

KNUST-TUM PV Knowledge Hub

ProPENS WiSe'24/25 Ghana

The KNUST-TUM PV Education hub project is one of the first steps from the TUM ENS chair as a long-term vision for strategic and sustainable partnership with KNUST, Ghana. In the shorter-term, we are attempting to cultivate an entrepreneurial mindset among students and enhancing renewable energy skills through block-course format, short education camps.

Vision

We focus on knowledge transfer, particularly through "Teach the Teachers" strategy, emphasizing local ownership and teaching capacity building. The daily operation and management of the PV Knowledge hub will remain the sole responsibility of KNUST collaborators, with TUM providing advisory support.

All course content will be open-source, fostering wider accessibility. They should also have interactive lectures with focus on "Active Learning" and "Learning by doing" paradigms, multimedia teaching material for renewable energy systems, experiments with Lego components, 3D printed schematics and circuit layouts for power electronics components and emphasis on reproducibility of teaching material for a variety of countries. Furthermore, video explainers to the teachers, IT tools to create a local encyclopedia of lecture resources for smartphones and computers, group activities with a competitive edge, should also be part of the course development cycle.

ProPENS - Overview



Figure 1: ProPENS Ghana PV Education Hub group in Summer 2024.

We began with a successful ProPENS group of 10 students in SoSe 24, who worked on laying the groundwork for creating teaching material - textbook, kits and software, to be used in the PV Education Hub. The associated slides and textbooks created by the last ProPENS group are available here - Final Presentation and PV Lesson Teacher's Handbook.

Tasks

Student and Teacher Handouts

- Create a series of handout for the students based on the lesson plan provided for the experiment series
- Create an equivalent handout for the teacher with time-planning, checkpoints, clear learning outcomes and other best practices.
- Provide figures, tables, photos in an eye-catching fashion for the students.

Developing the experiment kit

- Research all the available resources to produce experiment kits based on the provided lesson plan.
- Analyse the cost efficacy of sourcing components locally without losing significant quality in the learning experience.
- Create CAD, PCB schematics and code repositories wherever required.

Expectations

- The program will be developed for the KNUST-TUM PV Education Hub in Kumasi. A periodic sync and progress update with the end-user is KNUST is to be expected.
- Expert sessions with school teachers and renewable energy educators will be organised.
- Deliverables include - Developed material in hard-copy and software format, project report, presentations, business plan (if applicable).
- An outlook for sustainable practices, inclusive classrooms, empathy for other cultures and a desire to democratise renewable energy education should be the guiding principles of the developed products.

Support for the groups

Each group will be supported by the TUM PhD students leading the initiative, whose broader research interests is aligned for education technologies for dissemination of Renewable energy know-how.

Two student tutors from the previous ProPENS group will be assigned as direct mentors for the new cohort.

The course content and collection of experiments will be provided to the ProPENS cohort. The entire PV-Education hub program will be built by student volunteers, PhD candidates and post-docs at the ENS chair. The tutors for this project are also part of the "Student laboratory for renewable energy systems" project funded by the German Environment Scholarship body. They have also led renewable energy camps in Zimbabwe, Nepal and India.

Contact

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References

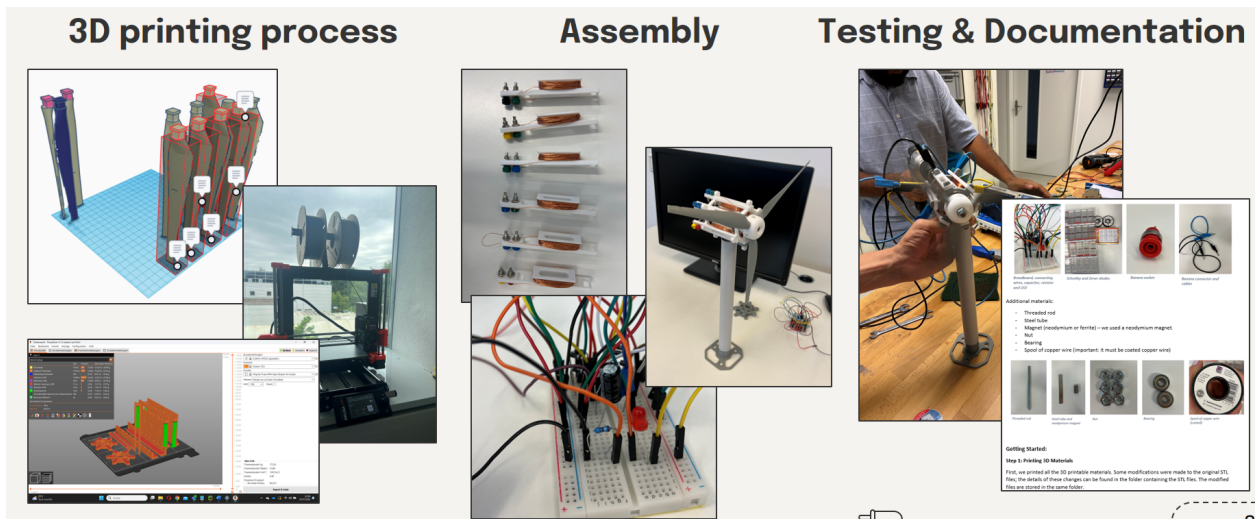


Figure 2: Kits developed in last ProPENS

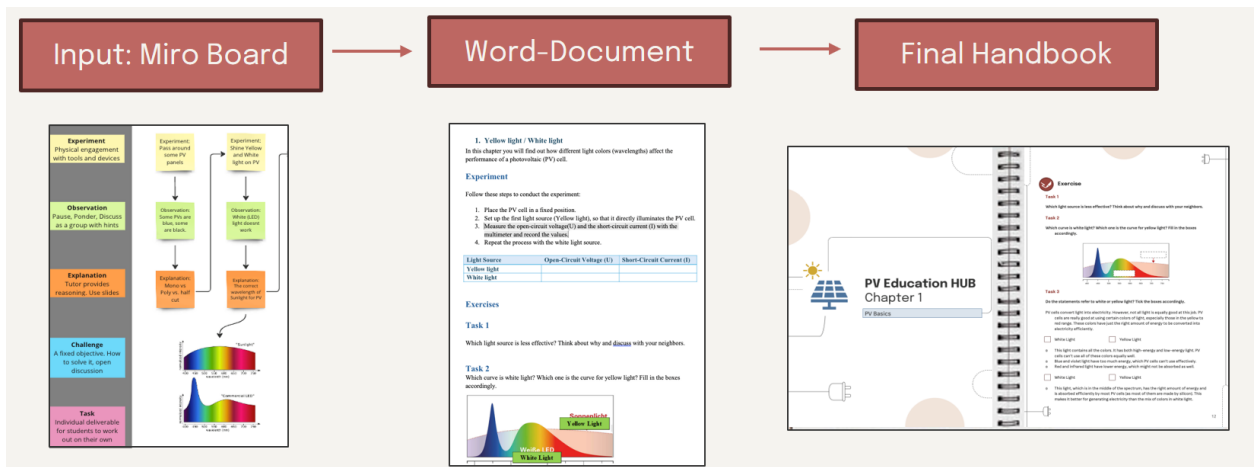


Figure 3: Teacher and Student Handbook created in last ProPENS.