Science and technology awareness for preschool children: A case study

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INTRODUCTION

A serious problem that needs to be addressed with urgency in South Africa is the skills shortage that exist. The Youth into Science Strategy document (2006) from the Department of Science and Technology states that career sectors most affected by skills shortages are professional engineers, scientists, surveyors, chartered accountants, actuaries, project managers, artisans and information technology specialists.

TekkiTots is part of the Young Engineers of Africa (YESA) research area within the emerging technologies group of ICT in education, youth and gender research group at the Meraka Institute of the CSIR. The aim of YESA is to increase the pipeline for the generation of more scientists, engineers and technologists by creating opportunities to grow interest and involvement of learners, starting from the Grade R-level right through to Grade 12.

OBJECTIVE

The goal of TekkiTots is to introduce the words 'science' and 'technology' to preschool children as an age-appropriate, meaningful positive experience. The intention is that children will then have these positive experiences as references to support their developing interests and attitudes towards science and technology.

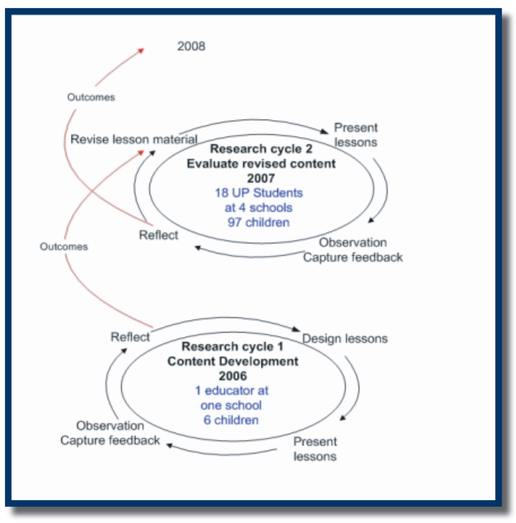
The intended outcomes of TekkiTots are:

- Children with positive attitudes towards science and technology
- The words 'science' and technology mean something to the children.

METHOD

The TekkiTots project is based on the action research approach of Zuber-Skerritt as cited by Louw, as a method with the purpose to gain knowledge and appropriate skills in a preschool environment. Through action research it is possible to get first-hand experience and understanding of the challenges for a preschool teacher/educator when introducing science and technology to preschool children.

Action research is a cyclical process where the outcomes and experiences of the first cycle serves as input for the actions and research in the next cycle. Each action research cycle includes planning, acting, observation and reflection. The result is then the refinement of the actions planned for the next cycle.



THE MODEL

OUTCOMES

2006 Cycle 1	2007 Cycle 2	Current 2008
One school (Morning Star Montessori)	4 schools Morning Star Montessori, Brooklyn Pre Primary, Sunnyside Pre-Primary, Swaan en Flamink Kleuterskool	7 schools Morning Star Montessori, Brooklyn Pre Primary, Sunnyside Pre-Primary, Unisa Centre, Tomorrow's People Hatfield, Panda Pre-Primary Hazyview, Floralise Preschool
One educator (Meraka Institute)	18 students from University of Pretoria Engineering, Built Environment and IT faculty volunteered as part of the JCP community project module with Dr Jordaan	26 + students from University of Pretoria Engineering, Built Environment and IT faculty volunteered as part of the JCP community project module with Dr Jordaan
6 children	97 children	140 + children
Logistics for one group	Logistics for 4 groups	Logistics are handled by students and Dr Jordaan
Outcomes: Lesson material evaluated Morning Star Montessori wants to continue with the project in 2007 At another preschool the teacher said that the content was too advanced for the children after three lessons on electricity. Feedback from the children was, however, positive. This emphasises the importance of the teacher's attitude toward success or failure of such an intervention.	Outcomes: Students presented 8 lessons of choice at preschools Positive attitudes of students, parents and teachers towards science and technology Variables between groups identified Logistical issues identified Requests from schools to return next year	Outcomes: In progress Introduce cut-off dates for students to enroll in the project. Students tend to delay and want to start as late as September: This might result in a rushed intervention where quality might suffer Identified the need for project plans from students: This will ensure continuous exposure versus once- off exposures Requests from schools to put their names up for TekkiTots next year

Comments from students 2007

"We were strongly touched by the kids of Brooklyn Pre-Primary. The irony is that we learned so much - beyond our expectations - and hope that they will build upon the foundations we laid down. TekkiTots was the highlight of our year."

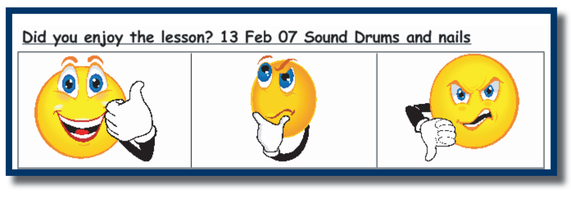
What we have learned:

- Patience. Teaching young kids is not the same as teaching adults; they take time to understand things; you need to be patient.
- Team player. Doing the JCP projects with my group taught me a lot of interpersonal skills. How to integrate people's ideas with mine and working together in a group to achieve a certain goal.
- Time management. Managing my time between school and the 40 hours I had to do for JCP.
- Communication skills. It is very difficult to get kids to understand what you are trying to teach them. You need to put certain things in a language that they understand.
- You also need to use special techniques in order to get their attention or calm them down when they get out of control.

