# STEM

Hands-on STEM education in Angola: strengthening vocational learning through teacher empowerment and practical experimentation


**Abel Pascoal, ADPP Angola | Humana People to People**

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# About US


## Humana People to People

Humana People to People is an international network of **30 local NGOs** working for the sustainable development of communities in Sub-Saharan Africa, the Americas and Asia.

To **address high youth unemployment and the gap between education and labour market needs,** Humana People to People has made Technical and Vocational Education and Training (TVET) a key strategy for promoting skills development and sustainable livelihoods.

Across the network, **16 vocational schools** in Africa provide practice-oriented training for young people, combining technical education with strong links to local labour markets.

**A distinctive element is the integration of STEM education**, including initiatives implemented through our member organisation ADPP Angola, where teachers and students engage in hands-on learning that strengthens problem-solving, critical thinking and preparation for green, technology and social sectors.

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# About US

## ADPP Angola

ADPP Angola (Ajuda de Desenvolvimento de Povo para Povo) is a national NGO working in the fields of education, health, agriculture & environment and integrated community development.

The organisation works in **17 provinces and 81 municipalities**, reaching around **2 million people** annually through its programmes.

Education is one of the core pillars of ADPP's work and includes:

**Teacher Education**

- Teacher Training Schools preparing new primary school teachers
- 1,091 teachers graduated in 2023 (37% women)
- Continuous pedagogical training for teachers (2,025 teachers in 2023)

**Technical and Vocational Education and Training (TVET)**

- **8 Polytechnic schools** providing vocational training for young people
- 354 graduates in 2023 (44% women)

**Other education programmes**

- Literacy programmes (5,800 learners)
- Community preschool education (1,100 children)
- Entrepreneurship and skills courses for women (746 participants)
- Training for school leadership (618 school directors)

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# STEM IMPLEMENTATION IN ANGOLA

In Angola, STEM is implemented by ADPP in collaboration with INFQE/MED, funded by block 15/Exxonmobil and KOICA.

The pilot phase took place from 2016 to 2021 in Luanda, covering ADPP Vocational Polytechnic Schools.

STEM helps human solve everyday problems through science and technology, create innovations that improve health, education, agriculture, the environment, transportation, and communication.

GOVERNO DE ANGOLA | med.gov.ao Ministério da Educação

INFQE Instituto Nacional de Formação de Quadros da Educação

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# EXPANSION

The expansion phase began in 2022 and to date, STEM Education is in 13 Provinces of the country, having achieved the following results:

| PROVINCES | TEACHERS IN PRE-SERVICE | TEACHERS IN SERVICE | STUDENTS |
|---|---|---|---|
| Luanda, Bengo and Namibe | 290 | 529 | 13475 |
| Zaire | 300 | 50 | 1500 |
| Huambo, Bié, Uíge and Namibe | 480 | 400 | 18117 |
| Zaire, C. Norte, Malanje and Uíge | 240 | 628 | 21980 |
| Benguela, Icoloe Bengo and Cuanza Sul | 409 | 147 | 6645 |
| Luanda and Icolo e Bengo | | 33 | 1190 |
| Luanda and Icolo e Beno | | | 1711 |
| Luanda | | | 250 |
| **TOTAL** | **1719** | **1787** | **64868** |

## HOW DID IT ALL START?

## (Self-formation of National Trainers)

In 2017, the pool of national STEM trainers was created, consisting of specialists trained in **Japan, Brazil, Portugal, Kenya and Cuba**, in the areas of laboratories and they shared their experiences with each other for the materialization of STEM training, using the themes of the Curricular Programs, for the **production of the STEM Teacher's Manuals**.

The Manuals cover courses of the Polytechnic and Vocational Schools of ADPP.




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# CONTENT

The content prioritizes themes related to **real life**, aiming to solve socioeconomic and environmental problems that affect communities.

Examples: Production of homemade insecticide, production of homemade mayonnaise, electrical circuit (physics), among others.

# METHODOLOGY

The schools are organized into poles consisting of **5 to 12 application schools**, led by an organizer and each hub has a **Resource Center**.

The training is done as follows:

- 1st week – Teacher training takes place at the Pole or ZIP
- Week 2 – the Teacher will implement the sessions in their classroom

The routine is cyclical and modular until the 25 or 40 Sessions of the STEM Manual are over.

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# CLASSROOM SESSIONS

Teachers implement the sessions in their classrooms, after participating in the training at the pole/ ZIP.

The sessions are based on the Manual with themes of Natural Sciences, Biology, Physics, Chemistry and Mathematics.

In addition to these, it has transversal sessions that integrate all STEM disciplines.

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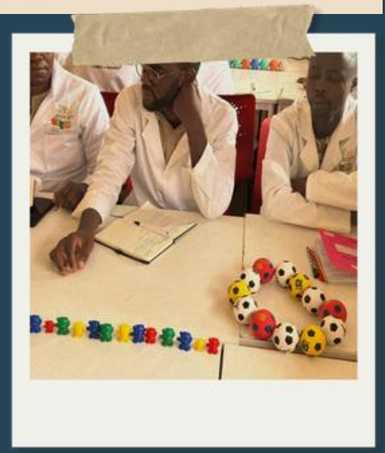
# EXAMPLES OF PRACTICAL AND EXPERIMENTAL SESSIONS

## STATISTICS

The student learns "statistics" through colored objects as follows:

- frequence: colorful objects that appear frequently;
- Median: sorting the random colored objects and identifying whatever is in between;
- Arithmetic mean: count all the objects and divide them by the number of colors;
- Note: You can use the balls or numbers.

The approach to the experiences includes reflection on real situations.



