

TARMII_{fp} Highlights

Technological innovation to improve teaching
and assessment practices

TARMII_{fp}



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1 | Introduction

The past two decades have witnessed technological innovations that have transformed our work places, our institutions and our daily lives. These innovations have also transformed the way we access information, communicate and learn. So far, however, it seems that these technological innovations have not significantly transformed our schools or the teaching and learning process in classrooms.

A recent Organisation for Economic Co-operation and Development (OECD) report indicates that in educational systems where technology is used, research analysis indicates that the impact on teaching and learning is limited and often disappointing. This disappointment raises critical questions about our level of understanding of the ways in which technology should be developed and used to support teaching and learning.

In South Africa, a variety of challenges faced by the few provinces that have attempted to integrate technology into schools provides a clear testimony of the need for further research in this area. Furthermore, the recent initiative by the South African government to provide support and training to schools in all provinces, and their effort to integrate technology into their daily processes, increases the urgency for this kind of research.

This document presents the highlights of a research project report. The report is based on the development and pilot of a technological innovation, intended to support the South Africa Foundation Phase teachers in their teaching and assessment practices. We refer to this project as TARMIfp – Teacher Assessment Resources for Monitoring and Improving Instruction for Foundation Phase teachers.

2 | What is TARMIfp?

The TARMIfp software is designed to support teachers in their daily assessment responsibilities. The aim is to improve both teaching and learning in the foundation phase.

Imagine a technological innovation that provides the opportunity for teachers to:

- Access quality assessment activities relevant to what they are expected to teach on a daily basis;
- Contribute to the development of these assessment activities;
- Contribute to the improvement of existing assessment activities;
- Generate assessment tasks for learners;
- Record learners' responses to these activities;
- Generate reports of learners' performance; and
- Access video clips and PDF resources to support teaching and assessment practices.

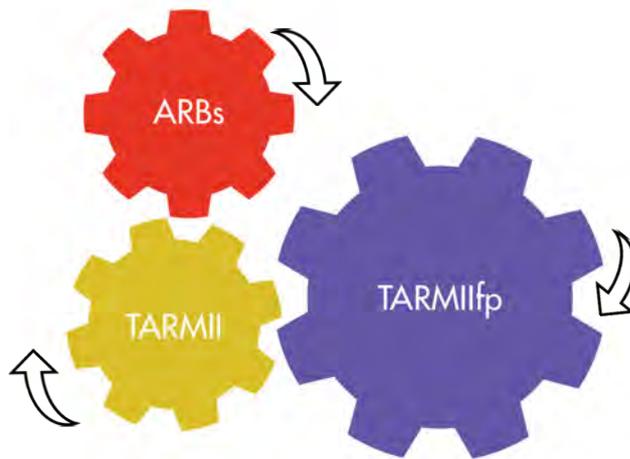
Then, imagine the possibility of teachers accessing this innovation through their language of instruction and using the technology for monitoring purposes, which provides them with the required support and motivation.

The development of the TARMIfp system is moreover based on an open source platform, allowing school systems to make changes and adaptations on the system to suit their contextual needs.

3 | TARMIfp History

The figure below represents the development of TARMIfp.

Figure 1.1 Genesis of TARMIfp



For the past ten years, the Human Sciences Research Council (HSRC), in collaboration with the South African Department of Basic Education (DBE), has been involved in initiatives to help improve teachers' assessment practices. These initiatives included the development of the Assessment Resource Bank (ARB). The ARB is a database of quality-assured curriculum-relevant assessment items that have been made available to teachers free-of-charge.

The ARB materials were first developed in a paper format, which allowed schools and teachers to photocopy the originals for class use. The success of the initial ARBs led to the development of the first version of TARMII (Teacher Assessment Resources for Monitoring and Improving Instruction), a software program that included an electronic database of assessment items. An innovative edge unique to the TARMII system was the ability of the software to generate a series of diagnostic reports based on overall class performance as well as individualised learner performance.

These reports were expected to help teachers with the necessary information and insights to inform remediation strategies and support for learners. The change of the South African Curriculum in 2011 from the National Curriculum Statement (NCS) to the Curriculum Assessment Policy Statements (CAPS) resulted in a discussion around the re-design of the TARMII software to align this with CAPS.

