“Shuffle and Shake” and “Pay as you go” - The VG grade 8 experiment

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Abstract

The major aims of this paper is to present a new methodology of classroom practice, analyse the extent to which this new methodology was successful in terms of increasing the effectiveness of the teaching and learning of grade 8 Mathematics at our school; as well as analyzing the extent to which we have been successful in our aim of creating a paradigm shift in the minds of the learners to them seeing Mathematics as a dynamic exciting subject intrinsically associated with the 21st Century and 21st Century skills. The new methodology focuses primarily on the twinned concepts of changing the approach of the teachers and changing the approach of the learners. Educator changes include a lead teacher taking responsibility for each section; the introduction of more technology-based, games-based and kinesthetic-based approaches, and the changing of classes and teachers per section. Learner approaches and attitudes would (hopefully) be changed both by the constant classroom reshuffle, and changes in the way additional support is delivered. The success of implementing this system as well as the success of the system itself is discussed. Finally the transferability of this system is evaluated.

Introduction

The paradigm shift that we were hoping to achieve was essentially a psychological one: Mathematics is viewed by many in society as talent rather than a skill or set of skills. Many of our learners thus suffer from a double curse of a lack of basic Mathematical skills coupled with a societal excuse not to overcome this lack of skill. (The ‘No-one in my family is a “Maths person”’ syndrome.) In addition to, and ironically despite this perception, it is also common for both learners and families to blame the teacher if the child is struggling with Maths. Moreover, Mathematics is generally viewed in our society as something that is boring, difficult and only for the minority, a special elite of “Maths people”. More subtle societal prejudices are the concepts that “girls can’t do Maths” and that “black people can’t do Maths”. These are perhaps more insidious as it is politically incorrect to say such a thing in the 21st Century. The result is that the prejudice continues, largely unspoken; and because it is unspoken it cannot be rebutted; and because it cannot be rebutted, it continues.

As a result of combination of all of these factors, many learners struggle with Mathematics; struggling learners, need constant assistance, which causes a drag on the system, thus disadvantaging stronger learners.

Traditionally streaming has been used to address this problem. In South Africa, the Department of Education is against streaming, and for good reason: children who end up in “bottom” classes soon begin to identify with the stigma of being “bottom”. However, the advantages of being able to move at different paces with different classes mean that this approach is, in reality, often still used.

Aware though we are, as a department, of these factors, it is often hard to know how to redress them. We have for many years had, at the school, an extensive academic support system including extra lessons from staff, peer tutoring and computer-based support amounting to an average of 15 hours of “extra Maths” on offer per week. However, many learners do not utilize the help on offer, and of those who
do, many use the support as a continuous crutch, thus not taking responsibility for their own
development, and underutilizing class time. Thus potential solutions become rather part of the problem.

In seeking ways to address these issues, in a way that would be beneficial to both staff and learners,
bearing in mind the time constraints on staff, we came up with the “Shuffle and Shake” and “Pay as you
go” strategies.

In short we wanted to

- create a feeling of Maths being fun, relevant, and accessible to all
- tailor learning to be as individually paced as possible
- ensure that our lesson planning was as dynamic as possible, and in particular
  - ensure the inclusion of extension work to stimulate top learners
  - ensure the inclusion of technology in our teaching
  - ensure the inclusion of kinesthetic and model based learning
- make learners more accountable for their own successes and failures in Maths

The System (in theory)

“Shuffle and Shake” - instead dividing learners into classes assigned to a specific teacher, teachers take it
in turns to introduce each new topic to the whole grade, then (after a short test following the
introduction) learners are divided into working groups for that topic. So for each topic, learners will be
with different classmates and have different teachers. Introductions are taped and made available on
our network for revision. The “lead teacher” for the topic is also responsible for providing extension
work and the end of topic test. Interns work as teacher assistants on certain days to assist individuals
who are really struggling. At the end of the topic learners write a control test before returning to the
lecture group for the next topic.

At the same time a “pay as you go” system has been introduced for extra lessons facilitated by teachers.
Payment” is in the form of 10 mark worksheets generated using Microsoft Worksheet generator (or
similar online versions) on the specific example that gave trouble. This approach is designed both to
reinforce the correct methodology once remediation has happened, and also to encourage a more pro-
active use of class time for solving problems rather than relying unnecessarily on extra lessons.