## ENERGY & LIGHT

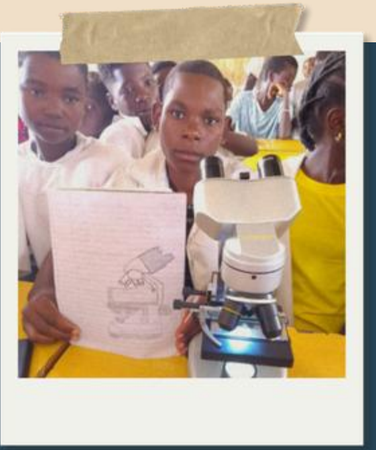
Students identify transparent, translucent and opaque objects through the experiments:

- Transparent: illumination of the lantern on transparent glass;
- Translucent: illumination of the flashlight on plastic bag;
- Opaque: illumination of the lantern on a piece of wood.

Various objects around it are explored to carry out the experiments.

## CELL

The student understands the characterization, functioning and structure of cells through the observation of the osmosis of onions, green leaves, etc., under the microscope.



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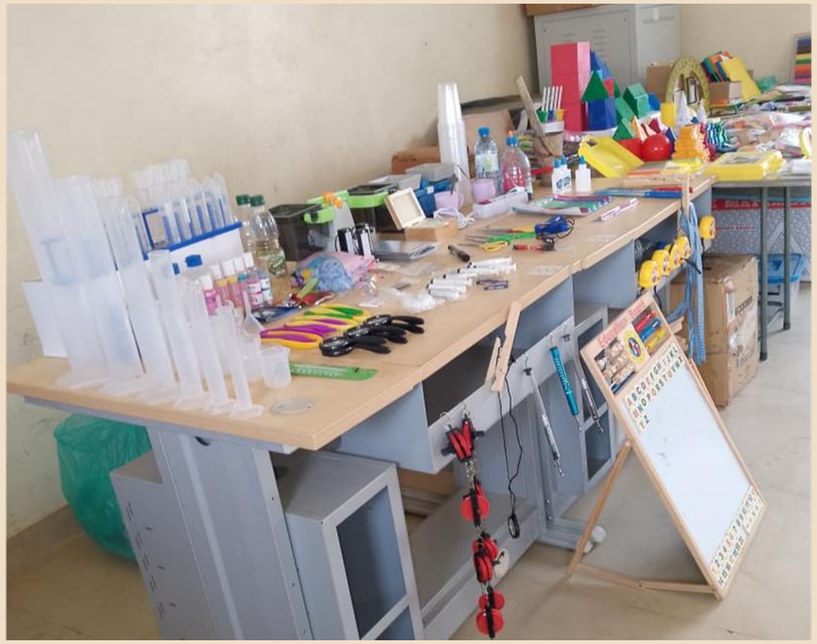
# STEM RESOURCE CENTERS

There are **23 STEM Resource Centers** in the country, **which serve for Teachers to collect materials and equipment they need, so that the practical or experimental component is carried out in the classroom.**

The Teacher requests it and, after using it, returns it so that the other Teachers can request it as well. The centers also serve as spaces for practical preparation for teachers.

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# SCIENCE FAIRS & STEM OPEN DAYS

make students able to explain the contextual integration of the content in approach and relate its application in everyday life and allow the interaction of the academic community (from the same school and from other schools).

# CIRCULAR CHANGE COMPLEMENT

The implementation of STEM influenced the inclusion of the Science, Technology and Mathematics Component in the Curricular Program of Primary Education in Angola, under the New Regime of Assisted Monoteaching, starting in 2024.

| ÁREAS DE CONHECIMENTO (A.C) | COMPONENTES CURRICULARES (C.C) | CARGA HORÁRIA | | | |
|---|---|---|---|---|---|
| | | 5.ª | 6.ª | Horas Totais por C.C. | Horas Totais por A.C |
| HUMANIDADES E CIDADANIA | Língua Portuguesa | 6 | 6 | 360 | 720 |
| | Língua de Angola (CCRC) | 2 | 2 | 120 | |
| | Língua Estrangeira (CCRC) | 2 | 2 | 120 | |
| | Cidadania e Desenvolvimento | 2 | 2 | 120 | |
| CIÊNCIAS, TECNOLOGIA E MATEMÁTICA | Matemática | 6 | 6 | 360 | 660 |
| | Ciências Integradas | 5 | 5 | 300 | |
| EXPRESSÕES | Educação Física e Artística | 5 | 5 | 300 | 300 |
| Total de T.L. Semanal | | 28 | 28 | 1680 | 1680 |
| Total de T.L. Anual | | 840 | 840 | | |
| Total de Componentes Curriculares | | 7 | | | |

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# IMPACT

Learning became more meaningful, supported by practice based on the use of low-cost and recycled materials to carry out Science and Mathematics experiments.

# LESSONS LEARNED

**MOST SIGNIFICANT CHANGES:** STEM provides inclusive and equitable education without leaving anyone behind (cities or rural areas).

With the STEM methodology, content approaches will have a more concrete and meaningful understanding.
Instead of designing the microscope and the cell, STEM brings equipment and ideas for practical and experimental work with low-cost materials, in schools without conventional laboratories.

**PROBLEM-BASED STEM ACTIVE LEARNING:** They stimulate critical thinking and creativity through real challenges, linked to competitions, Olympiads, promoting motivation, interaction and the practical application of academic and scientific knowledge, reinforcing the spirit of research and innovation among students and teachers.

They develop the capacity for collaborative planning, research and execution. Participants apply scientific and technological knowledge to create innovative and sustainable solutions.

The projects promote engagement and meaningful learning, connecting theory to practice and boosting creativity and protagonism in solving social and environmental problems.

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# *a short video*

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# QUESTIONS ?

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*"Advancing together in professional excellence, building an Africa prepared to thrive through science, creativity and knowledge."*

# THANK YOU

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