In 2012, as part of the School Capacity and Innovation Program (SCIP), initiated by the United States Agency for International Development (USAID) and The ELMA Foundation, the HSRC submitted a proposal for the development of TARMIfp. TARMIfp was intended to be an extension of the TARMII program for South African foundation phase teachers. In line with the USAID (SCIP) objectives, TARMIfp was designed to assist teachers with improving the literacy development of Foundation Phase learners in South African schools. The design of the TARMIfp system was guided by improvements, suggestions and experience gained from the development of the first TARMII software.

4 | Uniqueness of TARMIfp

Figure 1.2 reflects some of the unique innovations on the TARMIfp system.

Figure 1.2 TARMIfp innovative design concepts



The innovations include:

- The localisation of the interface that would allow for access to software in the South African indigenous languages;
- The dynamic state of the Activity Bank that allows teachers to write and share assessment activities;
- The creation of an advanced filter facility that allows for a range of options when selecting assessment activities;
- The ability of the software to communicate information about teachers' use of the software;
- Teachers' access to a resource bank of printable PDFs and video resources to support assessment and instructional practices; and
- A facility that allows teachers to customise the rubric provided for each activity.

The figure below represents the key functions of TARMIfp.

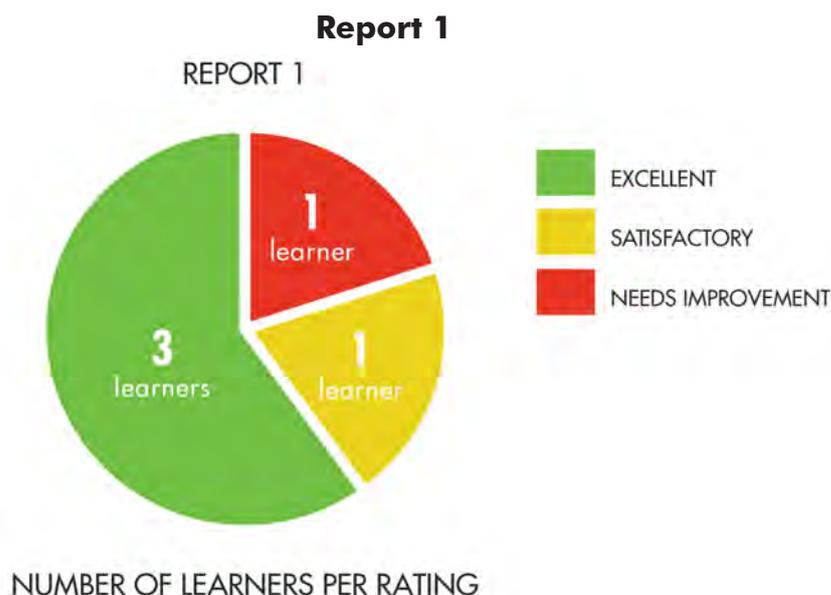
Figure 1.3 Key functions of TARMIfp



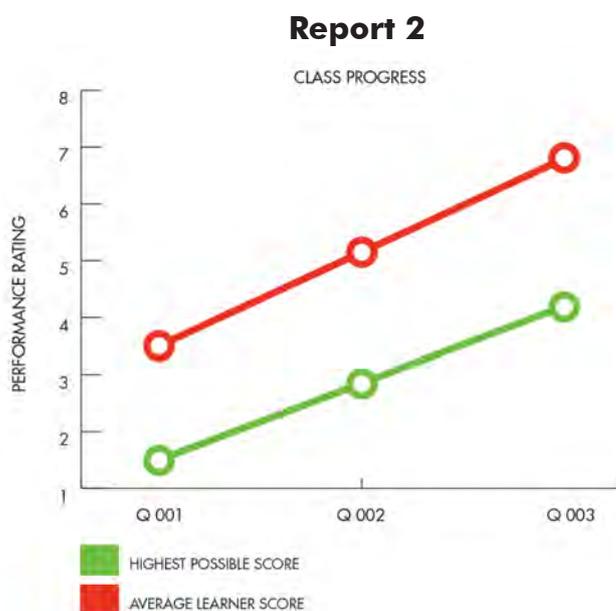
5 | The Diagnostic Report Function

This component (Figure 1.4) is the “gem” of the TARMIfp software program. In order to generate these informative reports and graphs, it is important that each and every response per assessment activity is recorded on the system. Only on completion of this would the system be able to generate the six reports or outputs as shown in Figure 1.4. The first five reports provide the teacher with diagnostic feedback of the class. The sixth and final report is the mark list, which provides a record of learner scores over time. The system also allows a teacher to generate a PDF version of each of the six reports. These reports can then be utilised to give feedback to parents.