The advantages we anticipated were

- **Appropriate pacing without stigma** - dividing classes per topic rather than per year, provides
  all the advantages of traditional “streaming” in terms of being able to go at a different paces
  with different classes, without the disadvantages of the stigma of being in the “bottom class” as
  the classes are continuously in flux. In addition to this class sizes can be altered per topic to
  match the “natural break” in the test results. The extension work aspect, the use of computer lab
  (for Cami-Maths, online worksheets, World Maths day entries etc), as well as the use of teacher
  assistants would also play into our ability to pace work individually.

- **Label breaking** - by keeping the groups in flux children will be able to let go of labels like
  “Artsy not Mathsy” by realizing that Maths has many faces and that they can excel in some even
  if they struggle in others.
• **Learner accountability** – as the learners will largely have different teachers for each topic, they will not be able to attach either success or the lack of success to the teacher and will have to own their own triumphs and difficulties. Having the introductions available digitally means that learners can take the initiative to revise the section from the start in their own time. “Pay-as-you-go” results in less misuse of extra help, and good consolidation for those in genuine need.

• **Fun by association** – the Audio-Visual room (the venue for the introductory lectures) is associated with watching videos, we hoped that the positive association would rub off!

• **Teacher creativity** - as each teacher is responsible for only one in four topics, each has more time to be creative in preparation. Also, because of the experimental nature of the new system, teachers are given the freedom/permission (even the expectation) to experiment and be creative.

• **Teacher accountability** - introducing the topic means being watched by the rest of the department, you are accountable for delivering a dynamic lesson and extension work for your section, and your success or failure is very visible – thus ensuring the followed through on good intentions of making lessons dynamic; including more kinesthetic activities and more technology; and providing extension work.

• **Teacher in-service development** - teachers will learn from and critique each other in an informal and constructive manner, providing support and development

The disadvantages that we anticipated were

• **The personal touch** – not getting to know the learners as well as with a traditional class system.

• **Preparation time** - increased time in preparation in preparing dynamic introductory lessons for the whole grade

• **Class division pressure and admin** – the pressure of having to mark the whole grade overnight in order to be ready for new class divisions.

• **Multiple classes unsettling** – children might struggle to adapt to new teachers, and find the class swopping unsettling

**The execution of the system in reality**

At the time of going to print, certain aspects of the system have not been implemented because of practical/technical difficulties

• Videoing of lessons – video equipment failures, and videographer (i.e. me) failures have meant that this has not happened. Most of the introductory lessons have involved PowerPoint presentation, however, and these have been made available on the network, along with other resources and links to sites online.

• Because we have wanted to give ourselves flexibility in terms of when it is best to move on to the next section, rather stick to a rigid (“equations will take two weeks”) time-table, our ability to utilize the interns has been restricted because of time-table clashes. Also some of the interns were daunted by the prospect of tutoring Maths

• We have not included as many kinesthetic activities as we would have hoped (although this may be a more natural part of the geometry sections still to come).

• After the second session we realized that it would often be better to split the lead teachers’
lectures with a few days of small classes, to give learners a chance to master the basics before moving on, as there was a tendency for lead teachers to try to fit too much into the given time.

- We also needed to add a “correction and extension” lesson between the test and the returning to lecture group, in order for tests to be returned and corrections and remediation to happen before the next topic was started.

- The logistics of collating end of term marks, learners’ portfolios and report comment slips was a stumbling block that we had only half anticipated.

**Evaluation of the system after a term and a half**

It is impossible to analyze the success of this system in terms of results. We have deliberately used some easy tests working on the principle that success breeds success, and we have reshuffled the order in which we teach the syllabus, so that tests from last year are no longer covering the same range of materials as we have covered. Also there is no way of knowing how strong this group would have been in the conventional system, as they are new to our school in grade 8 and we have multiple feeder schools so no “control” is available. Moreover the motivation behind the change of system was more about changing the way learners approach and think about Maths, than about improving marks. (Although we certainly hope that the long term effect of an improved attitude will be improved results!) Perhaps by the end of the year, we will be able to get a fair sense, by comparing exam results to those of the last few years. For now however, all we have to go on is impressions. To ascertain these, in addition to the organic daily and weekly discussions amongst staff, learners and staff were asked to respond to a questionnaire after the first term and a half. By this time 6 topics had been covered and classes had swopped around 5 times (learners stayed in the same classes for topics 4 and 5 as these were relatively short sections).

1. Maps; direction and bearing; angles of inclination and declination; Cartesian planes and plotting
2. Exponents
3. Introduction to negative integers
4. Factors LCM HCF
5. Pattern
6. Introduction to algebra

The learners’ questionnaires were kept deliberately vague, and generalized, not referring directly to the new system, but trying go gauge their feelings in general while allowing enough space for the new system to be included in their responses. The teacher questionnaire was specific.

