School Inputs and Learning Outcomes in Mozambique
A quantitative analysis

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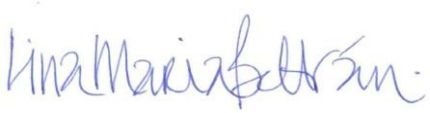
ABSTRACT

Quality education has been a major challenge, especially in the least developed countries where resources are limited and expansion of educational services has hindered the quality agenda. This research aims to identify which inputs and external interventions have the most significant effect on learning outcomes in the first cycle of Primary Education in Mozambique. A quantitative analysis was carried out in 1167 schools, including government schools with interventions supported by five international or local non-government organizations and a control group of government schools receiving no additional support. The findings of the linear regressions for each of the sample groups point towards text books being the school input with the most meaningful impact on pass rates regardless of the intervention (or lack of it), while teaching/learning in local languages to be the intervention yielding the most meaningful results.

DECLARATION

I, Lina Maria Beltran E., do declare that this dissertation is my own unaided work. It is being submitted for the degree of Masters of Education (Policy Planning and Management) at the University of Witwatersrand, in Johannesburg. It has not been submitted for any degree or examination at any other university.



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Abbreviations

ADE	Direct Support to Schools (Apoio Directo as Escolas)
AKF	Aga Khan Foundation
BSM	Building School Material
CIP	Centre of Public Integrity (Centro de Integridade Publica)
CON	Concern Worldwide NGO
DLR	District Literacy Rate
DOR	Drop-Out Rate
ECD	Early Childhood Development
EFA	Education For All
EMIS	Education Management Information System
EP1	Primary School Level 1
EP2	Primary School Level 2
EPC	Complete Primary School
FASE	Education Sector Support Fund
GER	Gross Enrolment Rate
GoM	Government of Mozambique
GOV	Government
HAS	House Assets
HHE	House Hold Electricity
HHW	House Hold Water
HOM	Housing Materials
INDE	National Institute for Educational Development
INE	National Institute of Statistics (Instituto Nacional de Estadisticas)
MICS	Multiple Indicator Cluster Survey
MINED	Ministry of Education
NGO	Non Government Organisation
PET	Public Expenditure Tracking
PMC	Percentage of Multi-level Classrooms
PPC	Pupils per Classroom
PRO	Progresso NGO
PR5	Pass Rate in Grade 5
PTR	Pupil : Teacher Ration
SACMEQ	Southern African Consortium for Monitoring Educational Quality
TBS	Text Books per Student
TQS	Teacher Qualification Score
UIS	UNESCO Institute for Statistics
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNICEF	United Nations' Children Fund
WFP	World Food Programme

Background

The Millennium Development Goals have been pivotal in guiding the human development agenda including education in developing countries for the past decade (UN 2012). Governments all around the world committed and focused on expanding access to educational services in order to achieve universal primary education. Policies such as free compulsory primary schooling became common and school systems expanded rapidly. The quality trade-off of expanding primary education has been high and many countries have seen their learning outcomes lag behind with students failing to progress through primary education as the enrolments have increased (ECOSOC 2011).

Mozambique is not an exception. In the period between 1992 (immediately after the end of the civil war) and 2003 the gross enrolment rates (GER) in 1st grade grew from 59% to 123% and the GER for the first cycle of primary education (grades 1 to 5) increased from 60% to 112.7% (World Bank 2005). The number of schools went from 2,800 to over 8,000 (World Bank 2005). Nevertheless, quality and internal efficiency indicators do not show the same pattern. Quality concerns were at the centre of discussion brought to the table in Dakar in 2000 for which the international commitment to achieve Quality Education for All was taken as a key point in the Educational agenda worldwide (UNESCO 2000). Ten years down the road, quality still remains a concern for both rich and poor countries (Education For All (EFA) Global Monitoring Report 2010)

Despite Mozambique having net enrolment rates for primary schooling that have increased to 81.3 in 2008 and adult illiteracy has been reduced from 90% in the early 1970s to 48% in 2008 (INDE-MICS 2008), the quality of education and learning outcomes seem to be stagnated or in decline. According to the Southern Africa Consortium for Monitoring Educational Quality (SACMEQ) data from 2005 and 2009 Mozambique's scores for Math and Reading in grade 6 have decreased from 530,0

and 516,7 points to 483,8 and 476 points respectively (SACMEQ 2009). Whatever the reason, the decline is among the most significant in the region.

A study carried out by the Academy for Educational Development (AED 2011) to measure school effectiveness in Mozambique used a sample of 49 schools in five districts in Cabo Delgado Province. They found that 59% of grade 3 students could not read a single word in Portuguese and 90% of students could not read 10 words per minute. Although the results cannot be generalized to the whole country, they do present an alarming picture of the status of early reading and an x-ray of the quality of education that students are receiving in many rural areas. This situation has triggered a number of initiatives that will be explored later to address quality issues.

Despite being one of the poorest countries in the world (172nd out of 177 in Human Development Index), Mozambique has gone through a significant economic growth rate in excess of 7% for the past years (UN Mozambique 2011). As much as the economy seems to be expanding and public expenditure increasing, the resources allocated to the education sector as a percentage of the state budget are not increasing. The annual allocations made to education sector since 2007 have seen a slight reduction as a percentage of the state budget. In 2007, education received 21.6% of total resources (Government of Mozambique (GoM) 2008), and, in 2010, resources allocated fell to 20% of the total (GoM 2011). For 2011, the resources committed to the sector amount to 17.2% of the budget. However, it is important to mention that in real terms the resources spent for education have more than doubled from 8,797 million MTN in 2006 to 19,871 million MTN in 2010 (GoM 2007 and 2010). Despite the fact that the educational expenditure has more than doubled in four years, the quality of education, as measured by SACMEQ is declining.

Primary education has been free and compulsory in Mozambique since 2005 and it is designed in three cycles. The first cycle comprises class 1 and class 2 while the second cycle comprises class 3, 4 and 5. The combination of the first two cycles is known as EP1 (First level of primary education) and the third cycle comprising class 6 and class 7 is known as EP2 (Second level of primary education). The first one comprises five years of schooling for grades 1 to 5 while the second one comprises two years for 6th and 7th grade. Schools with the complete two cycles of Primary

Education are known as Complete Primary Schools (EPC – *Escola Primaria Completa*). Completion of the two primary levels allows students the choice to transition to general secondary education, lower primary teaching colleges, basic technical and vocational schools or secondary education for adults.

In addition to government allocations of educators and capital expenditure, schools receive financial resources from the government under the framework of the *Apoio Directo as Escolas* (ADE - Direct Support to Schools) fund. These resources are decentralized to schools and are aimed to be used for the acquisition of teaching and learning materials such as notebooks, pens, pencils, erasers, sharpeners, chalk. (Ministry of Education (MINED) 2011). There is a minimum amount that schools receive and then it goes up based on the number of pupils and the number of classes. Out of the total amount of the ADE funds allocated to each school, there is 15% flexibility to use funds to cover costs for items which are not considered eligible (MINED 2011).

The Mozambican government's education sector depends greatly on the financial aid from international agencies, as well as bilateral and multilateral cooperation partners. In the education sector a common fund called the Education Sector Support Fund (Fundo de Apoio ao Sector da Educação, FASE), serves as the means to channel support from donors to the education sector. "In 2009, the resources of the fund represented about 25% of the education budget, and between 60% and 70% of all direct foreign aid to the sector" (OSISA 2012). Even though their activities tend to be limited to a small area, foreign NGOs are also vital sources of financial support for education; the country counts with a significant number of ongoing initiatives that are individually supported or implemented by both national and international organisations at various levels, from school to district to provincial and national level aiming to support the government in achieving its commitment to access and quality of education.

Further efforts in Mozambique should be geared towards improving the quality of the educational service that is being offered.

Aim and Rationale

As stated above, Mozambique devoted approximately 17% of its total budget to education in 2011, compared to almost 22% in 2007; in addition to that, the limited overall state budget (even with the current growth) is still a constraint. The expansion of the aggregate budget has not had a corresponding growth on the social sector budget, including education. Even though spending has doubled in the past few years, the sector has been in such a dire situation that the increased expenditure has aided the much needed expansion but a lot of work is still required to respond to quality challenges. Moreover, fluctuating budgets pose additional challenges. For instance, following the constant growth from 8,797 million MTN in 2007 to 19,871 million MTZ in 2010, a significant drop took place in 2011 bringing the education budget down to 14,482 MTZ representing a drop of 26.8%. According to a discussion paper recently published by the Open Society Initiative for Southern Africa (OSISA 2012) the ministry of Education estimates that in order to promote improvements in the quality and equity of the delivery of services with the sector growing at the same rate of the past years (8% per year), the annual budget for the education sector needs to increase by at least 5% per year. Unfortunately, the trends of donor support to both FASE and the education sector seem to be in decline. (OSISA 2012)

In theory, the expansion of access can have a negative impact on the quality of education for which quality needs to be promoted at the same time as growth (World Bank 1997, 2006). The test scores for Mozambique in comparative regional studies show that the learning achievements of students in grade 6^{th} is declining (SACMEQ 2005; SACMEQ 2009). It is not clear, however, the extent to which this is a result of expanded access. Regardless of this, if Mozambique is to achieve the Quality Education for All Goals, substantial efforts need to be put into improving the quality of the education that the system is currently offering.

In a situation like that of Mozambique, where the financial resources are so scarce, it becomes of paramount importance to use the available resources in the most effective

way possible. For this reason it is important to determine which are the factors that have the most significant impact on the quality of education in this context in order to allow not only the government but also development partners to ensure that funds are used in the best way possible.

A better idea of the factors that positively affect the learning achievement of students is the basis to develop more focused and targeted projects and programmes as well as influence policy decisions aiming to improve the quality of the educational services offered in schools. Therefore, this study aims to identify which are the factors with the strongest effects on student achievement in Mozambique.

Research Question

The aim of this study is to determine what factors have the most significant effects on learning outcomes in Mozambican schools for pupils in grade 5. In doing so, the study will analyze quantitative data available on schools in the following four broad categories: infrastructure, learning resources, human resources and socioeconomic conditions. Variables to describe these categories will include the material in which schools are built, textbook : pupil ratio, teacher : pupil ratio, classroom : pupil ratio, teachers' qualifications, drop-out rates, number of multi-level classrooms, literacy level of the community, availability of water and sanitation in the households, access to electricity and socio-economic status.