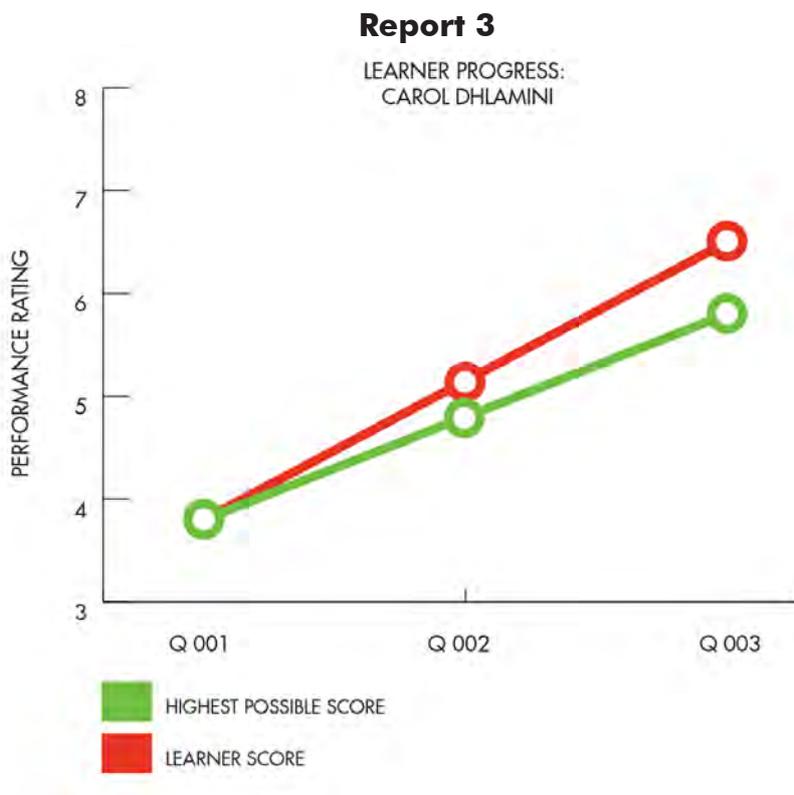
Figure 1.4 TARMIfp diagnostic reports



Report 1 presents the overall feedback with regards to learner performance for each item tested. The report is based on the rating scale for each item, the legend guides the teacher on how to read the pie chart. Each sector of the pie chart has the total number of learners who achieved in that scale.



Report 2 represents the overall class performance per item tested. The legend guides the teacher on what each of the two lines represent. The green line and green data point indicates the highest possible score for the specific item. The red line and red data point reflects the average learner score in the class for the same item.



Report 3 represents the performance per items tested for an individual learner. The green line and green data point indicates the highest possible score for the specific item. The red line and red data point reflects the score of a selected learner in the class for the same item.

Report 4

STRENGTHS

ACTIVITY THAT THE HIGHEST NUMBER OF LEARNERS ANSWERED CORRECTLY	Q004
ACTIVITY THAT THE SECOND HIGHEST NUMBER OF LEARNERS ANSWERED CORRECTLY	Q001

WEAKNESSES

ACTIVITY THAT THE HIGHEST NUMBER OF LEARNERS ANSWERED INCORRECTLY	Q003
ACTIVITY THAT THE SECOND HIGHEST NUMBER OF LEARNERS ANSWERED INCORRECTLY	Q002

Report 4 supplies the teacher with an indication as to the level of difficulty of the items answered by the learners. The green blocks indicate the two questions that learners found easy and the red blocks represent the two questions learners had difficulty answering.

