



Building on what works in education

Concise summaries of ongoing policy research aimed at helping to improve the national education system

Options for talented learners from disadvantaged backgrounds

MANY learners from disadvantaged backgrounds capable of obtaining university entrance passes in mathematics do not do so either because their schools do not teach mathematics, or the tuition is inferior. In recent years the private sector has initiated a number of projects aimed at realising this potential. CDE commissioned JET Education Services to study some of these programmes in order to establish what makes them successful, and whether any of them could be taken to scale.

TEN PROGRAMMES aimed at realising the potential of talented children from poor households were surveyed (see box). This is not an exhaustive list, and there are a number of other projects or programmes with the same objective. The selected programmes were visited, programme managers interviewed, and programme documents read.

The programmes vary widely in terms of the interventions offered, and consequently have very different cost structures. While all the programmes studied seem to provide a valuable service to the learners they have selected, none of them had been externally evaluated at the time of the survey. As a result, a scientific cost–benefit analysis could not be conducted, and it was not possible to assess the extent to which any of the programmes could or should be taken to scale. Nonetheless, the exercise has provided some important new insights into privately funded education initiatives.

TEN PROGRAMMES STUDIED	
St John's Academy: three years extra tuition	Enrichment at school – 3 years extra tuition in grades 10-12 for selected boys from disadvantaged backgrounds drawn from nearby
Star Schools: supplementary education	Enrichment at school – 1000 learners with potential from disadvantaged background given extra lessons, etc
Sekolo sa Borokgo: independent non-profit school	Specialist school with placement – 100 per cent African pupils in Jhb North suburbs focused on science, maths, and English
LEAP Science and Maths Independent Schools	Specialist school with placement – 100 per cent African pupils in 3 CT and Jhb schools focused on science, maths, English
St Barnabas College: focused learning school	Placement in existing schools – Bosmont, Jhb 50 per cent African pupils drawn from wide region with focused learning in science and maths
Alan Gray Orbis Foundation: school placement programme	Placement in existing schools – Representative racial spread of high potential pupils placed nationally in Circle of Excellence Schools
Independent Schools Association: Maths and English programme	Placement in existing schools – 19 participating private schools take 333 pupils from disadvantaged backgrounds in grades 10-12
Make A Difference Foundation: placement programme	Placement in existing schools – 52 high potential learners placed in mainly W Cape schools with records of good results
Scientific and Industrial Leadership Initiative training	Placement in existing schools – CT catch-up programme followed by placement in high-performance public and private schools
Student Support Programme: placement programme	Placement in existing schools – Jhb/Pretoria/EL programme for placement scholarships from grade 7 upwards

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Programme types

The sample can be broken down into two main types: enrichment programmes and placement programmes.

- Enrichment programmes are those which leave children in their current schools and provide additional classes outside of school hours. They can be further classified according to whether they are held on school premises, or at venues other than schools.
- Placement programmes are those which take talented children from deprived backgrounds out of their schools, and often out of their homes and communities as well. They can be further broken down into two types:

- Specialist mathematics and science schools which select learners on the basis of talent in mathematics; and
- Learner placement programmes which place talented learners in existing schools.

Enrichment programmes offer supplementary lessons to learners over and above their normal school education. Learners remain in their own schools during normal school hours and receive extra lessons in the afternoons, on Saturdays, or during school holidays. These programmes support learners, and do not replace normal schooling. Examples of enrichment programmes that focus on mathematics, science and English are the St John's Academy and the Star Schools Maths and Science Incubator Programme.

Special mathematics and science schools – such as Sekolo sa Borokgo and the LEAP Schools – may be sponsored by the private sector, or may be established by a provincial education department. One example of the latter option is St Barnabas College, originally a non-government initiative, which was taken over by the Gauteng Department of Education.

The most common type of programme places selected learners in existing public or independent schools with a track record of producing good mathematics and science results. Examples include the Allan Gray Orbis Foundation (AGOF) Scholarship Programme, the Maths and English Programme of the Independent Schools Association of South Africa (ISASA), the Make a Difference (MAD) Foundation, the Scientific and Industrial Leadership Initiative (SAILI), and the Student Sponsorship Programme (SSP).

