Smart Classrooms for Education Improvement in Ethiopia

DEVOTRA Smart Classrooms for Primary -, Secondary -, Higher Education and TVET

The Government of Ethiopia (GOE) wishes to include ICT in education at all levels to improve access, quality and relevance of education. The Education Sector Development Programme (2016-2020) includes the General Education Quality Programme which has, amongst others, ICT as an integrated component. In addition a separate component dedicated to ICT is included with the objective to provide ICT infrastructure, facilities and resources to support teaching and learning and students' development for work in an increasingly digital environment.

The Devotra Smart Classroom integrates all of the above and brings 21st century education systems to Ethiopia. The Smart Classroom is available for: TVET, Primary-, Secondary- and Higher Education, allowing for smooth integration of teaching and learning at all levels.

The Devotra Smart Classroom seamlessly integrates the following components:

- Digital Learning Resources Library with 8.500 ready-made learning units
- Learning units mapped against curricula and programmes
- Practical demo and training units which are linked to the Digital Learning Resources Library
- State-of-the-art ICT laboratory for hands-on exploration, investigation and production
- Using on-screen simulations, virtual experiments and presentations
- Top quality ergonomic designed furniture for a safe and modern learning environment
- Future proof solution that is available offline or online via a suitable e-learning platform
- Teacher training, technical support and after-sales

Maglev workstation

The Devotra Smart Classroom acts as an incubator area for ideas based on industry and labour market requirements. It changes students and teachers mind-sets and brings innovation, spur creative and catalytic thinking, triggers students' exploration skills, enhance problem-solving based learning and provide the opportunity to teach and learn design, programming, engineering and production skills.

Primary Education

The hands-on digital programme teaches Maths, Science, Engineering and English language skills to primary school children.

The National Learning Assessment (NLA) has shown that improving learning achievements for Grade 4, 8, 10 and 12 students remains challenging. This is mainly reflect in student learning and acquisition of basic skills such as literacy and numeracy which contribute to observed poor attainment and achievement. It is assumed that integration of ICT in primary and secondary education can improve learning outcomes. This is acknowledged by the GOE and by donors, such as the World Bank, which included the component Improving the Quality of Learning and Teaching through the use of Information and Communications Technology (ICT) in the General Education Quality Improvement Project II.

The Smart Classroom active learning program for primary education is composed of creative hands-on tasks and interactive virtual software applications that work together flawlessly. These activities encourage children to explore scientific scenarios by themselves, and enables them to explain what they have learned about STEM.

A combination of high quality content and practical experiment kits, provides teachers with the necessary tools to ensure the STEM learning experience becomes very existing and understandable for young children.

This specific primary education Digital Learning Resources Library covers more than 1.000 lessons, including 300 exciting inquiry-based digital investigations and simulations.

The typical primary education STEM Lab configuration
(content and experiment kits) covers 6 STEM learning areas:
- [ ] Life science
- [ ] Earth Science
- [ ] Physical Science
- [ ] Mathematics
- [ ] Engineering
- [ ] Science Practices

Secondary Education

The Smart Classroom can be customised to meet the specific needs of High Schools and Senior High Schools in Ethiopia, in order to improve access, quality, and relevance of the secondary education system. Students are prepared for a career in the sector of their choice and for continuing education, through a blended mix of hardware and software resources.

In the previous ESDP (IV) it was already planned to equip all secondary schools with the equipment necessary to access satellite television education and e-learning programmes in well-organised computer laboratories. The government continuous to be committed to the expansion of ICT use in education in order to improve the quality of teaching and learning. In the plan period of ESDP V integration of pedagogy, content and technology will take priority. Furthermore, ICT will be mainstreamed across core subjects at all levels. Good core foundation skills are essential for students to benefit from ICT based learning. Rather than a stand-alone ICT course, activities will exist for all core subjects that demand the use of ICT.

The Digital Learning Resource Library provides students with a wide range of educational experiences that integrate Science, Technology, Engineering and Mathematics (STEM). Modern technologies, with an emphasis on exploring science are featured. With a wealth of practical hands-on and virtual assignments the Smart Classroom can significantly contribute to improved Ethiopian General Secondary Education Certificate and Ethiopian Higher Education Entrance Certificate Examination outcomes.

The Digital Learning Resource Library for secondary education covers 3.000 lessons. The typical STEM ICT-based lab configuration includes the following 12 themes:

- Architectural technology
- Construction engineering
- Electronics technology
- Energy in buildings
- Engineering design
- Biomedical technology
- Mobile robotics
- Mechatronics
- Manufacturing technology
- Mass transportation
- Industrial robotics
- Transportation technology

Higher Education STEM programmes

The Smart Classroom can be used for the improvement of Higher Education Science, Technology, Engineering, and Mathematics (STEM) programmes.