Report 5

	Q001	Q002	Q003	Q004
CAROL DHLAMINI	EXCELLENT	MERITORIOUS ACHIEVEMENT	GOOD	MERITORIOUS ACHIEVEMENT
KENNETH MVULENI	GOOD	EXCELLENT	MERITORIOUS ACHIEVEMENT	NOT RATED
KEVIN SPRIEMAN	EXCELLENT	MERITORIOUS ACHIEVEMENT	NOT RATED	EXCELLENT
MZO JACOBS	GOOD	NEEDS IMPROVEMENT	GOOD	GOOD
RACHEL JONES	EXCELLENT	MERITORIOUS ACHIEVEMENT	MERITORIOUS ACHIEVEMENT	MERITORIOUS ACHIEVEMENT
URSULA PATEL	NEEDS IMPROVEMENT	EXCELLENT	MERITORIOUS ACHIEVEMENT	GOOD

Report 5 serves as both a learner as well as item report. The teacher can use the report to identify individual learner performance across all items and thus identify learners who are performing weakly or the teacher may use the report to identify problematic items that might be too easy or too difficult for learners in that grade.

Report 6

LEARNER	TOTAL SCORE	MAX SCORE	PERCENTAGE	RATING CODE
KENNETH MVULELI	6	8	75	6
KEVIN SPRIEMAN	3	8	37	2
MZO JACOBS	3	8	37	2
RACHEL JONES	5	8	62	5

RATING CODE	DESCRIPTION OF COMPETENCE	PERCENTAGE
7	OUTSTANDING ACHIEVEMENT	80 - 100
6	MERITORIOUS ACHIEVEMENT	70 - 79
5	SUBSTANTIAL ACHIEVEMENT	60 - 69
4	ADEQUATE ACHIEVEMENT	50 - 59
3	MODERATE ACHIEVEMENT	40 - 49
2	ELEMENTARY ACHIEVEMENT	30 - 39
1	NOT ACHIEVED	0 - 29

Report 6 serves as a composite report per test for each class. This report supplies the teacher with a mark list that comprises of the max score as well as the learners score. The learner score is then converted to a percentage. The conversion table below the class list converts the learner percentage to a rating scale and accompanied competence description as guided by the South African CAPS document.

5.1 The Teacher Resource Module

The resources in this module include:

- simple wall charts;
- alphabet charts;
- hand writing formation work sheets;
- weather charts; and
- other key resources required in the Foundation Phase.

We refer to this as a static resource bank. This module also has a number of simple, short, animated video clips. These video clips focused on certain key aspects of teaching certain skills in the Foundation Phase (handwriting, phonics, holding a book and holding a pencil). An important design of the module is a filter that allows teachers to easily select and identify resources.

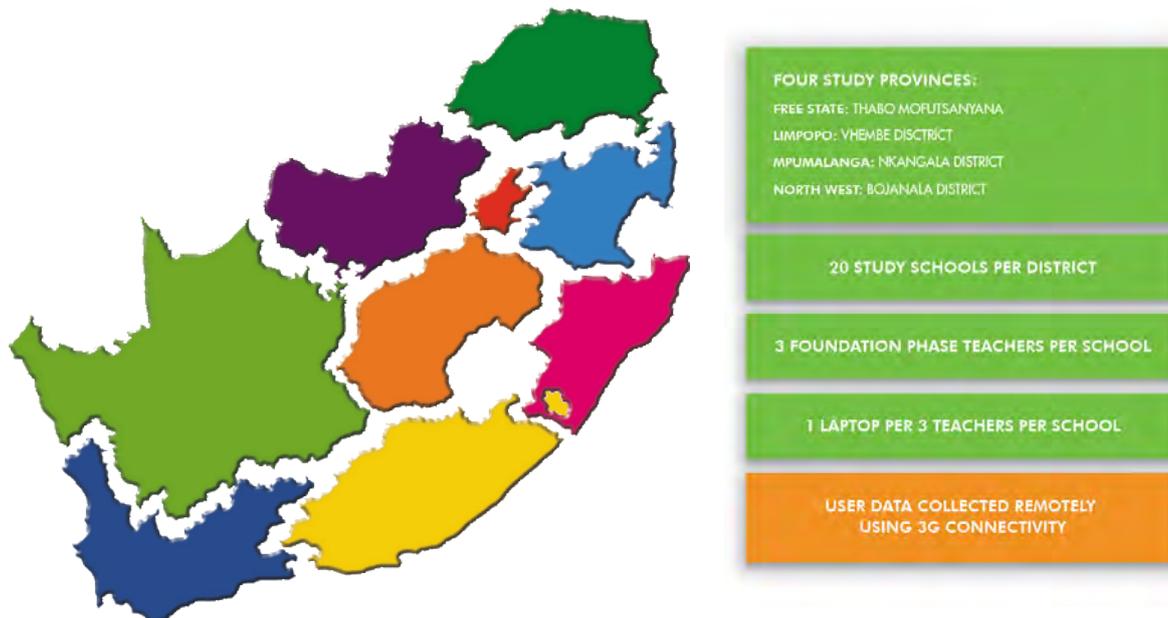
6 | Pilot of TARMIfp in South African Schools – Participatory Approach