Selection of learners

The concepts of aptitude and achievement are closely related, yet distinctly different. Aptitude refers to the inborn potential to perform a specific task or learn a specific skill. Achievement refers to current performance, or level of mastery in a specific area.

Aptitude tests generally produce very reliable results, and can provide standardised, consistent, and valid predictions of a learner's future success in a specific area. However, they are relatively expensive, require specialised administrators, are not readily available in all official languages, and cannot easily be adapted to specific needs.

By contrast, achievement tests are more readily available in all languages, easier to develop and administer, can be relatively easily adapted to specific needs, and are available in more forms and more languages. Furthermore, reliability and validity data are usually available for standardised achievement tests.

Neither aptitude tests nor achievement tests used in isolation are sufficient predictors of future academic success. Research in the United States, for example, has shown that only 25 per cent of students' grades could be explained on the basis of commonly used test scores. Thus 75 per cent of students' grades are explained by factors such as motivation, determination, personality, emotional maturity, and study habits.

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St John's Academy is the only programme that does not test learners: it selects its learners on the basis of recommendations from educators at the learners' schools, together with an interview. The Academy does not seek to corroborate these recommendations, as it believes the educators have been successful in identifying talented learners who have an aptitude for mathematics but lack the basic foundations in mathematics, science and English they should have received in primary school.

Two of the organisations interviewed – the Make A Difference Foundation (MAD) and St Barnabas College – use aptitude tests to select learners. The MAD Foundation believes this is a scientific way of identifying learners with aptitude and, although very expensive, it has proved to be an accurate approach. St Barnabas College uses the Global Scholastic Aptitude Test (GSAT), but in conjunction with an English test which assesses comprehension, punctuation and writing, and a mathematics test which tests the basic mathematics skills which a learner should have obtained by Grade 7. While those organisations that use achievement tests are generally satisfied with this method, they all express a desire to measure aptitude.

The main problem in relying on achievement tests, is that they usually only test what a learner should have learnt at school by a particular grade. Most beneficiaries or aspirant beneficiaries have attended primary schools where the fundamentals in most subjects, but particularly mathematics, science and language, were not taught adequately. As a result, these learners, who are usually regarded as talented, and have achieved good results at their own schools, have huge gaps in their learning, and do not perform well in the achievement tests. So while learners may have the potential to do well at mathematics, their inadequate schooling puts them at a disadvantage in this type of test.

Most programmes have devised additional methods for identifying promising learners, in order to circumvent the constraints of achievement tests. These include setting benchmarks for inclusion; assessing learners' potential either through interviews or observation or through their own writing; or by assessing learners' 'teachability', or ability to learn. The last assessment is based on a test-teach-test technique. Here learners' are tested on work which is based on arithmetic, but which they have never learnt before, then they are taught the area they were tested on, and retested: the scores achieved are meant to reflect a learner's ability to absorb instruction.

The programmes and schools examined identify learners at different ages, but most place learners in schools or in supplementary education either in Grade 8 or Grade 10. There seems to be a consensus that the younger the learner, the better they will do. The later a learner is identified, the more irrelevant aptitude seems to be if the basics that should be learnt in primary and early secondary school are not in place. Learners placed in a programme in Grade 10 spend a lot of time trying to catch up, and while an aptitude in mathematics may help them, three years might not be enough to catch up and achieve a good mathematics pass.

Lack of funding seems to be the main reason why many organisations don't identify learners at a younger age. There are, however, both advantages and disadvantages to choosing learners at a younger age. Identifying learners earlier provides organisations with a bigger pool to choose from, and gives the school extra years to work with learners. On the other hand, ISASA has found that there are some benefits to identifying learners in Grade 10. It believes that learners who have reached Grade 9 in a

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public school and achieved more than 60 per cent in mathematics are resilient and willing to work hard, which are important characteristics for success.