The study also attempts to determine to what extent additional support to schools in the shape of programmes offered by development partners have had an impact on learning outcomes and if so, compare which ones are yielding the most significant results.

Research question 1: To determine the input variable that has the greatest effect on school outcomes.

Research question 2: Which additional support programmes to schools have had the greatest impact on learning outcomes.

According to the Official Development Assistance to Mozambique database, there are 46 projects that have been funded by 21 donors since 1997 (although 75% of the entries have been done after 2003) specifically to support basic education with a total amount of 401,348,758 USD. However, it is difficult to track the effect that all these funds have had in learning outcomes since many of the initiatives of these development partners have had a national scope or fallen within the state's direct budget support (FASE for the Education sector), so it is difficult to make any differentiation between these, as funds are allocated all throughout the system and it is difficult to track them within the sector to the school level.

There are, however, some more specific programmes which target a relatively large pool of schools. Five different programmes supporting government schools were identified, analyzed and compared. These interventions include:

1. The Child Friendly Schools Programme by The United Nations' Children's Fund (UNI).
2. The school feeding from the World Food Programme (WFP)
3. Instruction in local languages and provision of textbooks by Progresso (PRO)
4. Early Childhood Development Programme from the Aga Khan Foundation (AKF)
5. Community Mobilisation and sensitisation on matters related to the importance of education by CONCERN (CON)

Details on the programme, geographic areas covered timeframe of the intervention and number of schools from each of these interventions will be provided under the sampling section of the Methodology chapter.

Literature Review

One of the cornerstones of the literature regarding the effects that school resources have on learning achievement is the Coleman report (Hanushek 1998). In 1966, The United States Office of Education in accordance with the Civil Rights Act of 1964, commissioned a study in order to observe the state of educational equality in the US. The leading researcher was James Samuel Coleman and hence the name of the report. Even though the rationale for this study was linked to racial inequalities, his main conclusions are pertinent to the problem stated above. Coleman's main conclusions included the fact that additional resources provided to schools or the school quality did not seem to have a substantial effect on student performance and that their performance had to do more with the social composition of schools and the student's family background among others (Coleman 1966). Coleman is widely cited ever since and inspired subsequent work carried out in the United States.

Hanushek has been one of the authors that, inspired by the Coleman report, wanted to dig deeper into finding additional evidence regarding the effects of school resources on student achievement in OECD countries. Since the early 80s he has published his findings of the meta analysis of selected literature on education production functions. He finds that the estimations made of the effects of resources do not provide solid evidence indicating that additional resources will improve student performance (Hanushek 1997). Moreover he finds a methodological bias showing a pattern where resources seem to have increased effects as the level of aggregation is increased at the various levels, from student, to school, to district to state etc (Hanushek et al 1996; Hanushek 1997). Levacic & Vignoles (2002) reached the same conclusion for selected literature in the UK.

Hanushek's findings were contested by Greenwald R. et al (1996) who using very similar data sets, reached the exact opposite conclusion: "that school resources are systematically related to student achievement and that these relations are large enough

to be educationally important". They attributed the variance of the findings to the methodology used by Hanushek where the use of different studies analysing the same database were counted as independent observations whereas Greenwald et al make a differentiation for independent datasets (Greenwald et al 1996). This ignited a debate that lasted quite a number of papers. Both currents of thought, however, seemed to agree on the fact that there is no convincing evidence to support either theory. Nevertheless, as even Greenwald et al (1996) recognize, Hanushek's position remains influential in the subject. It is important to highlight that until then, both currents had focused mainly on schools within the educational system of the United States.

Levacic and Vignoles (2002) make a systematic review of the literature in the UK pointing out the limited availability of strong methodological studies. Out of their short number of acceptable studies according to quality criteria set, they find some evidence that variables of school resources have positive effects on school attainment as well as wages and school quality on educational outcomes, but limited evidence of resource effects on learning outcomes. This means that additional resources seem to impact on the amount of years that students stay in school but not on their results.

Some years later, the discussion took a different turn and researchers began to question whether the theory that school resources had no impact in students' performance could only be valid in developed countries (Gaviria et al, 2004; Murillo F.J & Roman M 2011). This was supported by the fact that most of the available literature had been produced based on data coming from educational systems in developed countries. Gaviria et al (2004) argue that systems and schools in developed countries receive higher shares of their GDP; in their view, the differences between the quantity and quality of the resources in these schools is relatively low. Their findings confirm the fact that resources do matter and have a significant impact on the performance of students in Math, although their study is limited to Brazilian schools.

A more recent study carried out by Murillo F.J. & Román M. (2011) using the data of the Second Regional Comparative and Explanatory Study carried out by UNESCO which included data from 15 Latin American countries concludes that basic facilities, infrastructure as well as teaching and learning materials do have an effect on 3rd and 6th grade pupils' performance in Latin American schools.

Nevertheless, the literature in developing countries is not as conclusive as it may seem. For instance, a study carried out by Nannyonjo (2007) in Uganda with the support of the World Bank, provides various indications of limited correlations between supplies to schools and learning outcomes, especially when it comes to resources generally viewed as the most important ones, such as funding per pupil, class size and textbooks, among others. Similarly, with the support of the Asian Development Bank, Maligalig et al (2010) measured the education outcomes in the Philippines. Although they conclude that resources do have an effect on school and student performance, they find that the socio-economic characteristics of students are much more significant determinants of pupil achievement.

In an effort to expand the research and address the issue of applicability of the theory in developed and non-developed countries, researchers began to look into international standardized test. For instance, Wossman L. (2003) uses a database of over 260,000 students from 39 countries to estimate the effects of family background, resources and institutions on learning achievements for math and science. His findings include that differences in students' performance have a limited correlation with differences in school resources.

The lack of evidence to find a correlation with learning outcomes in developed countries is in line with the view that increased expenditure in schooling has taken school systems beyond some minimal threshold (Hanushek 1997). This would point towards the idea that a minimum standard of school facilities is of significant importance but once this level is reached, additional resources seem to have a negligible impact.

There are certainly many limitations to the use of a production function to determine the extent to which some factors affect the outcomes of students' performance and thus the difficulty to come to a consensual conclusion (Levacic and Vignoles 2002; Gustafsson, no year). Some of the limitations cited by these authors include endogeneity between school resources and student outcomes; omitted variables – particularly those that describe what happens in the classroom- which can result in biased estimates; and levels of analysis or use of aggregated data. Nevertheless,

Gustafsson points out that despite the limitations, such an analysis can still reveal which are the most and least important aspects influencing the quality of education especially in developing countries where resources reach schools at a rather basic level.

Moreover, Wenglinsky (1997) argues that the absence of conclusive findings from meta-analysis, points towards methodological limitations of the original studies to begin with. Beyond methodological aspects, Levacic and Vignoles (2002) confirm that "empirical research has so far produced equivocal findings" on the effects that schools resources have on learning outcomes. However, they attribute these equivocal findings in a large extent to the quality of data and highlight that good quality of data is crucial to obtain valid results. Another important issue they highlight is the fact that limited efforts have been made to measure factors related to what happens in school, such as processes, management and the way in which institutional arrangements may also affect schools.

In a study made in South Africa by Vinjevold & Crouch (2001) on learning assessments in grade 3, their findings are inconclusive and they point to socio-economic status (SES) of schools as the possible explanation for this. In a subsequent follow up by Perry (2002) to measure the effects of schools SES, her findings are equally inconclusive and she suggests administrative procedures within schools could be the explanation. Levacic et al (2002) make a strong argument that these processes could be of great importance on the effective use of funds and could thus explain why education production studies ignoring school processes have not managed to identify systematic effects of resources on pupil performance. Some authors are even more critical and question the appropriateness of the production function methodology to measure the equity of educational funding equity such as Fortune and O'Neil (1994).

Wenlinsky (1997) found that expenditures for administration of school districts and instruction were associated with student performance. In his hypotheses he presents a chain of effects starting at the administrative and management level. Certain managerial or administrative choices could lead to low teacher-student ratios and increased level of education of teachers and positively influence the school environment which subsequently influences positively on student achievement. It is

interesting to see an effort to look at administrative and institutional issues and their resulting processes, although he fails to explain how he measures this 'cohesive environment' which raises mathematics achievement.

In his 2003 study Wossman finds that international differences are significantly related to institutional arrangements. Established central examinations, school autonomy in certain decisions, teacher influence over teaching methods among others seem to be institutional arrangements with positive effects on test scores (Wossman 2003). Similarly, Hanushek (1997) stated that his findings did not mean that all schools were the same and thus 'schools don't make a difference'. He rather interpreted that some schools used resources in a more effective way than others and in his view, the policy implications needed to be geared towards creating incentives for schools to use resources in a more effective way rather than just pouring additional resources.

In the past decade, the Southern and Eastern Africa Consortium for Monitoring Educational Quality, also known as SACMEQ, has been conducting assessments to evaluate the schooling conditions and the quality of education in 14 African countries (15 when Tanzania mainland and Zanzibar are counted separately). Hungi and Thuku (2010) carried out a multilevel analysis using SACMEQ data to determine which are the factors that matter the most in the variations of students' achievement in reading across these countries. They found that some of the factors with the most significant impact include grade repetition, pupil socio-economic background, speaking the language of instruction at home, pupil age and pupil sex. In the specific case of Mozambique, boys seem to outperform girls, and in relation to grade repetition Mozambique was one of the two exceptions of countries that did not show a significant difference between students that had repeated years and students who hadn't (Hungi and Thuku 2010).

Castanheira (2007) carried out a research thesis looking into the quality of Education in Mozambique using the SACMEQ data of 2000. He found that socio economic status of students strongly influences reading scores but not math ones. Another conclusion he reached was that "pupil-teacher ratio had a negative impact on reading scores" but decreasing this ratio would not have significant effects on the outcomes.

Presence of school facilities and female teachers increased the reading scores. Big class size also impacted negatively on performance.

Similarly, Passos (2009), using the same 2000 dataset from SACMEQ, aimed in her doctoral thesis to determine the extent to which teacher competence influenced student performance across countries but giving emphasis to Mozambique. She concludes that the model used is consistent across all 14 countries, were teacher competence is a predictor for reading scores and to a lesser extent for math. In Castanheira's research (2007) the regressions for math scores proved rather poor as well; this was quite surprising keeping in mind that in the teachers' competence test, teachers in general scored better in math than in reading. Passos (2009) also found positive correlations between students' socio-economic status, school resources and parent involvement with scores for reading and math. She also found pre-existing pupil's characteristics to be among the main predictors of students' reading scores and students speaking the language of instruction at home tend to score higher in both math and reading.