Following the TARMII design, we decided to pilot the TARMIfp software in schools from four of the nine provinces in South Africa. In each of the four participating provinces, 20 schools were selected for intervention (as experimental schools). These schools were matched with 20 other schools that served as control schools. In each experimental school, we worked with three Foundation Phase teachers – one teacher from each Foundation Phase grade (Grades 1, 2 and 3).

We gave a laptop installed with the TARMIfp software to the teachers participating in the project. We also gave each school a 3G dongle that allowed the teachers to connect their laptop to the internet. An important aspect of the pilot process was our participatory approach where we made a conscious effort to involve our stakeholders (districts, school principals and teachers) in our decision making. This was done through advocacy meetings with these stakeholders and by setting up a steering committee in each district to co-ordinate and oversee the implementation of the TARMIfp project. This participatory approach was intended to help the schools and the districts develop a better understanding of the research project and, most importantly, take ownership of the project.

Figure 1.5 sets out the implementation of the project.

Figure 1.5 Project implementation



7 | Collaboration with the Districts

In South Africa, the districts play a fundamental role in overseeing the implementation of all new policies developed at the national and provincial level. Furthermore, they support schools with resources, systems and professional development. They also monitor their utilisation of inputs and achievement of targets and influence the implementation of school-level interventions.

We believe that the successful implementation and the sustainability of the TARMIfp initiative depended upon the districts' ability to provide effective co-ordination and monitoring of interventions at school level. We, therefore, made a conscious effort to engage with senior personnel within the four districts where we emphasised the need to integrate the TARMIfp intervention activities into district plans. These four districts are:

- Bojanala district (North West);
- Nkangala district (Mpumalanga);
- Thabo Mofutsanyana district (Free State); and
- Vhembe district (Limpopo).

We set up steering committees in the four provinces and districts to ensure achievement of project objectives, to guide implementation of the project and to serve as an accountability structure. We recommended that steering committee meetings be chaired by a senior official within the district.

These meetings were used as platforms to discuss:

- annual project plans,
- school, teacher and learner data collection;
- training of district officials and teachers;
- teacher training and monitoring; and

- support of teachers.

Furthermore, we collaborated with the district in matters such as identifying service providers for training Foundation Phase teachers, getting district officials to make inputs to the Basic ICT training manual and having district officials facilitate basic ICT and TARMIIfp software training sessions within their respective districts.

Collaboration with the districts through all phases of the project implementation seems to have generated some success. For example, in the Bojanala district in North-West, the e-Learning Co-ordinator initiated follow-up TARMIIfp training sessions when it was realised that teachers had not fully mastered use of the software.

In three districts the monitoring and support of teachers in TARMIIfp was done by subject advisors during their regular school visits. This was possible where, for example, the district had integrated monitoring and support visits into the implementation plan. In the Thabo Mofutsanyana district, TARMIIfp implementation progress was reported upon at monthly provincial meetings.

The collaboration with the districts also facilitated our advocacy meetings with principals and teachers in the participating schools. Through these meetings, we were able to discuss and explain the project activities in the TARMIIfp system. We emphasised the need for co-operation between the HSRC research team and the schools involved. Most importantly, we encouraged the participating schools to see this project as an opportunity for them and the HSRC research team to develop an understanding of how technology should be used to help them improve their teaching and assessment practices.

8 | TARMIIfp – Assessment Activities

The development of assessment activities was guided by the Curriculum and Assessment Policy Statement (CAPS). CAPS outlines the different components of the literacy skills that learners in the Foundation Phase are expected to develop. We contracted Foundation Phase teachers and curriculum advisors to develop the required assessment items. We believe that the involvement of teachers in developing assessment items for the system will help them develop a sense of ownership and therefore contribute to the sustained use of TARMIIfp. One thousand assessment items per grade were developed in English Home Language (EHL). These covered the following language components: listening, speaking, reading, phonics, writing and handwriting.

