methods, noting that they improve relationships between teachers and learners while making assessments more efficient.
- Cost structure can fall below \$100 per school year, by developing local mentorship skills, thus making this training model very efficient and scalable.

Challenges & Suggested Improvements:

- Live marking can be time-consuming – Consider rotating marking across the week or limiting it to specific exercises.
- Expert learners helping with assessment may face jealousy – Rotating roles ensures fairness, and teacher supervision helps prevent misinformation.
- Differentiation is difficult for some teachers – More training on Bloom's Taxonomy and leveled questioning could help.
- Group work participation varies – Teachers should monitor closely and encourage all students to contribute.
- STEM material accessibility is a challenge – Schools will need to locate better supply chains
- Portfolio language is complex – Simplifying terminology could make it easier for teachers to engage with reflective tasks.
- Teacher motivation is key – Certification could help, but there's concern about corruption. Fair allowances to support private costs incurred in training is essential.

Conclusion

The overall response is very positive, and while some adjustments are needed, teachers, head teachers, and learners are seeing real benefits. Expanding training and mentorship—while addressing concerns like differentiation, time management, and material access—will help sustain these improvements.

Local STEAMie business & learning enterprises are developing well and already supporting school communities' with added income streams.

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2. Bounajim, D. (2021) Applying Cognitive Load Theory to Examine STEM Undergraduate Students' Experiences in An Adaptive Learning Environment: A Mixed-Methods Study
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THE EDUCATION STREAM FOUNDATION

England & Wales - Charity number 1199759

Accounts



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

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 Otuke 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.



- **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.
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- **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.

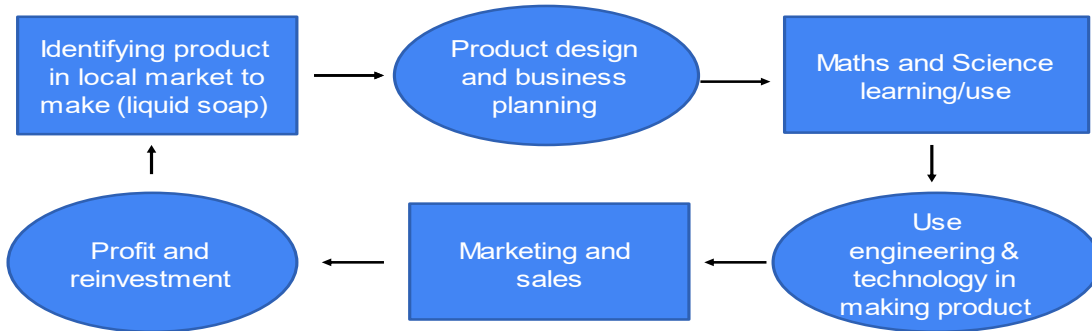


Picture 4 – Liquid soap production in Iguili girls secondary school in Dokolo, Uganda.



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

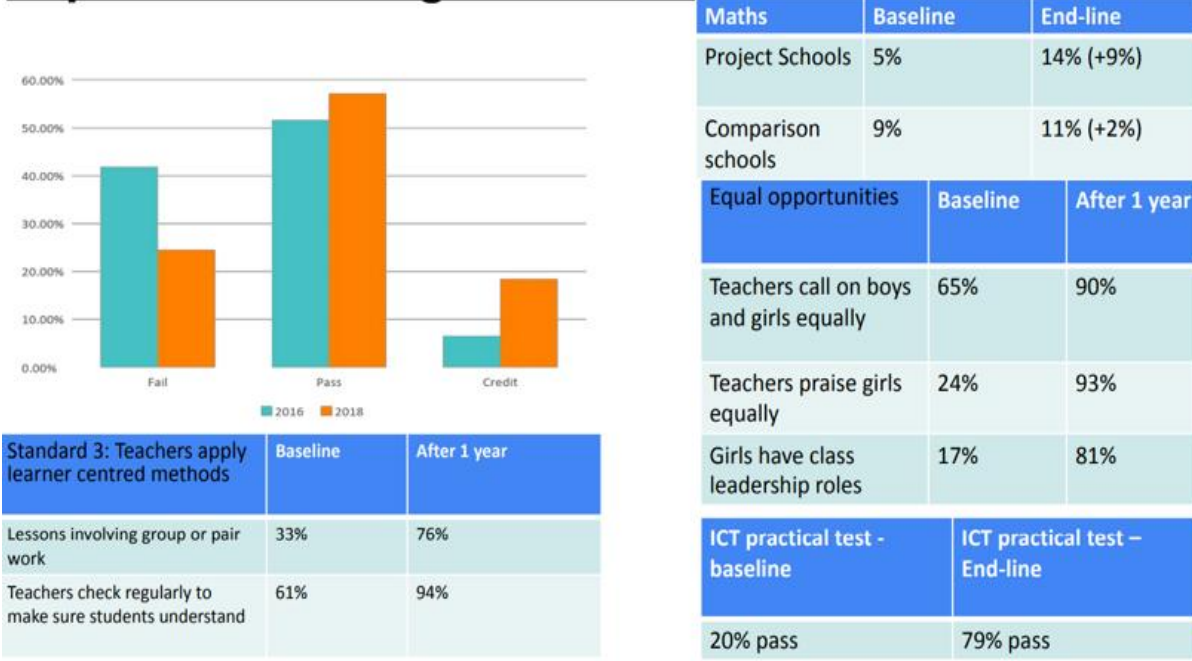
STEAMie cycle for learning



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 recommendation 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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