So far, the literature has covered the production function and the effects of school inputs in general on the learning outcomes. However, it is important to have a framework for the individual interventions or external support (School feeding, use of local languages, early childhood development, community mobilisation and educational packages) that schools receive in order to address the second research question as well.

School feeding programmes are largely aimed to act as incentives for students to attend school and address nutritional challenges that could hinder students' development and their subsequent capacity to learn. Powell (1998) finds that children receiving breakfast at school have better improvement on weight, height and attendance compared to the control group. However, none of the two groups made significant progress in wide range achievement test scores. Greenhalg (2007) on the other side found that "school feeding programmes significantly improve the growth and cognitive performance of disadvantaged children". According to Meir (2005) enrolments and attention spam are increased by school feeding programmes. Baxter

(2005) sustains that the school feeding on its own has no impact on the quality of education if other underlying issues are not tackled as well.

The literature in general points towards positive effects of early education programmes on subsequent achievement. Campbell and Ramey (1994) find positive effects of preschool programmes on intellectual development and academic achievement through age 12. Similarly, Currie (2001) based on an analysis of various initiatives (small and large scale) in the United States, concludes that early childhood programmes have "significant short and medium-term benefits" especially for disadvantaged students. These benefits include attainment, success and earnings, though it is not specific or conclusive on academic achievement.

According to Saville-Troike (1984) the use of the first language (L1) enhances conceptual development which is key in the learning and understanding processes regardless of whether it will be subsequently tested through the medium of the L2. Swain et al (1990) carried out a study to determine the effects of learning in L1 in a bilingual context on learning a third language. Results showed that literacy in L1 has a strong positive impact on learning a third language. Students who had undergone literacy in L2 did not have this positive effect which would suggest that learning in mother tongue should have positive effects on academic results.

The literature regarding the effects that community mobilization has on learning outcomes or academic achievement is not very extensive. Conley (1998) argues that "increasing community participation in education is not a sufficient condition for improving the quality of teaching and learning" she suggests that the teachers must be at the centre of any initiative to improve teaching methods and techniques suggesting that the impact of these kinds of interventions is limited.

The Global Monitoring Report on Education For All (EFA 2010) points out the fact that "many countries are failing the quality test" and underlines the large disparities among and within countries, with low income states showing the weakest results. If education systems in these countries fail to provide the minimum skills to students, their possibility of benefitting from further education is undermined. Moreover, despite the improvements made in adult literacy in Mozambique, close to 50% of the

adult population is still illiterate. This means that most parents lack the skills to support any schooling opportunity that their children are involved in. UNESCO BREDA (2007) did a study in 22 African countries and found that adults with 5-year-school attainment had a 40% chance of being illiterate. If quality issues are not addressed, and students in Mozambique do not get the minimum literacy and numeracy competences, the illiteracy – and poverty- cycle is prone to remain undisturbed.

Every year, the United Nations Development Programme (UNDP) measures a number of indicators to calculate a Human Development Index in most of the member states. Some of the indicators include life expectancy at birth, mean years of schooling, expected years of schooling and the Gross National Income (GNI) per capita, Mozambique was ranked 184th out of 187 countries by the 2011 Human Development report (UNDP 2011). This places Mozambique as one of the poorest countries in the world with very low schooling years. Given the limited resources available and the low quality baseline where the system currently stands, the literature review above suggests that additional resources are likely to have an effect on learning outcomes.

Methodology

The study entails a quantitative investigation of a sample of schools, which will be looked at in detail further below, including schools which receive additional support from programme implemented by non-government actors plus a control group of schools getting the basic support from the government. Programmes were considered as part of the sample if they provide support to at least 20 schools in order to ensure that possible differences were not just coincidental.

Sampling

The sample of schools includes the following six categories:

Aga Khan Foundation (AKF)

The Aga Khan Foundation does not provide direct support to schools. However, it has been implementing an Early Childhood Programme (ECD) with 74 pre-schools in five districts in Cabo Delgado Province. The ECD programme is part of an integrated programme on Education, Health and Agriculture in order to provide a holistic framework aiming to tackle rural poverty that includes Adult Literacy to support parents with child care; Food Security with home gardening promoting diversity along with nutritional education; and health skills for parents to provide early stimulation to the children. The pre-schools have also adopted regular snacks under the health component.

The intervention of Aga Khan began in 2001 in a small scale and eventually expanded. However, there have been fluctuating populations due to drought, poverty and other reasons for which it has been more challenging to implement activities in some districts. In order to take the most representative sample of AKF, only the two districts

were AKF's presence is most significant were included in the sample. These are Macomia and Pemba Metuge. It is important to highlight that AKF has targeted these districts for being among the most deprived in one of the poorest provinces in Mozambique. While the AKF intervention is aimed at pre-school, the study looks at whether it has had an impact on the subsequent primary school quality in the districts in which it operates. The total number of EP1 schools in these two districts was 76; however, following some of the limitations from the data base (described in the limitations section below) the final sample of schools from AKF of **60 schools** in Cabo Delgado province.

Concern-supported government schools (CON)

Concern has been supporting schools in a number of districts in Manica and Sofala Provinces by helping to improve access to education for vulnerable children. Concern works mainly with school councils, providing training for school council members on planning and designing school plans and management. They also provide education materials to orphans and vulnerable children. Working with district authorities, they provide ethics and regulations training for teachers and school councils as well as helping school councils to design user-friendly codes of conduct and to hold teachers and principals accountable to these councils.

The original list of schools supported by Concern consisted of 126 schools in 9 districts in the Provinces of Manica and Zambezia. The final sample consisted of **102 schools** distributed as follows: 56 schools in Manica Province and 46 schools in Zambezia Province.

Government Schools with no additional support (GOV)

A control group of government schools with no additional support was included in the sample. However, deviation of funds in government schools could undermine the reliability of the results of this research. In order to overcome this issue, Public Expenditure Tracking (PET) studies from the Public Integrity Centre (*Centro de*

Integridade Publica - CIP) were analyzed to determine which the districts with the best track records were.

The CIP carried out small PET studies in 15 districts in Mozambique in 2011 in order to track and monitor the expenses of 2010. In most cases the funds allocated to the District Directorate for Direct Support to Schools, were fully decentralized to schools. Only a few districts presented mismanagement and deviation of funds at the district level. These districts were automatically dropped from the list as possible samples for the control group.

When moving further to the school level, a whole variety of issues were raised by the CIP. The most common situations they found included the following:

1. Schools not being able to provide the totality of receipts for their expenses
2. Some expenses declared were different from what was stated in the receipts or vouchers
3. Some schools were able to provide receipts for items but these items were not present in the school
4. Expenses for non eligible costs exceeded the 15% threshold established by the government.

There seems to be no district with a perfect record. Only one district seemed to have no major concerns on the process of ADE funds. In other cases, it was reported that schools were able to account for all their expenses but they had exceeded the 15% threshold of non-eligible items. In most of these cases, schools had used the funds to build additional classrooms or bought roof material.

For the purpose of this study, the 15% threshold has no implications especially if the funds were ultimately utilized for or within the school environment. For this reason, districts with only this concern at school level were considered eligible as well. A total of 4 out of the 15 district studies met the criteria for eligibility as control group. The selected districts are Mavalane in Gaza Province with 28 schools, Homoine district in Inhambane Province with 56 schools, Murrupula district in Nampula Province with 66

schools and Mandimba district in Niassa Province with 26 schools for a total of **176 schools** for the control group.

Progresso-supported government schools (PRO)

Progresso is a membership based non-profit Mozambican organisation. They are supporting bilingual education programmes and provide the text books and materials for schools in five local languages in Cabo Delgado and Niassa Provinces. They have also carried out training for teachers to use and teach with the bilingual materails provided. The original list of schools from Progresso contained 62 schools from Niassa Province and 59 schools for Cabo Delgado Province. The final sample contains 48 schools in Niassa and 49 schools in Cabo Delgado for a total of **97 schools**.

United Nations Children Fund-supported government schools (UNI)

The UNICEF intervention supports schools with a minimum multi-sector package that includes teaching and learning materials, school rehabilitation, teacher training, capacity building to managers and school principals, vaccination campaigns, school health training, water and sanitation, promotion of hygiene practices and community involvement among others (UNICEF 2009). The programme began with schools in Maganja da Costa district in 2006 and by 2008 it had expanded to a total of 5 districts (Buzi and Mossurize in 2007 along with Chibuto and Changara in 2008). Mantepuez and Angoche districts were the last to be added in 2009 for a total of 7 districts. The final sample of UNICEF-supported schools consists of **624 schools**

World Food Programme-supported government schools (WFP)

The WFP programme aims to support access to education and reduce the gender gap as well as improving the nutrition and health status of students (WFP 2009). Their activities include school feeding as well as distribution of take-home rations to

orphans or vulnerable students considered prone to drop out. The WFP initiative began in 2001 after heavy flooding in affected districts. However, over the time, the initiative expanded to other districts as well until there was a more or less even distribution among Provinces and some of the districts in them. However, as a result of this choice, the sample of WFP-supported schools was rather scattered from a geographical point of view. Their final sample consisted of **108 schools** distributed in 47 districts (mainly 2 schools per district) in all ten provinces of Mozambique.

Descriptive and analytical statistics were used to investigate the extent to which four broad categories identified according to the literature review and availability of data influence the pass rates in each of the sample schools. Moreover, beyond looking at the traditional variables that the government dataset allowed, an additional dummy variable was added, linked to the support that schools receive from non-government development partners and agencies described above, which have got different approaches but in general have the common aim to improve educational quality in schools. The above was carried out with the following two main objectives:

- Determine which of the selected variables has the strongest effect on learning outcomes and
- Determine to what extent the additional programmes implemented in schools are yielding better results compared with the control group using the same variables.

Variables

A description was made of the sample schools in terms of the following variables which were suggested by the international literature and available in the database:

Variable 1: Infrastructure

Pupils Per Classroom (PPC): is the average number of pupils in a classroom in a specific level at a given point in time. Classrooms refer to the number of covered, constructed spaces dedicated to teaching and /learning activities**.** This variable is key in determining whether schools have enough learning spaces.

