



# Smart Classrooms for Education Improvement in Kenya

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

The Government of Kenya (GOK) wishes to develop an ICT ready workforce as indicated in The Kenya National ICT Master plan 2014. The strategy to achieve this is, among others, through the collaboration with relevant policy makers and regulators to integrate ICT in education and training at all levels. The most effective and efficient method of developing an ICT workforce is to integrate ICT in schools, colleges, and universities curriculum for non-ICT subjects.

The Devotra Smart Classroom is in line with the National Masterplan as well as with the ICT strategy for Education and Training as it integrates ICT at all levels of education and brings 21st century education systems to Kenya. 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

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 as well as competency based education and provides the opportunity to teach and learn designing, programming, engineering and production skills.

Maglev workstation



# Primary Education

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

The ICT Integration in Primary Education (Digital Literacy project) is one of the key flagship Programmes highlighted by the Ministry of Education. The main aim of the project is to align integration of ICT into teaching and learning for standard one pupils in primary schools. The components of this project include: improvement of ICT infrastructure, development of digital content, capacity building of the teachers and provision of ICT devices.

The Smart Classroom for primary education captures all of the objectives above. The active learning programmes for primary education are composed of creative hands-on tasks and interactive virtual software applications that work flawlessly together. These activities encourage children to explore scientific scenarios themselves and enables them to explain what they have learned about STEM.

A combination of high quality virtual content and practical experiment kits, provides teachers with the necessary tools to ensure the STEM learning experience becomes very exciting 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 meets the specific needs of Upper Primary and Secondary Schools in Kenya, 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.

The Government of Kenya is providing great support to the secondary education sector and as such it has embarked on the Kenya Upper Primary and Secondary Education Quality Improvement Project. Amongst other the project will improve the quality of Science, Language, and Mathematics teaching by providing schools with advanced high quality teaching-learning materials; create enabling learning environment in the schools by improving infrastructure such as science and computer labs, libraries, and enhancing co-curricular activities; support the improvement of STEM teaching; and support the transition from a content-based to competency based curricula. Under the specific innovation component, the use of ICT to provide virtual and blended learning opportunities to students and teachers is included. Furthermore the Government of Kenya, wishes to support the marginalized schools and the remote schools in rural areas as much as the other schools in urban areas.

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 transition and pass rates.

The Digital Learning Resource Library for secondary education covers 3.000 lessons.

The typical STEM ICT-based lab configuration includes the following 12 themes:

- |   |  |
|---|--|
| <input type="checkbox"/> Architectural technology | <input type="checkbox"/> Mobile robotics           |
| <input type="checkbox"/> Construction engineering | <input type="checkbox"/> Mechatronics              |
| <input type="checkbox"/> Electronics technology   | <input type="checkbox"/> Manufacturing technology  |
| <input type="checkbox"/> Energy in buildings      | <input type="checkbox"/> Mass transportation       |
| <input type="checkbox"/> Engineering design       | <input type="checkbox"/> Industrial robotics       |
| <input type="checkbox"/> Biomedical technology    | <input type="checkbox"/> 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 Kenya Education Sector Support programme supported, amongst others, expansion of access and equity in University education; enhancement of quality and relevance; improvements in governance and efficiency; and enhancement of use of ICT in public universities. Kenya currently counts 7 Public Universities, and 18 Private Universities which are rapidly expanding and can hardly cope with the continuous demand for university education. The Cabinet Secretary for Education, Science and Technology, however added that the expansion of university education should not compromise the quality of higher education institutions. To cope with the increased demand Kenya will promote the establishment of open universities and the expansion of distance education in existing universities, leveraging on ICT. With the online applications, the Smart Classroom can also contribute to Distance and Open Learning which has become a significant alternative mode of delivery at tertiary education level. Furthermore, Kenya hosted and participates in the knowledge exchange initiative "Partnership for skills in Applied Sciences, Engineering and Technology" (PASET) which acknowledges that STEM education is critical for developing research capacity, skills in critical thinking, creativity, and scientific collaboration.

The Smart Classroom for the specific integration of STEM in Higher Education includes 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 with direct access to Digital Learning Resource Library server
- Practical demo and training units linked to the Digital Learning Resource Library

### Example topics for Research, Design & Technology

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



# 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 project "Smart (ICT) Classrooms for TVET Improvement" successfully implemented in Kenya at 10 Technical Training Institutes (TTIs) focused on providing an ICT based (virtual) learning environment, supported by the newly equipped practical training workshops and the practical TVET curriculum. This allows teachers and students to upgrade their practical skills up to the standards of the latest technology and prepare them for the labour market in a relatively short period, by using a virtual learning environment. The TVET smart classroom support the Competency Based Education (CBET) curricula as well as quality, access and relevance of the TVET sector. While working with the Kenyan TVET education sector since 2010 it became clear that there is a gap between theoretical and practical skills of both teachers and students. The Smart Classrooms supports CBET with an emphasis on experiments, investigations and virtual learning, ensuring that teachers and students are better prepared to use practical training equipment.



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

The Smart Classroom optimizes the use of the existing equipment at the workshops, through better understanding of engineering subjects, 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

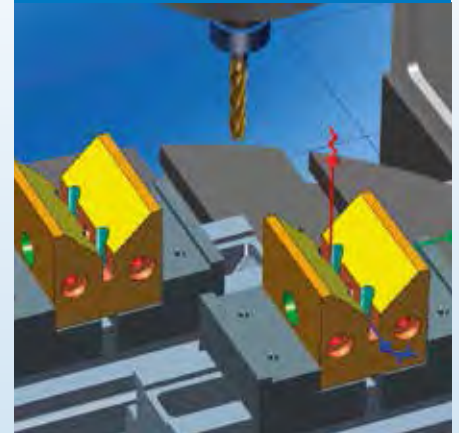
## RENEWABLE ENERGY



## MACHINE TOOLS & CNC



## CNC SIMULATION



## MATERIALS & PROCESSES



## INDUSTRIAL CONTROLS



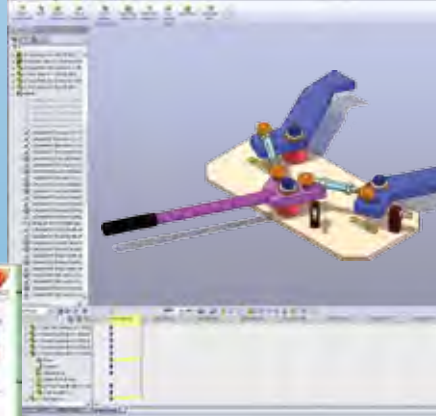
## HYDRAULICS



## AUTOMOTIVE



## 2D/3D DESIGN SOFTWARE



## PNEUMATICS



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