Selection of schools

Placing learners in the right schools is very important. All the placement programmes have strict criteria for selecting schools, and schools are sometimes required to create structures for supporting learners. While programmes vary, the general criteria for including a school in their programme include matric results; resources; academic and emotional support structures; the economic, social and cultural 'fit' between schools and learners; and the proven ability of a school to integrate learners. Most programmes insist that the school appoints a co-ordinator to mentor the selected learners and oversee support programmes, which generally include extra lessons as well as social support. The ISASA Mathematics and English (ISASA M&E) Programme, in which 19 participating private schools take 333 pupils from disadvantaged backgrounds into grades 10-12, chooses schools in which learners are likely to feel comfortable socially and economically; consequently, very few learners are placed in the most expensive private schools.

Programme managers have found that schools are usually happy to participate in these placement programmes. The school fees are guaranteed (although in some instances private schools subsidise fees). The learners are usually highly motivated and disciplined; perform well; and, especially at high-fee private schools, add to the racial diversity of the learner population.

However, there are some difficulties in placing learners in public schools. Unlike independent schools that can enrol any learners they like, the admission of learners into public schools is governed by legislation in terms of which a school must give preference to learners who live in their feeder zone, or whose parents work in the feeder zone. As a result, many good public secondary schools cannot accommodate learners from elsewhere on their placement programmes. Furthermore, a public school may not administer any test relating to the admission of a learner, or authorise or request any other person to administer such a test (although programmes are free to apply selection tests for bursary purposes). For these reasons it would be difficult to implement a learner placement programme on a large scale in public schools, unless the legislation is changed.

Academic support

One problem common to all the programmes and schools is dealing with backlogs in mathematics, science and English. The academic enrichment offered by St John's Academy and the Star School Incubator programmes exist specifically to help learners overcome these backlogs, and supplement what they learn at school. Many placement programmes require host schools to offer extra lessons for participating learners. Modalities of academic support include extra lessons, Saturday classes, holiday camps, and allocating additional time for mathematics, science and English in the timetable.

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Emotional and social support

A vital area of support for almost all the programmes is emotional support: all the respondents agreed that addressing emotional and social difficulties faced by selected learners was essential to producing good mathematics and science graduates, no matter what academic interventions or inputs are made. This is especially true of placement programmes which move children from deprived areas to more affluent ones. The background from which disadvantaged learners emerge is often characterised by poverty, a lack of stimulation, unsafe environments, violence, a lack of resources, no electricity, lack of food, absent parents, death, illness, a lack of confidence, and an absence of positive role models. Many learners experience most or all of these problems at the same time. Moreover, while most beneficiaries of placement programmes were among the best-performing learners in their old schools, their grades often drop in their new schools, and they are just average or even among the worst performers in their grade.

This often makes them feel insecure. They also experience pressure to achieve from many quarters – themselves, their parents, their community, their previous school, their new school, and the programme. Also, learners joining programmes in Grade 10 are at a particularly vulnerable age: they leave old school friends and familiar environments, and enter a new environment with a different culture and norms, where friendships and cliques have already been established.

Various strategies have been developed to mitigate these difficulties. For example, ‘whole personal development’ is an integral part of the LEAP objective. One of LEAP’s philosophies is that long-term systemic impacts and improvements will only be achieved with a holistic intervention. For LEAP learners to achieve academic goals, other changes need to occur as part of the learning process. The life orientation (LO) classroom is the space in which the interventions are most often ‘triggered, managed, and monitored’, and in which learners develop a sense of internal structure as well as the capacity to manage and overcome life and academic pressures. Besides life orientation, LEAP schools offer a number of other interventions to assist learners: providing lunch; weekly visits from a health nurse who checks eyes, teeth, and general health; monthly visits from a reproductive health counsellor; and a full-time occupational therapist and addiction counsellor.

Similarly, the ISASA M&E programme provides learners with emotional support in the form of mentors which each school is required to appoint. For ISASA the mentor system is the key to the success of the programme: learners require a lot of support and encouragement, and this is the task of the mentor. The camps which ISASA hold twice a year for each grade are also aimed at assisting learners with their emotional and social development; they combine academic, physical, team-building, confidence-building, and leadership development activities. In Grade 12, career guidance is also offered at the camps.