School Building Material (SBM): refers to the material in which each classroom in the school is built with. The database provides information on the number of classrooms in each school and the predominant material that each classroom is built with. Five materials are present in the database and each of them was given a weight from 1 to 5 as follows: Cement (5); bricks/tiles (4); wooden reinforced cob wall (3); wood, bamboo, hay (2); Others (1); the value was applied to each of the classrooms in the schools built with that specific material and the total was subsequently divided by the total number of classrooms recorded for that specific school. As a result, each school was awarded a School Building Material score representing the average score of the various classrooms which ranges from 1 to 5, being 5 the highest value (better, safer and more durable school building material) and 1 being the lowest value.

Variable 2: Learning resources

Text Books per Student (TBS): is the average number of textbooks per pupil at a specific level in a given subject at a specific point in time.

Dropout rate (DOR): it refers to the proportion of pupils from a cohort enrolled in a given grade at a given school year who are no longer enrolled in the following school year. The dropout rate has a direct effect on the internal efficiency of educational systems. In addition, it is one of the key indicators for analysing and projecting pupil flows from grade to grade within the educational cycle. It has been considered within the resources variable because high drop-out rates represent significant resources that get lost to the investment made in the system.

Formula (UIS)

$$\mathbf{DR}_i^t = 100 - (\mathbf{PR}_i^t + \mathbf{RR}_i^t)$$

Where

$\mathbf{DR}_i^t$ Dropout Rate at grade i in school year

$\mathbf{PR}_i^t$ Promotion Rate at grade i in school year t

$\mathbf{RR}_i^t$ Repetition Rate at grade i in school year t

Variable 3: Human Resources

Pupil-Teacher Ratio (PTR): is the average number of students enrolled per teacher at a specific level in a given point in time. According to the UNESCO Institute for Statistics (UIS online) it is used "to measure the level of human resources input in terms of the number of teachers in relation to the size of the pupil population"

Formula (UIS)

$$\mathbf{PTR}_h^t = \frac{\mathbf{E}_h^t}{\mathbf{T}_h^t}$$

Where

$\mathbf{PTR}_h^t$ Pupil-teacher ratio at level of education h in school year

$\mathbf{E}_h^t$ Total number of pupils or (students) at level of education h in school year t

$\mathbf{T}_h^t$ Total number of teachers at level of education h in school year t

Teacher Qualification Score (TQS): The Database from the Ministry of Education collects data on of the type of qualification that each teacher in public schools has. It records the highest recognized qualification that a teacher has, meaning that the same teacher, even if holding several of the diplomas present in the database, will only appear as having one (the highest) qualification. There are 19 possible entries recognized as teacher qualifications listed (one of them is "no training" though).

Some of these qualifications receive higher remunerations while other groups of qualifications receive the same denominator within the Ministry's salary scale even though some qualifications within the same denominator are slightly more advanced than others. The Directorate of Human Resources Department within the Ministry has got an illustrating document of Teacher Professional Training (ANNEX 1) which shows the course characteristics for each of the qualifications. Based on this, it was possible to rank these qualifications including entry level, duration and what grade should teachers exercise in. Salary scales along with this document were used to rank all qualifications, (even those within the same denominator and salary scale) from 1 to 16.

In a similar process as the one carried out for the school building material, each teacher was attributed a score based on his/her qualification adding to the school score and the total score for the school was divided by the number of teachers. In this way, each school received a teacher qualification score (TQS).

Percentage of Multi-level Classrooms (PMC): Multi-level classrooms are in many cases a consequence of limited resources and poor planning. Nevertheless, Multi-level classrooms have the potential to have positive impacts such as expanded access, cognitive achievement effects on learners as well as social and personal effects on students (UNESCO 2005). However, for these effects to be verified, some minimum requirements need to be met for multi-level classrooms to bring beneficial effects on learners (UNESCO 2005) including awareness, curriculum adaptation, and teacher preparation among others. Without these, as Mason and Burns (1996) point out, a bias selection and lower quality of education are two factors that can result from multi-age classes

There is limited literature that indicates that the Government of Mozambique is making a bet on multi-level classrooms along with limited evidence of efforts to provide teachers with specific skills to manage multi-level teaching activities. This suggests that multi-level classrooms would have a negative rather than a positive impact on learning outcomes in the Mozambican context.

Variable 4: Socio-economic conditions

All the socio-economic data is aggregated at district level, which represents the smallest unit of geographic area with socio-economic data to which each school (and student) falls into.

District Literacy Rates (DLR): the literacy rate was taken at district level and was applied to schools falling under each district.

Households with Electricity (HHE): refers to the number of households that have access to electricity in a specific location at a given point in time expressed as the percentage of the total amount of households in the sample.

Households with access to water (HHW): is the number of households that have access to improved sources of water expressed as the percentage of the total amount of households in the sample.

Housing Materials (HOM): District profiles with data from 2007 contain information on the percentage of households that are constructed with a variety of materials for the roofing, walling and flooring. Based on these percentages, each district was given a housing material score.

Household Assets (HAS): In a similar way, the district profiles contain data on the assets present in each household. The key items that were surveyed were possession of a car, motorcycle, bicycle, TV, radio. Each of these items was given a score (shown in parenthesis) and based on that, each district received a score for the assets present in each household.

There is limited evidence to suggest that one variable is more important than the other in the Mozambican context. Moreover to keep the statistical process simpler, it is important to note that the variables were not weighted.

Learning Outcomes

The learning outcomes were measured by pass rates in grade 5 which mark the completion of the first degree of primary education (EP1) into the second degree of primary education (EP2). The relationship between these outcomes and the factors listed above was tested with correlations.

Finally an Education Production Function was used in order to carry out a regression to determine the extent to which each of the variables and factors within them impacts the most on the learning outcomes. The traditional education production function can be expressed as follows:

$L = f(I, R, H, S)$

Where

L are the learning Outcomes
I is the infrastructure
R are the learning resources in schools
H are the human resources
S socio-economic background

The study is a non-experimental research. Data sets from the following sources were used to populate selected variables described above:

- Annual school survey of the Ministry of Education
- Data from the EMIS system from the Ministry of Education
- Census data at district level from the Instituto Nacional de Estadisticas (INE)

Limitations of the research

A number of limitations in the use of education production functions have already been outlined in the literature review. The limitations in this section will not touch upon those but will look into limitations that are specific to the local context and that were found during the research, based on the use of the data in Mozambique.

Database Quality

The UNESCO Institute for Statistics (UIS) has carried out a Data Quality Assessment framework aiming to evaluate the quality of educational statistics in countries around the world. Despite the fact that the Education Management of Information System (EMIS) in Mozambique scores relatively well in the methodological soundness, the accuracy and reliability dimension score very low (68% and 26% respectively in comparison with international norms) (UIS 2009). Countries are evaluated in six dimensions; Mozambique's EMIS is given an overall score of 41% compared to international standards. The weaknesses in the system pose a limitation in terms of quality of the educational data that was analysed.

Transparency and accountability on funds transferred to schools

Funds directed to schools (ADE) have had various transparency concerns raised. The Centre for Public Integrity (CIP) has been carrying out since 2010 public tracking expenditure exercises at district level. Many of these exercises have pointed out that the flow of ADE funds between District Directorates and schools has several leakages. For example, in the exercise conducted in the Bilene district for 2010, the monitoring team found that schools did not receive the total funds that were allocated to them according to the distribution manuals (CIP 2011). Inaccuracies in the funds allocated and funds actually received by schools could undermine the whole exercise. In order to mitigate this potential discrepancy, the studies of districts which have had a public

tracking expenditure exercise carried out were analysed and schools in districts which have received the best feedback available were included in the sample.

Aggregated data and lack of information on test scores at central level

The difficulty of triangulating different methods of measuring learning outcomes is known. Moreover, in Mozambique, there is no systematic way of collecting data at school level on individual student performance throughout the year for which promotion is based on the final national exams performed in grades 2, 5 and 7. These national exams are produced at central level but are administered and corrected at school level. Data on tests scores is only available at schools and not at central level. The absence of test scores by subject at central level made it impossible to have a secondary research based on them. The only data available at central level which could be related to learning outcomes were the pass rates..

Pass Rate calculation

The use of pass rates in itself presented a number of challenges. Throughout the research, it was found that even though automatic promotion is the rule for the grades that do not have national examinations (classes 1, 3, 4 and 6), the results of previous years are taken into account to calculate the results of students in grades that require examinations (classes 2, 5 and 7).

Figure 1 Structure of Primary Education and its Examinations

Class	National Examination	Automatic promotion			
1	no	Yes	1st cycle	EP1	
2	Yes*	No			
3	No	Yes	2nd cycle		
4	No	Yes			
5	Yes	No			
6	No	Yes	3rd cycle	EP2	
7	Yes	No			

*Exams for class 2 are not developed at national level

Students are assessed on a scale of 0-20 points receiving a classification depending on the amount of points they get.

Figure 2 Levels and Classifications for Test Scores

Level	Qualitative Classification	Quantitative classification
1	Very Good	17-20 points
2	Good	14-17 points
3	Satisfactory	10-13 points
4	Acceptable	7-9 points
5	Not-Satisfactory	0-6 points

According to the document the first three classifications in *Figure 2* above are considered positive while the last two are considered negative. However, students in grade 2 with an acceptable classification will progress into grade 3 even though acceptable is considered a negative.

Levels 1, 2 and 3 (left column) are considered positive making the pass at 10 points out of 20 for grade 5.

At the end of the second and third cycle (class 5 and 7 respectively), three exams are imparted to students in Portuguese, Math and Natural Sciences which aim to measure the student's learning and competences according to the curriculum.

Calculation of the final score for grade 5 which determines the pass is calculated in the following way:

Each student receives a classification for each of the subjects. The classification for 5^{th} grade (end of second cycle) is the following:

$$CC2 = \frac{2 \times MC2 + Exam}{3}$$

Where

CC2 is the Classification for Cycle 2

and

MC2 is the average of the scores obtained in class 3, 4 and 5 as expressed below:

$$MC2 = \frac{\text{Average of Class 3 + Average of Class 4 + Average of Class 5}}{3}$$

At the end of the second cycle the pass grade is conceded to students with:

a. A global classifications (all subjects) equal to or above satisfactory
b. A classification equal to or above satisfactory in Portuguese and Math
c. A classification equal to or above acceptable in the remaining subjects

The above has been taken literally from the General Evaluation Rules of the Basic Education schools. Despite the fact that the above can be confusing to some extent, clarification was requested from Ministry Officials and what this means is that B applies provided that C is verified so they should not be listed as separate points.