**Learner questions:**

In terms of my Maths marks so far this year I feel...
The Main difference between Maths this year and Maths last year is ...
What I really enjoy about Maths is ....
Sometimes I wish...

**Teacher questions:**

1. What has worked?
2. What hasn’t worked?

3. a. Should we continue next term?
   
   a. If so with what modifications?

4. a. Should we do this system again with next years’ grade 8s?
   
   b. If so with what modifications?

5. Other comments

Analysis

Learners were generally disappointed with their results. This is not surprising as the jump between primary and high school is always a shock. However, what was encouraging was that most learners were still enjoying Maths and /or were strongly motivated to improve their marks despite being disappointed by the mark itself.

18 out of a total of 63 questioned mentioned the ‘class changing’ system at all, 4 specified that they liked being taught be the different teachers; 7 mentioned without comment that the classes changed; 7 students wished that they could have the same teacher.

23 mentioned the level of complexity the detail and the speed of High School Maths. 8 said that Maths this year was easier.16 commented on Maths being more fun and enjoyable this year. (There was an overlap here of 9 with those commenting on complexity.) (There was no correlation between marks and any of the tendencies/preferences.)

The technological aspect was only mentioned by one learner who commented that she enjoyed Cami-Maths, though I have no doubt that this contributes generally to their sense of Maths being “fun”

The issue of favourite/preferred teacher was only raised by 3 learners. 1 learner commented that their current teacher didn’t explain clearly enough (the only blaming the teacher type comment, although arguably the 7 wanting 1 teacher may be transferring blaming the teacher to blaming the system)

The response from the staff was strongly positive with the following pros and cons being identified.

Pros: general positive attitude about Maths, general desire to improve their marks; generally taking responsibility for their successes and failures; the diversity of teaching styles is positive; staff learn from each other, and feel supported and encouraged; staff pick favourite topics or areas of expertise which enhances teaching and satisfaction; development of staff skills facilitated organically; staff get to know the whole grade, and see the whole spectrum of ability levels within the grade

Cons: individual attention hard in lecture venue; time is sometimes lost setting up the data projector; centralized admin is needed and is hard to manage; knowledge of individual learners is reduced.

3/4 of us said we would like to use this system again next year with slight modifications, and the remaining person saying she wasn’t sure. 4/4 of us opted to continue with the system this year, with modifications.

From my subjective perspective the system has been enormously beneficial despite its problems. The pros far outweigh the cons to my mind. The number of student who are clearly unsettled by the system is not as dramatic as we anticipated, and the generally positive effect is apparent. It is ideally suited to
grade 8 which is a stage at which both the Maths, and the learners themselves change dramatically, so it is an ideal moment for a paradigm shift. Learners are also more open to a new way of doing things because they accept that High School is different from Primary School; and for many a paradigm shift has certainly been achieved.

In addition, I believe that the teaching staff have also undergone a paradigm shift. We have developed wonderful resources, enjoyed each other’s lessons, and help each other to constantly improve our teaching styles and methodologies. We have seen both how easy and how powerful the inclusion of technology, games, and kinesthetic activities are, and we ourselves are less likely to label individuals learners as “strugglers”.

Adaptability and applicability elsewhere

I have broken this experiment down into 5 components to analyze its adaptability, as this isn’t an all or nothing system. Class reshuffling: adaptable provided the department is large enough and staff are willing, however I think that grade 8 is the ideal place for such a methodology. I am not convinced that it would be as successful in higher grades at school. At university level this could be effectively implemented in certain tutorial settings. Effective in terms of de-stigmatizing Maths ability and encouraging learners to take responsibility for their own learning. Team teaching to introduction topics: adaptable anywhere. Extremely valuable both for its developmental aspect and for encouraging top class creative work. Expectations need to be firmly laid out from the beginning. Use of games, modeling and kinesthetic exercises: adaptable anywhere. Definitely had a positive effect on learners perception of Maths. Technological component: adaptability depends on resources but powerpoint element requires only one computer and one data projector. Extremely valuable especially for visual learners and attention deficit learners. “Pay as you go” Easily adaptable at school level (though easier with the technology available) Adaptable to university. Extremely effective.

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i This system is an adaptation of a similar system was used a Westerford a number of years ago.

ii Based on Howard Gardner’s “Multiple Intelligences” theory.