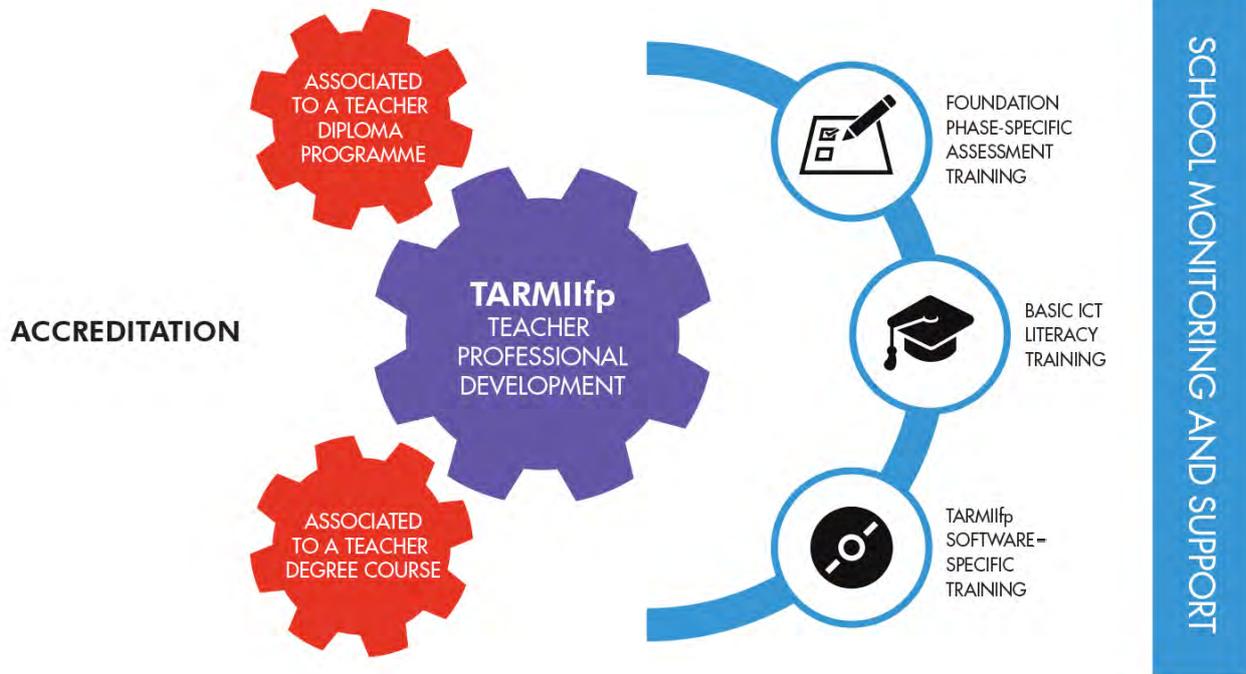
The English assessment items were later reversioned into the other ten official languages. We ensured that reversioning was done by home language speakers located in the provinces where the project was being implemented. For example, reversioning into Tshivhenda was done by subject advisors in Vhembe district.

During the item development process, we realised that Foundation Phase teachers interpreted the CAPS differently. This was evident in the draft assessment activities that teachers submitted to the HSRC. To counter this, the HSRC team sought to interact and consult with more teachers, district officials and other education-allied professionals outside the school systems. This was done to get a good understanding of what is expected of teachers to implement the CAPS successfully in the classroom. This process was helpful in giving insights into CAPS implementation and the information was shared with developers of the assessment activities in TARMIIfp.

9 | Professional Development for TARMIfp

Figure 1.6 illustrates the professional development for the program.

Figure 1.6 Professional development for TARMIfp



The professional development for TARMIfp had three main components:

1. Assessment training that emphasised understanding of teachers' formative assessment needs;
2. Basic computer skills development; and
3. TARMIfp-specific training to help teachers use the software.

About 240 Foundation Phase teachers from 80 schools had the opportunity to use the software. These teachers were based in four districts in four of the nine provinces in South Africa. For most of these teachers, this was their first opportunity to use technology in their teaching. It was therefore not surprising that their use of the software in the 2014 academic year did not significantly improve the literacy development of their learners when compared with learners in the control group we set up with similar background characteristics. Most teachers are able to access teaching and assessment materials from the system, but only a few could use the diagnostic function.