This presents a number of challenges. The first one is that only the end of cycle 2 and 3 (5^{th} and 7^{th} grade exams are prepared at national level). This means that any assessment carried out prior to that are not necessarily harmonized at national level for which assessments can be of different type and quality sprouting different results which are later taken into account to calculate the final score.

Despite the fact that the examination for grade 5 is developed at national level, the actual final grade is computed by multiplying by two the average grades of previous class 3, 4 and 5 which are not standardized (see formulae above).

Moreover, progression in these classes is semi-automatic, children with results equal or above acceptable, even though they may not have reached the desired level, will still progress to the next level, which could add to their burden and accumulate weak results. Students accumulating weak results over time will have more difficulties both in terms of their competences but also in terms of calculations to achieve a passing score in fifth grade.

On the other hand, schools with limited rigour in their own assessment processes may have students who are ill-prepared receiving positive assessments. In an opposite way, these students will be likely to receive a passing final score even if the final examination is weak.

Data Collection

The data collected for each of the schools came from four different excel files provided by the Ministry of Education. One on enrolments at the beginning and end of the year and number of passing students; another one with teacher information, a third one with classroom and infrastructure data and the last one regarding books and their distribution. However, difficulties and in some cases discrepancies between the files led to the deletion of some of the schools. All schools supported by the various organisations were included in the initial sample. The following are the main reasons why some schools were dropped from the sample:

- Some Primary schools offer only a few grades. Since the pass rate in grade five was going to be one of the measures of learning outcomes, schools that did not have at least all five grades of the EP1 cycle were dropped from the sample

- In some cases schools had the same name but a different school code in the pass rates file. However, in the teachers' file there was only one record for the school with that name and no school code. In these cases, both schools were dropped from the sample to avoid double counting.

- The WFP school feeding programme was very scattered from a geographical point of view. Since district data needed to be taken from a different database than the school data, each district had to have its own calculations. In some cases WFP would be supporting one school in one district. These schools were not representative of the district and were only adding on to the database

workload without any added value. These lone-standing schools were also dropped from the sample.

- In some cases the names of the schools provided by the organisations did not match any school in the government data base. These schools were dropped as well. In other cases same names with different spellings were provided. After close scrutiny, only when there was no doubt the school was the same, was it added. In dubious cases, the school was dropped.

- In some cases, even though schools had data on the number of students and pass rates teacher etc, the same school would not appear in another one of the files, for example the school building materials or number of classrooms. In these cases, given the lack of data from one or another file, these schools were dropped as well.

Findings

The following chapter covers the findings of the data and is divided into five sections. The first one looks into descriptive data, mainly the pass rates and compares them to the various factors within the variables. The second section analyses whether some of the initial findings could be explained by changes over time. The third section looks into the correlations. The forth section goes into a deeper analysis of each of the interventions and analyses their individual regressions. And finally an overview of all the regressions is made to determine whether there are any interesting patterns by looking at the regressions globally and analysing the regression of the whole dataset.

The research sample covered a total of 1167 schools which represent 11.4% of the total EP1 schools in all provinces in 2010 which amount to 10,195. Note that this value does not include government schools in Maputo city which are further 107 EP1 schools. Often, research carried out in Maputo city is regarded as non-representative

of the country due to a privileged situation of the capital city in comparison with the rest of the country and particularly the rural areas. Maputo has better schools, more universities, better services and better qualified human resources. The economy of the country moves in Maputo, there are more job opportunities and access to services. As a result the reality in Maputo has little to do with the reality in the rest of the country. For this reason, schools from Maputo city were not included in this research sample. *Table 1* below shows a summary of the distribution of schools in the research sample according to Province and intervention.

Table 1 Number of Schools by Province and Intervention

Province	AFK	CON	GOV	PRO	UNI	WFP	Total schools in the sample	Total schools in Province	Percentage of schools covered (%)
Cabo Delgado	60	0	0	49	90	9	208	846	24.6
Gaza	0	0	28	0	90	3	121	662	18.3
Inhambane	0	0	56	0	0	16	72	738	9.8
Manica	0	56	0	0	82	10	148	689	21.5
Maputo	0	0	0	0	0	11	11	428	2.6
Nampula	0	0	66	0	72	18	156	1758	8.9
Niassa	0	0	26	48	0	6	80	861	9.3
Sofala	0	0	0	0	80	16	96	729	13.2
Tete	0	0	0	0	94	2	96	957	10.0
Zambezia	0	46	0	0	116	17	179	2,527	7.1
Total	**60**	**102**	**176**	**97**	**624**	**108**	**1,167**	**10,195**	**11.4**

As we can see Cabo Delgado has the largest sample, both in terms of absolute numbers (208 schools) as well as percentage of schools covered (24.6%) while Maputo Province had the smallest sample with 11 schools representing 2.6% of the total schools in the Province. Inequities between the northern and the southern provinces are well known and confirmed by indicators such as literacy rates. The samples above would suggest that interventions have had a tendency to target more deprived provinces in the central and northern provinces of the country.

Regarding interventions, UNI has the biggest sample with 624 schools, followed by the GOV sample (control group) with 176, while AKF has the smallest sample with 60 schools. WFP interventions were very scattered with just a couple of schools in many districts resulting in a small number of schools in *all* provinces.

Pass Rates against variables

Table 2 below shows the Pass Rates of grade 5 (PR5) for the various interventions showing the results by Province. Blank spaces mean that a particular intervention is not being implemented in that particular province. Note that in order to make a broader comparison, an additional exercise was carried out later; the results of the variables were calculated for all EP1 schools in Mozambique which have grade 5 learners from every Province and every district. From here on, the *National* values shown in various tables represent the results from all schools in the country (or all the schools in the Province depending on the table).

Table 2 Pass Rates by Province and Intervention

Province	AFK	CON	GOV	PRO	UNI	WFP	National	Stan Dev
Cabo Delgado	76.2	-	-	71.7	77.3	75.1	77.3	16.9
Gaza	-	-	63.3	-	71.3	64.8	66.3	13.8
Inhambane	-	-	85.1	-	-	75.7	75.9	13.3
Manica	-	70.2	-	-	78.9	67.3	70.1	16.1
Maputo	-	-	-	-	-	70.5	66.7	16.5
Nampula	-	-	72.5	-	85.8	57.5	76.2	14.8
Niassa	-	-	73.5	85.8	-	70.8	77.5	17.2
Sofala	-	-	-	-	67.3	73.5	77.5	14.2
Tete	-	-	-	-	77.1	78.1	79.2	14.4
Zambezia	-	73.8	-	-	78.4	73.7	74.6	18.2
Sample Total	**76.2**	**71.3**	**75.2**	**77.0**	**76.5**	**74.5**	**73.9**	**16.2**

KEY	
AKF	Aga Khan Foundation
CON	Concern
GOV	Government
PRO	Progresso
UNI	UNICEF
WFP	World Food Programme

Pass Rates by intervention range from 71.3 (CON) to 77.0 (PRO). The control group (GOV) shows a Total Pass Rate in 5th grade of 75.2. As we can see from the table above, the total Pass Rates for the interventions of AKF, PRO and UNI are showing results above those of the control group, while WFP and CON have got Total Pass Rates below the control group.

When looking at the Pass Rates by interventions and comparing them to the national pass rates, we can see that AKF has pass rates slightly below the national pass rates for each Province while PRO is below in Cabo Delgado and above in Niassa compared to the national pass rates (grey column) where they are implementing their programmes. UNI has all its values above the national pass rates except for Sofala and Tete Provinces. Interventions in the districts in these two provinces began in 2007 and 2008 respectively, for which a limited amount of time since the intervention began could be behind the negative trend in these two provinces. However, some of the provinces with pass rates above the universal sample also began interventions in the same year.

On the other hand despite the fact that CON has total pass rates below the control group (GOV), the pass rate is slightly higher than the average pass rate for the province in Manica when using the National values. Zambezia Province, however, remains below even when using the National results.

For WFP, the Pass Rates by province remain below the in all provinces except for Maputo when comparing them to the National results. Nevertheless, all intervention schools and GOV sample schools are above the total national average pass rate which stands at 73.9. It is not surprising that intervention schools have better pass rates than the average of the National pass rates, given the additional support that these schools receive. However, it is very interesting to note that the schools in the control group (GOV) have better Pass Rates in 5^{th} grade (75.2%) compared to the average national level of the universal sample.

It is important to remember that the criterion for selecting these GOV schools was the appropriate financial management of resources received by districts and schools. This could probably point towards a correlation between good financial management and school performance and would support the thesis of Levacic et al (2002) who argue that processes could be of great importance on the effective use of funds and could thus explain why education production studies ignoring school processes have not managed to identify systematic effects of resources on pupil performance. However, further research would be required to confirm such a statement in the Mozambican

context since none of the variables in this research can be directly or indirectly linked to managerial, financial or administrative processes.

Table 3 below shows the pass rates by intervention and compares them to the factors within the school infrastructure variable. These factors include the number of Pupils Per Classroom (PPC) and the Building School Material (BSM). All of these have had the Standard Deviation (STD) calculated in order to identify inequity issues.

The Pupils per classroom (PPC) numbers are concerning in every single one of the cases regardless of the intervention which shows a widespread need for an increase in the number of appropriate learning spaces. However, it is important to bring back the fact that the database does not allow for differentiation of schools with double shifts. This means that the numbers are likely to be lower in some cases, but the double shifts still present enormous challenges for which the problem still persists. The issue of single and double shifts will be touched on in further detail under the pupil teacher ratio analysis further below.

Table 3 Pass Rates by Intervention against factors in Variable 1: School Infrastructure

	Y		*Variable 1 - School Infrastructure*			
Intervention	**PR5**	**STD**	**PPC**	**STD**	**BSM**	**STD**
AKF	**76.2**	**13.6**	77.0	40.1	3.4	1.2
CON	**71.3**	**15.6**	80.0	60.1	3.3	1.0
GOV	**75.2**	**16.2**	67.9	34.7	2.8	1.1
PRO	**77.0**	**15.3**	90.6	54.1	3.5	1.0
UNI	**76.5**	**15.4**	91.8	58.4	3.2	1.1
WFP	**74.5**	**14.8**	85.8	75.9	3.9	0.1
Sample Total	**75.5**	**15.4**	85.6	57.3	3.2	1.1
National	**73.9**	-	83.9	-	3.3	-

KEY	
PR5	Pass rate in grade 5
PPC	Pupils Per Classroom
BSM	Building School Material
STD	Standard Deviation

PRO, UNI and WFP show the highest PPC values by intervention with averages of 90.6, 91.8 and 85.8 pupils per classroom respectively but two of them –surprisingly- are also above the average pass rate of the research sample and all of them are above

the national pass rate. This could point towards these schools attracting more students. If this is the case, parents and students may perceive these schools as providing better educational services. Nevertheless, crowded classrooms would hinder the very quality that these parents and students are looking for and could partly explain weaker performances by some of them.