The SSP programme requires participating schools to appoint a co-ordinator who can keep an eye on learners, and help them when necessary. Learners also attend two camps during the year, focusing on orientation, team-building, and character development. The MAD Foundation allocates a mentor to each learner. The mentors are volunteers who support the learner, and act as role models. Mentors take learners on outings, invite learners to visit them, visit learners at school, and keep up to date with their progress. The AGOF offers a personal development course for each grade up to grade 11. Its managers believe the course plays a vital role in helping learners who come from backgrounds other than those of learners at

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the placement school to settle down. St John's Academy and SSB both have full-time psychologists on their staff who assist and counsel learners where necessary. St Barnabas College utilises the services of a local counselling NGO. Many of the host schools have full- or part-time psychologists to assist learners.

School expenses

One of the main benefits of placement programmes is that they cover all costs, including school fees, the cost of uniforms, sports clothes and equipment, books, stationery, and school excursions. This is the case with the Allan Gray Orbis Foundation, ISASA M&E programme, SAILI, SSP, LEAP Schools, and St John's Academy. In cases where learners are placed in boarding facilities, this is also covered by the scholarships. The Star School Incubator programmes provide learners with all their learning materials.

Boarding

When learners are placed in schools where boarding is required, the cost of boarding is usually covered by the scholarship. Managers of programmes that provide boarding list a number of advantages, particularly for learners from deprived or troubled homes: boarding provides a safe environment, three nourishing meals a day, electricity, access to a library, computer centre, homework supervision and assistance, freedom from household chores and the care of younger siblings, and a support system in the form of a matron, nursing sister or teacher. However, learners placed in boarding often find it difficult to adjust and may take time to settle down, particularly if they come into boarding in Grade 10.

Boarding is expensive. According to the managers of all programmes that place learners in independent schools, those schools subsidise the boarding fees. Moreover, the Gauteng Department of Education subsidises learners boarding at St Barnabas with R2 000 per child per year.

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Transport

Only the LEAP Schools and St John's Academy transport learners to and from school. Programme managers said this was essential for getting learners to school or the enrichment programmes both quickly and safely. The provision of transport ensures more regular attendance. Some donors fund the transport of learners to and from their homes. However, this is not always the case, and sometimes transport issues do cause problems for learners. There have been occasions where schools could not participate in an incubator programme because of transport problems. In fact, according to Star Schools managers, in the current economic climate some companies which fund incubator programmes are cancelling transport arrangements.

Programme costs

Costs vary widely, depending on what they cover, the schools at which learners are placed, and whether boarding is included. Fees at independent schools are often much higher than at government schools, but in many cases the independent schools subsidise beneficiaries' fees. As one would expect, the enrichment programmes are much cheaper (less than R10 000 per learner per year) than the learner

placement programmes (about R20 000 to R30 000), while specialist schools are obviously the most expensive to run (R30 000 to R60 000 per learner per year).

Going to scale

A modelling exercise was undertaken to explore the feasibility of scaling up current activities. A large number of scenarios are possible: we chose five to illustrate some of the possibilities.

Scenario 1: Doubling up

Assumption: Double the number of NSC passes (i.e., add about 50 000 learners) with mathematics passes at 50 per cent.

Numbers: Start with 13 000 selected learners in year one, and scale up to 50 000 over eight years.

Selection: Students with potential in maths identified by aptitude testing.

Modality: Placed in Model C-type schools (could include top-end Dinaledi and middle-range independent schools), with the full spectrum of academic and social support.

Cost drivers: School fees (R20 000 per learner a year, minus government subsidy of R800), academic and social support (two sessions a week over 40 weeks at R150), half the students in boarding, with a government subsidy of R2 000 per child a year, travel costs for the non-boarding students, programme administration (10 per cent).

Total costs: R730 million in year one, and a total of R27 billion over five years

Constraints: This is an unrealistic option, not only for reasons of cost, but also because it is highly unlikely that enough places will be found at suitable schools.

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Scenario 2: Top Schools

Assumption: This is a more realistic version of Scenario 1, with 20 learners placed in each of 20 top schools. This could provide the foundation for later expansion.

Numbers: The only difference with Scenario 1 is that many fewer children are targeted. Four hundred additional learners will be recruited annually, giving a project total of 2 000 over five years.

Cost drivers: Same as Scenario 1.

Total costs: R22 million in year one, and R379 million over five years.

