Rwanda Education Board

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Problem - Solving Skills for Development

In this issue:

Dr. John Rutayisire
Director General

FOREWORD

Dear readers,

I am pleased to welcome you to the second edition of the Rwanda Education Board (REB)'s quarterly newsletter.

While in our first newsletter edition the focus was on literacy, in this issue we are proud to share our efforts towards improving math and ICT education, through which students gain invaluable problem-solving and critical thinking skills. These are the skills for the 21st century, needed for Rwanda's future programmers, engineers, technicians, and entrepreneurs. These are the skills that Rwandans need to propel ourselves towards Vision 2020.

Here at REB, we are busy at work to ensure that Rwanda's children are developing the skills they and Rwanda need to thrive.

We hope you enjoy the newsletter.

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Problem-Solving Takes Flight

Math education prepares the next generation of pilots, engineers, entrepreneurs.

This year Rwanda boasted of its first female pilot joining the national airline, flying its regional jets from Kigali to Nairobi, Johannesburg, Lagos, and Dar es Salaam. In sub-Saharan Africa, Rwanda has the third easiest economy for doing business, as ranked by the World Bank, and is one of few countries on track to meet most Millennium Development Goals.

When pilots learn about a storm approaching, a business is threatened by an economic crisis, or a country is faced with the challenges of development, people must act without anyone telling them which information is relevant, or where to start, or what process to use to find a solution.

"Rwandan children need these skills in order to compete in the regional and international economy," says Anathalie Nyirandagijimana, a pedagogical norms specialist at REB. Problem-solving, logical thinking, and intelligent decision-making are the skills developed in mathematics, and it all begins in primary school.

Schools receive world-class math materials

P1 and P2 students at 90 schools are now enjoying

Children participating in an L3 audio lesson

"Problem-solving, logical thinking, and intelligent decision-making are the skills developed in mathematics, and it all begins in primary school."

new games, chants, songs, and poems in their daily math lessons, thanks to print and audio instructional materials developed by REB and the USAID-funded Literacy, Language, and Learning (L3) Initiative, implemented by the Education Development Center (EDC).

By 2016, the comprehensive teachers' guides and interactive audio instruction programs will be in use across the country for P1 to P4.

The materials, informed by the latest research in children's learning development, support teachers in delivering child-centered lessons. Group and pair work ensure that all children, even in the largest classrooms, participate. Children are physically active, standing up, clapping along to number chants, and searching for objects to count. Students are responding positively. "The enthusiasm in the class was built up, so the kids want to learn more," says L3's Francis Kihumuro, who developed materials.

Open-ended word problems, which require students to come up with their own questions as well as answers, are also introduced in the program.

Problem-Solving Takes Flight

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One such problem says "Muhire has 1 pencil. Shema has 3. What can you say?" This problem has many correct answers. Students may report that Muhire has fewer pencils than Shema, that Shema has two more pencils than Muhire, that if Shema gives 1 pencil to Muhire, they will have the same number of pencils, and so on.

"This open-ended problem is a better model of the thinking needed to solve the problems we encounter in real life," says Dr. Paul Goldenberg, L3 senior math specialist.

Teachers learn problem-solving

Problem-solving is front and center in REB and L3's three-day Math Camps. The first brought thirty teachers together in Karongi district in April 2013, and plans to host others across the country are underway.

In a typical classroom, students may chant multiplication facts, solve equation after equation copied from the board, but never solve a problem that prepares them for solving the real problems they'll encounter in their business or other pursuits. Math Camps introduce teachers to mathematical investigations, problem-solving exercises in a real-life context, which require students to figure out their own method for finding the solution.

"Investigations help students to develop key skills such as choosing appropriate strategies, making predictions, thinking critically, and making logical arguments," says Nyirandagijimana.

For instance, in one investigation it is imagined that seven people meet and that each person shakes hands with the others. Students must determine the total number of handshakes and come up with their own method for doing this.

"This open-ended problem is a better model of the thinking needed to solve the problems we encounter in real life" says Dr. Paul Goldenberg, L3 senior math specialist.

Once they find the answer, the teacher can ask them to predict how many handshakes would be made if twenty people met, which can produce a general rule. Solving this investigation allows students to think through combinations and permutation while also exercising their problem-solving skills.

"It is important that teachers understand that investigations are real mathematics," says VSO's Terry Ward, who supported the design of the Camps. "Students will use geometry, algebra, or other math, but the emphasis is on using that knowledge to strategically solve a problem."

At the first Camp, teachers worked together to puzzle through investigations, committing to introduce them to students in the next term.

"Investigations will help the learners to discover the different methods to find the solution for difficult things," said Noel Murekeyeyezu, a P6 teacher.

Mathematics education isn't just about knowing shapes, equations, and formulas; it should prepare students for the world in which they live. REB's focus on problem-solving is working to make that a reality, ushering in a new generation of pilots, engineers, and entrepreneurs.

A training of E-champions

Using ICT for Quality Education

Equipping teachers and students with ICT skills and connecting ICT innovators with educators.

The government has revised the Vision 2020 plan for Rwanda, making the targets even bolder, increasing the target GDP, life expectancy, and number of off-farm jobs, and further decreasing poverty levels. ICT, and in particular ICT in education, has always been an integral component of achieving this vision.

The use of ICTs isn't only for programmers, web developers, and technicians; ICT enhances teaching and learning in any subject and facilitates learning by doing and the development of problem-solving skills.

REB promotes the integration of ICT in education by equipping teachers with ICT skills, connecting innovators and educators, and putting child-friendly laptops into the hands of primary school children.