The PPC is also showing tremendously high standard deviation values for all interventions. The standard deviation for the whole research sample for PCC is 57.3 with numbers ranging from 15 to 639 students per classroom. Over 50 schools report having more than 200 students per classroom. Some of these are likely to be schools with double shift. However, even if the value is divided by two in order to reflect the double shift, the numbers are extremely high. On the other end, close to 80 schools report having less than 40 students per class room.

The national average shows 83.9 students per classroom. This average is below all but two (AKF) of the intervention schools' averages, which could again be pointing towards intervention schools attracting more students, while the GOV control sample has 67.9 students per classroom. This is the lowest PPC value of all (67.9), which could mean two things: either the GOV sample has got more classrooms in its schools or it is attracting less students to its classrooms.

The BSM factor has very similar values between the total research sample average and the national average, with 3.2 and 3.3 respectively. This would suggest that in general terms, schools in the sample as well as schools outside of it, are receiving the same attention in terms of infrastructure and classroom building. However, the average is masking some differences between interventions.

As far as the Building School Material (BSM) averages by intervention, the GOV control schools have the lowest score with an average of 2.8 which is 5 decimal points below the total average of the research and national sample. It is interesting to see that all the intervention-supported schools but one (UNI, below by 0.1) have an average equal or above the national one even though many of them do not implement infrastructure or construction activities. Lobbying and advocacy of organisations supporting the intervention schools could be behind the positive trend. Government

officials at various levels could feel the pressure to ensure that these schools are well maintained given the constant presence of external, or outsider eyes on them demanding further accountability and/or training and supporting the community to do so. These kinds of activities fall under UNI and CON for instance. However, the highest values for BSM are for WFP (3.9) followed by PRO (3.5) and then AKF (3.4).

The GOV control sample has the lowest BSM of all with 2.8. Nevertheless, the low standard deviation suggests that schools are receiving relatively equal attention and support in terms of infrastructure.

Table 4 below shows the pass rates by intervention and compares them to the factors within the Learning Resources variable. These factors include the number of Text Books per Student (TBS) and Drop Out Rates (DOR). All of these have had the Standard Deviation (STD) calculated in order to identify inequity issues within these factors.

Table 4 Pass Rates by Intervention against factors in Variable 2: Learning Resources

	Y		Variable 2 - Learning Resources			
	PR5	**STD**	**TBS**	**STD**	**DOR**	**STD**
AKF	**76.2**	13.6	2.0	0.6	9.0	10.1
CON	**71.3**	15.6	2.2	0.5	6.5	5.9
GOV	**75.2**	16.2	2.1	0.6	9.8	9.3
PRO	**77.0**	15.3	2.0	0.6	13.0	9.1
UNI	**76.5**	15.4	2.0	0.6	7.5	11.9
WFP	**74.5**	14.8	2.0	0.6	7.1	6.6
Sample Total	**75.5**	15.4	2.1	0.6	8.1	10.5
National	**73.9**		1.9		7.99	

KEY	
PR5	Pass rate in grade 5
TBS	Text Books per Student
DOR	Drop Out Rate
STD	Standard Deviation

As far as textbooks per student (TBS) is concerned, there are four core subjects that require a book in primary Education in Mozambique. These are Natural sciences, Social sciences, Math and Portuguese. According to the data base, Primary schools can have a range of up to 19 textbooks with other subjects, including some of the

above in local languages (L1). According to the policy and guidelines, teachers should introduce the core subjects in local languages (L1) in the early grades. Keeping in mind the language issue, it means that each pupil should at the very least have seven textbooks, four for the core subjects plus three in the local languages.

As we can see from the table above, the average textbook pupil ratio is 2.1 books per student with no major changes across interventions with averages ranging from 2.0 to 2.2 textbooks per student. The low standard deviation values confirm the relatively equal situation of schools in terms of book distribution. The National textbook per student ratio in the universal sample is slightly below, with 1.9 text books per student.

Drop-Out Rate (DOR), which was considered for all the schools and not only for 5th grade has a sample average of 8.1%. If we look at dropout rates from an intervention point of view, PRO-supported schools seem to have the highest drop-out rates at 13%, higher than both the national DOR and the GOV control group DOR. It is important to underline that PRO supports bilingual programmes implemented in areas where teachers and students face significant academic difficulties; the first ones by teaching in local languages often with limited support and material and the latter by learning in Portuguese which is a second language (L2), often not spoken at home. According to (Bamgbose 2000), language difficulties are among the main causes of drop out from school in Sub-Saharan Africa.

On the positive side CON, UNI and WFP schools have dropout rates below the 7.99 national average and the 9.8 GOV DOR. This would support the hypothesis that these interventions retain students and especially in the case of WFP would support the thesis that school feeding and take-home rations are effective interventions to keep students enrolled.

However, it is interesting to see that the DOR average for the research sample is higher than the DOR for the national universal sample. An explanation for this could be that intervention schools are being able to attract students that otherwise wouldn't enrol but these same students are prone to leave and eventually drop out resulting in higher drop-out rates for some intervention schools.

If we look at the Pass Rates by intervention, we can see that the top two results for PR5 are within the top three results for DOR. One would expect PR5 and DOR to be inversely related. An explanation for this could be, as suggested above, that intervention schools attract students that wouldn't normally attend but subsequently drop out anyway. Another possibility is that students dropping out tend to be the weaker ones, leading to higher pass rates. However, it is impossible from the data to determine if any of these two hypotheses is reliable. Further research would be required to determine this.

Table 5 below shows the pass rates by intervention and compares them to the factors within the Human Resources variable. These factors include the number of pupils per teacher or Pupil to Teacher Ratio (PTR), the Teacher Qualification Score (TQS) and the Percentage of Multi-level Classrooms (PMC). All of these have had the Standard Deviation (STD) calculated in order to identify inequity issues within these factors.

Table 5 below shows that the Pupil Teacher Ratios are very high in all interventions, with UNI presenting the highest PTR at 70 students per teacher. AKF and CON have PTR values below the GOV control group while PRO, UNI and WFP have values above the GOV ones. It would seem as if UNI sample schools are attracting more students. However, once again, quality concerns could be raised by the limitations that teachers would have with such big groups of students. It is important to note that standard deviations are rather high for all the different interventions and the standard deviation for the total sample is 39.4 for the PTR values. UNI is showing the highest standard deviation in its sample with PTR values ranging from 22 to 480 students per teacher.

Table 5 Pass Rates by Intervention against factors in Variable 3: Human Resources

	Y		Variable 3 – Human Resources					
	PR5	**STD**	**PTR**	**STD**	**TQS**	**STD**	**PMC**	**STD**
AKF	**76.2**	13.6	53.7	16.5	3.6	2.1	3.6	23.8
CON	**71.3**	15.6	51.2	26.3	2.3	1.7	3.8	10.2
GOV	**75.2**	16.2	56.8	37.1	2.7	2.4	5.5	16.4
PRO	**77.0**	15.3	64.9	27.2	3.7	1.9	2.7	14.1
UNI	**76.5**	15.4	70.4	43.0	3.6	2.2	4.0	12.5
WFP	**74.5**	14.8	63.3	38.4	4.1	2.2	0.6	6.74

Sample Total	**75.5**	15.4	64.2	39.4	3.4	2.2	3.6	13.7
National	**73.9**	-	65.3	-	4.2	-	2.8	-

KEY	
PR5	Pass rate in grade 5
PTR	Pupil Teacher Ratio
TQS	Teacher Qualification Score
PMC	Percentage of Multi-level Classes
STD	Standard Deviation

Over 100 schools in the sample have a record of over 120 students per teacher. Some of these schools are likely to have a double shift but even if that is the case, according to a study carried out by Michaelowa (2001 and 2003) in PASEC countries (Programme on the Analysis of Education systems), 60 students would be the threshold where additional pupils would have an increasingly negative effect on learning outcomes. From this perspective, any value above that would hinder the educational activities in a significant way. Moreover, the workload of a teacher on double shifts is significantly higher than a teacher working a single shift. In the same research Michaelowa (2001) finds the impact of double shifts to be significant and negative. The reason for this could be that marking tests or even reviewing homework or classroom work takes twice as much time resulting in a toll on the time and quality that these teachers can devote to students and their work. For this reason, the Ministry has purposely kept the data base without making a differentiation between the double and single shifts. In this way, double shift or not, they are able to easily spot schools requiring support in terms of teacher recruitment.

On the other end, over 130 schools have less than 40 students per teacher. Some of these could be small rural schools, but even so, it would be worth exploring this issue since a better and planned deployment of teachers could help address the problem of teacher shortage at no additional costs.

Surprisingly, the average teacher qualification score (TQS) of the research sample is lower than the national TQS at 3.4 and 4.2 respectively. Given the additional support provided to the majority of the sample schools, one would expect teachers to be better qualified. It is not uncommon for teachers to receive additional training by the external or non-government actors. However, this training is often not recognized with diplomas nor certificates listed by the government in their qualification tables. As such, these additional skills do not show in the government data base and probably

explains why additional training does not reflect in the results here.

WFP shows the highest score for teacher qualifications and CON shows the lowest. Nevertheless, none of these two organisations support or provide additional teacher training so the findings (positive or negative) on this particular variable cannot be attributed to the intervention of these two organisations. On the other hand, UNI and PRO both provide additional training to teachers and both show TQS of two and three decimal points respectively above the total research average. GOV schools show the lowest TQS at 2.7 compared to the national average of 4.2.

The percentage of multilevel classrooms was also calculated for each school. This phenomenon occurs very often where there is a shortage of teachers and the few available are constrained to teach more than one grade at the same time. This has different implications including the need for additional training for teachers to handle these kinds of settings along with quality concerns linked to the limited amount of time that a teacher has to dedicate to each class and student.

If we look at the averages by intervention, AKF has the most classes teaching in multi-level settings. However, the AKF intervention has one of the lowest teacher to pupil ratios. Given the generally high PTR, a closer look to teacher deployment aiming to guide a normalization of available human resources would be worthwhile.