Scenario 3: Dinaledi

Assumption: This is a variant of the first two models, with 20 learners placed in each of the top 100 Dinaledi schools rather than in Model C schools.

Numbers: This scenario could target 2 000 additional learners a year, giving a possible (assuming 100 per cent pass rates) total of 10 000 additional maths passes in five years.

Main cost drivers: Academic and social support (two sessions per week over 40 weeks at R150), half the students in boarding, with a government subsidy of R2 000 per child a year, the non-boarding students travelling, school fees (R2 000 a year), programme administration (10 per cent).

Total costs: R38 million in year one, and R727 million over five years.

Advantage: This is the most feasible immediate option for government to take to scale, with or without private sector support (but see remarks on risk of Dinaledi school performance below).

Disadvantages: Legal restrictions on admitting learners from outside the feeder areas to public schools, and on screening entrants by means of testing, will need to be circumvented. In addition, the assumption above is that Dinaledi Schools will have a 100 per cent success rate, which is unrealistic given current performance.

Scenario 4: St John's Academy approach

Assumptions: This is an enrichment scenario, with 24 learners participating in each of 20 private schools.

Numbers: 480 additional matric passes a year, or 2 400 over five years. In terms of learner numbers, it compares with Scenario 2, but is much more cost-effective.

Main cost drivers: Teachers' salaries, travel, administration (10 per cent), lunch.

Total costs: R8 million in year one, and R50 million over five years.

Advantage: This is the most cost-effective option, with high-quality, intensive academic input. Since they do not radically alter the environment of participant learners, enrichment programmes do not need to provide the extensive forms of social and emotional support needed in placement programmes.

Disadvantage: Replication of enrichment programmes will be limited by the number of schools willing and able to serve as hosts, given the hidden costs that this implies for them.

This scenario could produce 2 000 additional learners a year, giving a possible total of 10 000 additional maths passes in five years

Scenario 5: Specialist schools

Assumption: Establish specialist independent schools – such as those provided by LEAP, St Barnabas and Sekolo sa Borokgo – which arguably provide the best overall 'whole child' care.

Numbers: 400 new learners a year, amounting to 2 000 learners over five years, making it comparable to Scenario 2.

Total costs: R60 000 a year per learner, amounting to R120 million over five years, or five times the cost of Scenario Two.

Advantages and disadvantages: Records suggests comparative effectiveness, but also comparatively costly.

Concluding remarks

There is little doubt that private sector and NGO initiatives in the field of mathematics education have led to some measurable successes, and that aptitude testing has played an important role in these interventions. Yet few people seem to be aware of the very wide spread of private sector initiatives of this nature, and the ten evaluated here are only a sample of the models which have found favour with many companies, particularly when they are implemented in their vicinity.

Some education specialists are sceptical of private initiatives on the grounds that they have not been independently evaluated, and that it is often difficult to distinguish companies' own assessments of these programmes – expressed in public relations or CSI-speak – from their actual efficacy and impact. Others argue that these interventions at the secondary school level are made too late, and that interventions at the primary school level would have more impact. Nevertheless, independent monitoring and evaluation is spreading, and stronger evidence about the relative effectiveness of various programmes should become available.

Speculating on the cost-effectiveness of going to scale is therefore probably premature. Future impact studies may show that the most expensive option is the only one that works in the long term. Evaluations should be of a longitudinal nature, tracking the progress and performance of graduates beyond their school careers. In the meantime, however, indirect evidence suggests that our simple modelling of the costs of going to scale probably underestimates the potential of private initiatives, and overestimates the cost-effectiveness of the Dinaledi option.

The widespread use of testing in the ten programmes under review suggests something which is philosophically important: the need to recognise and incubate potential. This is consistent with the general approach of many companies in the private sector. Combined with a sustained drive towards cost-effectiveness, it is this culture of incubating potential that is most likely to start lifting South Africa from – in the words of *The Economist* (3 June 2010) – the 'bottom of the world class' of education.

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This summary is based on a research report by **N Taylor, J Shindler, R du Toit and M Mosselson** entitled 'Aptitude testing for mathematical ability', commissioned by CDE, Johannesburg, 2010. This report is available from CDE. Please send your request to info@cde.org.za.



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