Over 3,000 e-champions trained

REB's e-champions initiative is building teachers' and students' confidence and skills in ICT, paving the way for using ICT applications as pedagogical tools.

"There is a belief in schools that computer labs are for ICT teachers only. They don't imagine an English or biology teacher using ICT in teaching," said Alex Nkurunziza of REB's ICT and ODel department. "We are trying to break that barrier."

In early 2012, REB staff trained over 1,000 teachers, university students, and recent graduates. The trainees formed ICT clubs, which then cascaded the training to more teachers.

In December 2012, 95 of these trained teachers and students trained more than 2,000 students and teachers, bringing the total of e-champions to 3,295 in 28 districts. In addition, 357 booklets on various topics were produced as part of the project-based learning of the training, and 57 ICT clubs were created.

"The training will also help improving the teaching

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methodology and the learning activities," said Diane Sengati from REB's ICT and ODel Capacity Development and Training Unit. "Using the project-based learning and learner-centered approach will enhance critical thinking and collaboration."

E-champions practicing ICT skills

ICT clubs have held various trainings and workshops, including one for head teachers on the use of video to provide important visuals in science classrooms. The student ICT club in Byumba taught primary students some basic computer skills and is planning to further support them in learning how to use the internet for research. "It helps students to understand better what they are learning through online practical exercises with illustrations," said Fabien Habimana, the president of the club. "As their computer skills develop, they can explore every angle of a subject."

Award-winning innovations for education

There are numerous ways to use technology in teaching and learning that span far beyond using the internet for research, and educational technology innovators are exploring those uses. The innovators are award-winners and participants from the first annual Rwanda International Conference on ICT in Education as well as the best of the e-champions. They are coming together through REB to promote and scale up their innovations in order to forge connections with the educators who need them.

Being able to clearly communicate their innovations to educators is the first step. "Many young innovators in ICT in education have great ideas but lack the skills of writing their ideas down in a professional way," said Nkurunziza. "In order to connect with MINEDUC, REB, or any company in the local or international market, proposal writing is essential." REB provided training in proposal writing to address this gap at the Educational Technology Innovators Workshop.

At the workshop, the 59 participants created a forum and four clubs to facilitate collaboration and synergy in their field. Innovators have already been submitting proposals to REB such as Rwandan Schools Online websites, integrated software for school reporting, and teacher training on mathematics' digital content development.

The latter proposal was by Emmanuel Ngezahayo, a gold prize winner at the international conference and a math teacher at Rusumo High School. He had realized the benefits of using ICT in math teaching and developed a guide to instruct educators on how to use Microsoft

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Office applications to write equations and sketch algebraic curves. "Using the curve sketching, they can check if what they have calculated corresponds to what they have sketched," said Ngezahayo. "It is very important for checking calculations."

In May 2013, Ngezahayo trained REB curriculum developers and math specialists. "Before, I would first draw graphs and then scan and attach it. But after this workshop, that's history," said REB exam specialist Nsengimana Jean Pierre. "I draw graphs using my computer thanks to the workshop."

Ngezahayo will soon train teachers on the applications, and next year, once students have developed their confidence in ICT tools, he'll start working with students on using ICT to sketch curves and write mathematical concepts.

"I want to form a student ICT and math club so that students will have the chance to use these tools," he said.

Children showcase programming skills

With child-friendly XO laptops, REB is cultivating the next generation of technology innovators. On May 18, Scratch Day was celebrated around the world to discover and highlight what children can do and create with the XO laptop.

"Scratch is a programming language that has been broken down into the simplest form for kids to understand," said Eric Kimenyi, Chief Technical Officer for One Laptop per Child (OLPC) at REB. "Kids put together different blocks which represent different programming language scripts or codes, and when put together, the students are able to create projects." Using Scratch, kids can create interactive stories, animations, games, music, and art.

Rwanda celebrated the day at the OLPC corner of the Kigali Public Library. A girl and boy student from GS Gisozi, GS Kimisagara, EP Nonko, GS Kicukiro, EP Gitega, and EPAK Kimihurura exhibited their Scratch projects.

Uwase Kevin, a P6 student from GS Kimisagara, created a project called "Right to Play." Her animation shows two boys, one who is able to play with others, and one who is not. The first boy helps the second to get involved.

"It is very rewarding to see students who are able to create a project at such an early age. They have to pick a theme to present about then proceed with structuring it and then be able to code it," Nkubito Bakuramutsa, National Coordinator of the OLPC program, mentioned. "Through scratch

A scene from a P6 student's Scratch project

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programming, students learn logic and problem solving which in high school will lead to basic robotics."

Distribution of the XO laptops, now at the sector level, will ultimately give all children the opportunity to explore their potential for creation. To date, OLPC has distributed over 201,902 laptops to more than 400 schools country-wide. Most of these are in rural areas to help bridge the digital divide in access to knowledge between urban and rural schools. This is made possible thanks to the major contribution from EWSA, the Rwandan electricity company, rolling out solar panels where the grid does not reach.

REB aspires to promote Rwanda's development through the use of ICT in education. Doing so will not only encourage the next generation of programmers and technicians, but also will give all children the chance to be creative and learn through discovery.

Primary students collaborating on Scratch project

> "It is very rewarding to see students who are able to create a project at such an early age," –Nkubito Bakuramutsa

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Acknowledgements

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EDC Learning transforms lives.

one laptop per child

VSO

About REB

In November 2011, REB was formed when a number of Ministry of Education (MINEDUC) institutions were merged as REB departments. With increased efficiency, coordinated management, and collaboration, REB has the mandate of fast tracking education development in Rwanda.

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