Table 6 below shows the pass rates by intervention and compares them to the factors within the Socio-economic Conditions variable. These factors include the District Literacy Rate (DLR), the access that House Holds have to Electricity (HHE), the access that House Holds have to Water (HHW), the Housing Materials (HOM) and the House Hold Assets (HAS). Standard Deviations were not calculated for these factors as all of these values are aggregated at district level. Most interventions are implemented in just a couple of districts for which a standard deviation calculation would be of limited value.

Table 6 Pass Rates by Intervention against factors in Variable 4: Socio-Economic Conditions

	Y		Variable 4 – Socio-Economic Conditions				
	PR5	**STD**	**DLR**	**HHE**	**HHW**	**HOM**	**HAS**
AKF	**76.2**	13.6	39.9	0.8	58.5	35.7	16.4
CON	**71.3**	15.6	50.7	2.4	48.6	41.0	21.9
GOV	**75.2**	16.2	48.0	1.6	48.5	43.6	23.9
PRO	**77.0**	15.3	43.1	1.9	51.3	40.3	25.6
UNI	**76.5**	15.4	46.7	2.9	52.5	42.2	22.3
WFP	**74.5**	14.8	45.9	3.0	51.8	41.8	23.3
Sample Total	**75.5**	15.4	46.5	2.5	51.7	41.8	22.5
National	**73.9**	-	41.8	10.7	11.1	*	*

*Data not available

KEY	
PR5	Pass rate in grade 5
DLR	District Literacy Rate
HHE	House Hold Electricity
HHW	House Hold water
HOM	Housing Materials
HAS	Household Assets

Access to electricity in the households remains very low at 2.5% of households having electricity in the research sample districts, meaning that after sunset, the possibilities for children carrying out further homework or learning activities is dim. The possible learning hours per day are further reduced during the winter months. From an intervention point of view, there are no significant differences with the range going from 0.8% for schools supported by AKF and 2.9% for schools supported by WFP. Of course, this is in no way related to the external interventions but rather was to determine whether children attending schools in areas with higher access to electricity were performing better.

The same applies for access to water. It is well known that households with no access to water often need to fetch it from the closest water source. This task is in most cases given to the children and the sources in some cases are far away from home taking a significant toll on the amount of time that children can spend at school or doing homework after classes are over.

In terms of housing materials, there is one outliner below the others which is AKF with 35.7% while all the other interventions and control group have values ranging between 40.3% and 43.6%. The same thing happens with the assets that household

possesses (HAS) where AKF has a 16.4% while interventions in other districts range between 22.0% and 25.5%

We can see that by looking at the various factors in the socio-economic variable, schools in the districts targeted by AKF are the most deprived ones, showing the lowest values for all factors except access to water, where it actually has the highest percentage. Despite the dire conditions that these districts may have, the AKF intervention districts are still showing better pass rates than the research sample average and the national average, which could point towards the importance of early childhood interventions and school readiness for students to perform better in school.

Changes over time?

As discussed above, the way the sample schools are distributed would suggest that interventions were made targeting schools in poorer Provinces, with lower educational indicators or simply more deprived. If that is the case, many of these schools may have "started" from a more disadvantaged position some years back and improving their performance over time bringing them to an average performance and thus presenting similar results (or lower results as is the case of WFP and CON) in 2010 compared to schools with no intervention.

In order to dig deeper into this issue, an additional piece of work was added to the research. Under the hypothesis that interventions are often selected to support schools with particularly deprived conditions, the whole sample was ran again using the data of 2004 looking into enrolment trends, drop-out trends and pass rate differences between 2004 and 2010. Table 8 below shows a summary of the changes in enrolment, Drop Out Rates and Pass Rates between 2004 and 2010.

Table 7 Change in Student Enrolments, Drop Out Rates and Pass Rates between 2004 and 2010 by Intervention

	Enrolment			Drop Out Rate			Pass Rate (Grade5)		
	2004	2010	PEC (%)	2004	2010	DOC	2004	2010	PRC
AKF	18,102	21,090	16.5	6.9	9.0	2.1	73.7	76.2	2.5
CON	35,918	44,382	23.6	7.1	6.5	-0.7	76.8	71.3	-5.5
GOV	44,287	60,820	37.3	5.3	9.8	4.5	78.8	75.2	-3.6
PRO	32,715	45,852	40.2	11.8	13.0	1.2	72.1	77.0	4.9
UNI	173,934	273,866	57.5	8.9	7.5	-1.4	76.0	76.5	0.6
WFP	64,044	78,335	22.3	4.8	7.1	2.3	77.8	74.5	-3.3
Sample Total	369,000	524,345	42.1	7.7	8.1	0.4	76.3	75.5	-0.9
National	3.024.819	4.327.630	43.1	7.2	8.0	0.8	77.5	73.9	-3.6

KEY	
PEC	Percentage Enrolment Change
DOC	Drop Out (Rate) Change
PRC	Pass Rate Change

Some interesting general things came out of the analysis of data from 2004. For instance 428 of the schools in the sample did not have 5th grade back then, while 142 schools did not exist at all. These schools account for 50,329 students in 2010 which represent 9.6% of the overall enrolment of the research sample in 2010 and 32.4% of the percentage increase in enrolments. It is important to highlight the fact that 261 schools in the sample recorded a negative trend in their enrolments from 2004 to 2010. The total percentage change in the enrolment is 42.1 % which amounts to 7% per year over six years. This is a substantial growth which poses a serious challenge for the quality of the system to keep up with the expansion.

Although enrolments have increased by 42% overall in the sample schools, the drop-out rate has also increased from 7.7 in 2004 to 8.1 in 2010. The overall pass rate in the sample schools dropped by 0.9% since 2004. It is important to mention that a new curriculum was introduced in 2004. This process normally takes time before teachers master the new instruments and the first two rounds of 'new curriculum graduates' from grade 5 came between 2009 and 2010. This could be behind the overall drop in pass rates for both the total research sample and the national universal sample.

CON has also seen the drop-out rates decrease from 7.1 to 6.5 and the pass rates from 76.8% to 71.3%. WFP had the lowest increase in enrolments, had its drop-out rates raise from 3.9 to 7.5 and the pass rates came down by 3.8%.

The best improvements in terms of Pass Rates are shown by PRO with a 4.9% improvement since 2004 and AKF with 2.5% higher Pass Rates than in 2004. Going back to the specific interventions, the above findings would suggest that school readiness and schooling in local languages seem to have the most meaningful impact over time. UNI also has a slight increase in pass rates of 0.6% over the same period.

The GOV sample shows an increased enrolment but it is below the total of the sample, being the second lowest in terms of enrolment increase. Drop-outs have also increased since 2004 from 5.3 to 9.8 and the pass rates have suffered a decline of 3.6% since 2004.

Table 8 below illustrates the changes by factor between 2004 for the National values and compares them to the 2010 showing how the research sample and the National values have shifted in time for each factor.

Table 8 Changes by factor between 2004 and 2010

	PR5	TBS	PPC	BSM	DOR	PMC	PTR	TQS	DLR	HHE	HHW	HOM	HAS
Sample 2010	**78.3**	2.2	92.8	3.3	8.5	4.6	73.4	3.4	46.5	2.5	51.7	41.8	22.6
National 2010	**73.9**	1.9	83.9	3.3	7.99	2.8	65.3	4.2	41.8	10.7	11.1	*	*
National 2004	77.5	0.09	83.0	3.3	7.1	3.3	64.7	1.9	*	*	*	*	*

*Data not available

The national sample shows a decline in pass rates between 2004 and 2010 of 3.6% along with an increase in the drop out rates from 7.1 in 2004 to 7.99 in 2010.

Interesting to highlight that despite the low TBS ratio for 2010 across provinces and interventions, there is clearly a major improvement since 2004 where the average textbook per student did not reach 1 (at 0.09) using the national universal sample.

What is also remarkable keeping in mind the expansion of access in the system is the fact that there seems to be a clear effort from the government to at least maintain (if not improve) the PTR. Despite having almost two hundred thousand students more only in the sample schools (1,302,811 students more in the whole country), the PTR at national level has had a negligible increase –keeping the proportions- of 0.6 since

2004. Moreover, if we look at the Teacher Qualification Score (TQS) we can see that in the universal sample, it has increased from 1.9 in 2004 to 4.2 in 2010. This shows an impressive investment in teacher training and professional development of teachers. Nevertheless, this raises again a question mark as to why are learning outcomes in Mozambique as measured by SACMEQ in decline?

The following table has a different perspective. It looks at all the schools in the research sample by province regardless of the intervention. Even though there are some interesting issues arising from the analysis of this table it is important to highlight that it is difficult to draw conclusions from here since in some cases we can not consider the research sample representative of the whole province due to the limited number of schools in the sample for that province or due to the concentration of sample schools in only a few districts of the province.

Table 9 Summary of Pass Rates against all factors by Province (including only schools in the research sample)

	Y	Variable 1		Variable 2		Variable 3			Variable 4					
Province	**PR5**	**PPC**	**BSM**	**TBS**	**DOR**	**PTR**	**TQS**	**PMC**	**DLR**	**HHE**	**HHW**	**HOM**	**HAS**	**PR5 National**
Cabo Delgado	75.4	91.6	3.5	2.0	7.9	60.2	3.4	4.8	40.9	2.0	54.4	38.1	21.9	77.3
Gaza	70.2	74.7	2.9	2.1	5.8	51.9	2.5	10.8	59.1	5.7	57.0	47.7	25.0	66.3
Inhambane	81.8	51.8	2.4	2.1	5.3	42.1	0.9	1.1	60.6	2.7	47.7	47.1	19.9	75.9
Manica	73.1	97.2	3.3	2.1	7.6	57.4	2.2	2.8	49.3	2.3	48.7	41.1	21.0	70.1
Maputo	70.5	67.0	4.5	2.2	8.6	47.8	6.8	0.7	62.5	14.6	59.8	50.0	23.5	66.7
Nampula	79.4	96.3	3.1	2.2	6.9	91.5	3.5	2.5	37.9	2.7	51.3	41.7	22.5	76.2
Niassa	79.9	81.7	3.5	1.9	15.6	61.2	4.2	3.9	44.3	2.9	50.4	43.8	29.8	77.5
Sofala	69.3	91.8	3.6	2.2	11.8	72.6	4.7	3.3	50.0	2.1	52.7	41.6	29.9	77.5
Tete	77.1	78.9	3.3	2.2	8.6	54.3	4.4	11.5	54.4	0.8	51.4	39.9	19.4	79.2
Zambezia	76.2	86.0	3.2	1.9	7.1	77.8	4.0	0.7	37.8	0.8	49.0	40.3	18.4	74.6
Sample Total	**75.5**	**85.6**	**3.2**	**2.1**	**8.1**	**64.2**	**3.4**	**3.6**	**46.5**	**2.5**	**51.7**	**41.8**	**22.5**	-
National	**73.9**	83.9	1.9	3.3	7.9	65.3	2.8	4.2	41.8	10.7	11.1	*	*	**73.9**

*Data not available

KEY	
PR5	Total Pass Rate (grade 5)
PPC	Pupils Per Classroom
BSM	Building School Material
TBS	Textbooks per student
DOR	Drop Out Rate (all school)
PTR	Pupil Teacher Ratio
TQS	Teacher Qualification Score
PMC	Percentage of Multilevel Classrooms
DLR	District Literacy Rate
HHE	House Hold Electricity
HHW	House Hold Water
HOM	Housing Material
HAS	House Hold Assets

In it we can see that the average Pass Rates in 5th grade (PR5) for the research sample is 78.3% with provincial averages ranging from 67.7% to 85.2%. Inhambane and Niassa are the Provinces with the highest pass rates at 85.2 and 80.9 respectively while the lowest pass rates are recorded –surprisingly- by Maputo and Sofala with 67.7 and 71.2 respectively. Nevertheless, even rural schools in Maputo Province (and in the south of the country in general) are perceived to perform better than schools in the Northern provinces. This is supported by literacy rates higher for Maputo Province and its respective districts' literacy rates which in this sample are amongst the highest.