The Ethiopian Government gives higher education a central position in its strategy for social and economic development. Therefore in the past 10 years, the government has demonstrated continued commitment to expanding equitable access to quality and relevant higher education. With the rapid expansion of higher education institutions also resource and other problems have emerged. In spite of massive resource allocations to higher education, universities still report insufficient supplies of text and reference books, laboratory and workshop equipment and access to ICT facilities. In the second Growth and Transformation Plan a national innovation system and relations among innovation institutes will be strengthened, capacity of quality and standards infrastructures will be further improved, curriculum on qualities and standards will be designed, also the medium and large manufacturing industries will be supported and encouraged to setup their own research units. The smart classroom will ensure that Higher Education Institutes will be better equipped, and their students will be enabled to support the GTP II.

The Smart Classroom for integration of STEM in Higher Education include the following rooms:

Teacher led presentation rooms
- Based on maximum 32 students
- Direct access to Digital Learning Resource Library for lecturers
- Numerous presentations and background materials

Student exploration and investigation room
- Based on maximum 32 students
- 16 workstations direct access to Digital Library server
- Practical demo and training units linked to the Digital Resources Library

Example topics for Research, Design & Technology
- Rapid Prototyping/Industrial Manufacturing,
- 3D printing and 3D scanning
- Control & Instrumentation,
- Mechanical & fluid power
- Computer programming
- Automotive Engineering
- Electronics
- Laser cutting/engraving
- CNC simulation
- CNC manufacturing
- Machine tools

Technical Vocational Education and Training

Introducing a unique TVET teaching and learning concept, combining state-of-the-art technologies, software, simulations, experiments and hands-on practical education, for a future proof environment.

The Ethiopian National TVET Policy, clearly indicates that the introduction of modern information and communication technologies (ICT) to TVET delivery and assessment is an important tool for enhancing access and quality in TVET and for developing life-long learning opportunities. Through ICT, training, teaching, learning, and assessment materials, can be provided at a lower cost. It supports learner-centred TVET delivery, improves access to information and knowledge and allows for self-paced learning and assessment. A systematic introduction and use of ICT solutions in TVET delivery is therefore promoted by the Government.

The TVET Smart Classroom provides a world-class learning facility, introducing a unique TVET teaching and learning concept, combining state-of-the-art technologies, software, simulations, experiments and hands-on practical education, making TVET Institutions, TVET Colleges and Polytechnic TVET Colleges future proof. The TVET Smart Classroom harnesses emerging technologies and fully integrates ICT based learning and best practices in TVET.

The Smart Classroom optimizes traditional hands-on learning in a cost-efficient way and allows for better quality teaching at the workshops, through better instruction and preparation, amongst others, through;
- Presentations
- Digital lessons
- Investigations
- Engineering simulations
- Virtual experiments
- Practical exercises
- Projects and group work

The Smart Classroom for TVET includes the following components;
- Project design
- Site-surveys and recommendations
- Creation of a virtual learning environment
- Digital Learning Resources Library
- Small scale practical demo units
- IT infrastructure
- Supply, installation and commissioning of equipment
- Training of teachers and Smart Classroom managers
- Long term technical support, training and maintenance
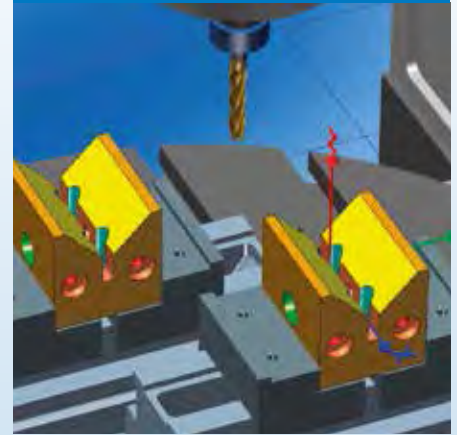
Smart Classroom workstation examples

RENEWABLE ENERGY

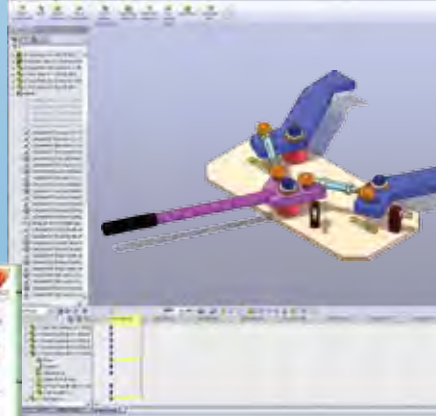**MACHINE TOOLS & CNC**

CNC SIMULATION

MATERIALS & PROCESSES

INDUSTRIAL CONTROLS

HYDRAULICS

AUTOMOTIVE

2D/3D DESIGN SOFTWARE

PNEUMATICS