We advocate for a long-term professional development program with certification that would serve as an incentive for teachers to engage meaningfully with the software. We hope the Department of Basic Education could engage teacher education institutions to facilitate this certification processes.

10 | Challenges Uncovered by the TARMIfp Project

The TARMIfp project uncovered a number of challenges as set out below.

Figure 1.7 Challenges uncovered by the TARMIfp project



These challenges would need to be addressed for a successful implementation of TARMIfp in schools.

11 | TARMIfp and Operation Phakisa

The TARMIfp project also has implications for 'Operation Phakisa', a South African Government initiative to scale up technology integration into all schools. The operation intends to adopt the "Big Fast Results (BFR)" model. The BFR model was initially developed and successfully implemented in Malaysia and requires a reliable theory of change along with monitoring, evaluation, reporting and an accountable framework to track the successful implementation of the technology integration processes.

The TARMIfp software can easily be adapted to serve as a management system that can be used to guide the implementation of Operation Phakisa. As we have indicated, the remote facility system on the software would also help us to develop a professional development program that would allow us to track teachers' meaningful engagement with technology to improve teaching and learning.

We have argued for the critical role of professional development and the need for the active involvement of teacher education programs and research institutions to guide this process. Just imagine, in each of South Africa's nine provinces, we have universities and research institutions working alongside the DBE. Working together to create professional development and graduate programs for teachers and other educational officials would surely produce leaders and agents of change that would lead to the success and sustainability of Operation Phakisa.

12 | Meaningful Experimentation Required for Successful Implementation of TARMIfp

Given the complexity of the processes required to effectively stimulate and support desired innovations and the variation in contextual factors within schools required for this change, we would like to advocate for the development of a culture of meaningful experimentations within schools and districts.

Meaningful experimentation refers to the idea that desired change resulting in improvement is possible through building a culture that allows teachers the opportunity to continuously experiment with innovations.

This culture can be built through professional development initiatives and teachers' participation in research projects such as TARMIfp. These research projects and professional developments should actively involve teachers in the research activities, and most importantly, help them to understand how to use their participation to innovate and improve upon the teaching and learning process. We advocate for an educational policy that supports professional development programs and research activities that encourage meaningful experimentations in the teaching and learning process.

Meaningful experimentations would require both expertise and incentives. The current expertise gained through professional development and usual teaching hours might not be enough. Teachers would need to gain expertise outside school through, for example, college or university courses. It would help to incentivise these courses with a credited certification for teachers who complete the course. These courses would have to emphasise teachers' demonstrated use of the innovation and the impact on teaching and learning through action research.

13 | Linking TARMIfp to the South African Annual National Assessment (ANA)

The South African Annual National Assessment (ANA) can also help in the scaling up of the TARMIfp system. The ANA is a national diagnostic assessment program designed to monitor and track learners' literacy and numeracy development. As a diagnostic tool, the ANA is expected to provide South African teachers with evidence about their learners' numeracy and literacy development. It will also inform the design of teacher training and development programs. The programs will focus on improving teachers' content and pedagogical knowledge. Teachers are therefore expected to use the ANA to:

- Analyse the performance of each learner and identify areas of strengths and weaknesses;
- Develop remedial techniques to address areas of weaknesses; and
- Track and compare the performance of a cohort of learners.

The current TARMIfp software can easily be modified to help teachers with their analysis of the ANA data of their learners. We strongly recommend this modification as this would serve as a great incentive for teachers to use TARMIfp.

14 | Considering Schools as Units of Analysis in Scaling up TARMIfp

The scaling-up process should consider schools as the unit of analysis for the success of TARMIfp. It must be recognised that among schools, processes that would lead to a successful implementation might differ. It would therefore be important to carry out a thorough needs analysis for all schools involved. This would require the active participation of teachers and principals with a clear understanding of how addressing the needs identified would lead to a successful implementation of the TARMIfp program.

Within each school, there should be a commitment to regularly track teachers' experimentation with the software and resulting changes, leading to a meaningful impact on teaching and learning. Each school should serve as their own laboratory, tracking their successes and building a culture of improvement based on research evidence. The districts and research intuitions involved should provide support and incentives for the development of this culture.

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