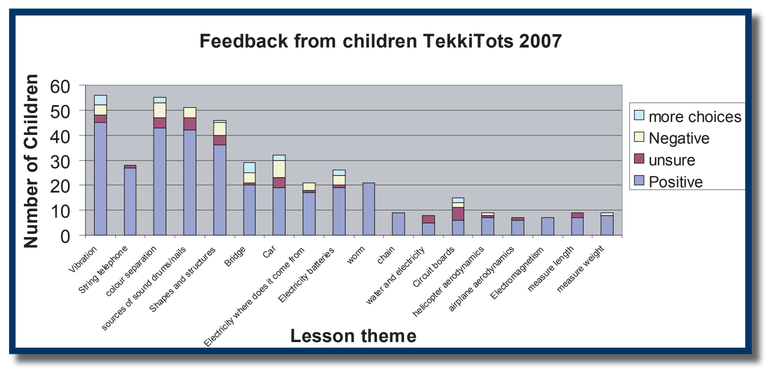
Comments from schools and parents feedback 2007

	Morning Star Montessori	Brooklyn Pre-Primary	Sunnyside Pre-Primary	Swaan en Flamink Kleuterskool
School/ teachers	"Thank you for everything you have done for us. Love Jenny, Teachers and Children Morning Star Montessori" TekkiTots's first pilot was at Morning Star Montessori. Jenny Miller is a person with a heart for children and their development. She identified the need for science and technology at her school, and guided and supported every interaction with the children. This has resulted in the TekkiTots programme running at her school for the third year in 2007.	"Big words should be explained in a simpler language, but you can teach the words – they love big words. Children enjoy experiments and it is great that they get exposed to it." "I think it is a very good idea to expose little ones to science and technology, but it must be fun."	"This has been an exciting project. We feel honoured to have been part of it. The children were always anticipating their arrival. Each and every activity and treat was accepted with enthusiasm. Much appreciated."	"It could be helpful to the students to attend a day or two at a pre-primary school to observe and see how the teacher interacts with the learners, see how discipline is handled and lessons are presented. Overall the students did a good job."
Parents	The parents at Morning Star Montessori supported the TekkiTots programme at the school.	"It exposes children to modern technology, which is important. It stimulates the child's interest in how things around him work. It could also spark an interest of a possible future career. Thank you for delivering such an important service." "Please continue this programme – children have enjoyed it and learnt valuable lessons."	"Congratulations for your work. Do not stop there. If you can continue in grade 1, 2, 3 and so on. It should be compulsory to matric." "Lessons must continue for the benefit of all kids and exposure." "Thanking the UnivPret. For their efforts and all involved. Hoping they have gained more than they hoped for." "The lessons are good and I would thank you for what you are teaching our children."	"I think it is great te expose children from so early an age to science." (quote translated from Afrikaans) "Chrisjan enjoyed the Tekkitots a lot – always shows us what you did. He also wants to do the experiments at home." (quote translated from Afrikaans)

Children 2007



Introducing science and technology to tomorrow's scientists, engineers and technologists: YESA creates opportunities to grow the interest and involvement of learners, starting from Grade R.



CONCLUSION

The outcomes that were initially overlooked were the influence the project would have on the teachers and parents. A person is more inclined to teach subjects of personal interest and background. The UP students at the Engineering, Built Environment and IT (EBIT) faculty all have Grade 12 science and therefore have enough subject background to feel comfortable to present the simple content to preschool children. These students are enthusiastic and positive about the TekkiTots intervention and have a positive influence on the preschool teachers. The teachers get the opportunity to stand back and facilitate the TekkiTots lesson from a comfortable distance, but have the opportunity to engage and continue with TekkiTots for another year. A good example where teachers will 'replace' the teacher, is at the Morning Star Montessori Preschool where the teachers will be presenting science and technology in 2009. The parents are reached through the child's experiences at school. The students valued and enjoyed the opportunity to work with the children. It is important to remember that these students will be tomorrow's parents who will have positive influences on their children and the children they have to care for.

Science and technology can be successfully presented to preschool children at a level they can understand.

The question lies in the sustainability and scalability of such interventions to try and reach as many children, teachers and parents as possible. Critical contributors to the success of the TekkiTots project are:

- A champion to take personal ownership of the project
- Dr Martina Jordaan and the community-based project she runs for students in the University of Pretoria, Engineering, Built Environment and IT faculty
- Energetic, enthusiastic students from the University of Pretoria
- A school and teachers with a positive attitude or willingness to allow the project in their school
- Preschool children
- Parents allowing their children to explore science and technology
- Lesson content and material.

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2. Jenny Miller and Morning Star Montessori Teachers and Parents, Brooklyn Pre-primary, Sunnyside Primary, Swaan en Flamink, Tomorrows People Hatfield, Unisa Centre and Floralise preschools

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