The same holds true, though to a lesser extent with Sofala Province, with capital Beira being the second city in the country and perceived as a Province growing and progressing in many aspects, it also has one of the best literacy rates for the central Provinces.

The fact that schools perceived to perform better seem to be getting the lowest pass rates raises some questions. This could be an explanation for Maputo and Sofala to be showing the lowest pass rates despite educational indicators that would point towards better quality schools. It is risky to make such a statement based on *table 9* above only; however, as we will see further ahead in the specific analysis by intervention, this hypothesis seems to be supported by subsequent findings.

In a similar but opposite way, Niassa is one of the three Provinces with the highest illiteracy rates (61%). Nevertheless, it has the second best pass rates in the findings above. If what is stated in the paragraph above holds true, the opposite could also point towards lower quality schools having weak examination processes with limited support and self-inspection, where teachers could be more motivated to present better scores for their students – and thus for themselves- than actually assessing their learning achievements.

An exercise was carried out to have a point of reference regarding examinations. Provinces were ranked according to their pass rates and these rankings were compared

to those of SACMEQ for each Province. This comparison is illustrated in *figure 3* below.

Figure 3 SACMEQ Ranking vs. Research Ranking by Province

Province	SACMEQ Ranking	Research Ranking	Difference with respect to SACMEQ
Cabo Delgado	9	6	+3
Gaza	7	9	-2
Inhambane	4	1	+3
Manica	3	7	-4
Maputo	2	8	-6
Nampula	1	3	-2
Niassa	10	2	+8
Sofala	5	10	-5
Tete	8	4	+4
Zambezia	6	5	+1

If we look at the SACMEQ rankings by province above, we can see that there are some interesting differences with some of the lowest ranking Provinces in SACMEQ showing much higher ranks in the research sample (Niassa and Tete for example) and some of the higher-scoring provinces in SACMEQ showing the worst rankings in the sample (Maputo, Sofala and Mainca). Beyond supporting what is stated above, this comparison is a strong hint towards the fact that the Pass rate as such is not telling us much about the competences and learning outcomes of students in grade 5.

Moving on to the other factors in comparison to the pass rates (*table 9*) we can see that the Building School Material (BSM) shows the schools in Maputo Province with the highest score (4.5) against Gaza with the lowest one (2.9). Most of the economic activities of the country are centralized in the capital resulting in higher revenues for the Maputo Province, this reflects strongly on the BSM scores.

The drop-outs seem to be higher in Niassa and Sofala while looking at Provincial averages with Inhambane being the best Province at retaining its students with only 5.3% drop-out rate.

Gaza Province has the highest PMC with 14% of classes being taught in multi-level settings. However, it is interesting to see how Gaza, with the highest PMC score is

also one of the Provinces with the lowest Pupil to Teacher ratios. This could point towards rural, isolated schools with few teachers but equally few students.

TQS is lowest in Inhambane even though it scores the highest in pass rates among all Provinces. In the same way, Maputo which is scoring the lowest pass rates has the highest score for qualified teachers. Sofala, which has the second highest score for teachers' qualifications has also the second lowest pass rates.

From a Provincial perspective, it is not surprising to find Maputo with the highest percentage of households that have access to electricity (14.6%) as an outlier. All the other provinces access to electricity ranges between 0.8% (Tete and Zambezia) and 5.7% (Gaza). The percentage of households that have access to water does not have outliers and ranges from 47.7% in Inhambane to 59.8 in Maputo.

Housing material and household assets were analyzed as means to determine the Socio-Economic status of each district and therefore schools and students falling into each of them. We can see that Cabo Delgado and Tete seem to be the provinces with the poorest construction materials for their houses while Maputo shows the highest score. However, when looking at the assets that households have, the picture is slightly different with Inhambane, Tete and Zambezia holding the lowest scores (19.9%, 19.4% and 18.4% respectively) while Sofala and Niassa have the highest scores (29.6% and 29.9% respectively). These two variables were expected to show the same level of deprivation. However, given the difference in the results, the two were kept as separate variables. This is an interesting reading which has many possible interpretations. For one, cultural differences from place to place may give different values to the kinds of assets that one has. Construction material can also be linked to the materials available in one region and the difficulty and costs of transporting more durable, resistant materials to isolated areas etc.

Correlations

The following figure illustrates the correlations between the different variables and the Pass Rates in 5th grade based on the whole research sample.

Figure 4 Overall correlations by factor against Pass Rates in Grade 5

Variables	Abbreviation	Correlation with Pass Rate Grade 5 (PR5)
Pupils Per Classroom	PPC	-0.06
Building School Material	BSM	-0.15
Textbooks per student	TBS	0.05
Drop Out Rate (all school)	DOR	-0.02
Pupil Teacher Ratio	PTR	-0.02
Teacher Qualification Score	TQS	-0.06
Percentage of Multilevel Classrooms	PMC	0.02
District Literacy Rate	DLR	-0.09
House Hold Electricity	HHE	-0.08
House Hold Water	HHW	-0.04
Housing Material	HOM	-0.03
House Hold Assets	HAS	-0.15

Note the extremely limited correlations in *Figure 4* between the pass rates for grade 5 and the different variables for the whole research sample with the highest (negative) ones being negative for Building School Matearial (BSM) and HouseHold Assets (HAS), both which would have been expected to be positive. It would seem that schools with weaker physical infrastructure seem to perform better than schools with higher scores for the Building School Material.

As expected, the pupils per classroom (PPC) and pupil to teacher ratio (PTR) are negatively correlated to the pass rates. However, it is very surprising to see that all of the variables used for the socio-economic variable have a negatively correlated to pass rates as this goes against what most of the literature says regarding the socio-economic status of pupils and its impact on learning results.

The number of Textbooks per Student (TBS) factor and the Percentage of Multilevel Classrooms (PMC) are the only two factors correlated positively to the pass rates. The latter is rather surprising as one would expect that the challenges and limited training provided to manage multilevel classrooms would impact negatively on the pass rates.

It is important to point out that positive or negative none of these correlations is close to meaningful – which should be from 0.5 and higher; but at least 0.3 and higher. However, as shown in *Table 10* below, the overall correlation for the whole sample is hiding differences within the individual interventions which do have meaningful correlations; these have been shaded in the table below.

Table 10 Correlations by factor and Intervention against Pass Rates in Grade 5

	PR5	PPC	BSM	TBS	DOR	PTR	TQS	PMC	DLR	HHE	HHW	HOM	HAS
AKF	**76.2**	-0.17	-0.29	0.06	0.26	0.02	-0.07	-0.09	-0.06	-0.06	-0.06	-0.06	-0.06
CON	**71.3**	-0.12	-0.16	0.13	0.13	0.19	0.03	0.13	-0.29	-0.25	0.06	-0.19	-0.02
GOV	**75.2**	-0.26	-0.19	0.08	-0.12	-0.23	-0.29	0.06	0.34	0.28	-0.01	0.33	-0.17
PRO	**77.0**	-0.14	-0.08	0.11	0.09	-0.17	0.08	-0.03	0.10	0.07	0.18	0.29	-0.06
UNI	**76.5**	-0.03	-0.13	0.02	-0.04	0.01	-0.04	0.01	-0.19	-0.09	-0.15	-0.15	-0.25
WFP	**74.5**	0.00	-0.02	0.12	-0.29	-0.06	0.05	0.08	-0.14	-0.15	-0.13	0.00	-0.10
TOTAL	**75.5**	**-0.06**	**-0.15**	**0.05**	**-0.02**	**-0.02**	**-0.06**	**0.02**	**-0.09**	**-0.08**	**-0.04**	**-0.03**	**-0.15**

As expected, higher numbers of pupils per classroom (PPC) impact negatively on pass rates in all interventions, however, the impact is meaningful only in GOV schools. Interventions as such could be making up for the negative effect of large numbers of students in classrooms mitigating the impact for which even if negative, it is not meaningful.

The BSM correlation against PR5 for AKF is negative -as are all the others- but the AKF one is meaningful. Let us remember that the AKF intervention focuses on early childhood development processes in the poorest provinces of the country.

Drop Out Rates (DOR) are positively correlated with pass rates for the AKF intervention. Given the poverty situation of the schools in the districts targeted by AKF, the poorest and most vulnerable students which would probably be the weakest ones, would be more prone to drop out. Having the weakest performers drop out of the system might artificially inflate the Pass Rates for AKF, which would explain why its DOR has a positive correlation to PR5

On the other end of the spectrum we have WFP with Drop Out Rates having a meaningful negative impact on its pass rates. If we look at WFPs intervention, School Feeding and take-home rations could be a life line for the poorest and probably weakest students and their families. In this case, the schools may be retaining the frailest pupils and thus the negative impact on the pass rates. This retention of the enrolled population that tends to underperform would certainly be an impressive achievement in terms of inclusion and could also be behind the weak results that the sample shows for WFP-supported schools. However, further research would be required to confirm this.

Surprisingly, the teacher qualification score (TQS) has a negative impact on all interventions meaning that the more qualified teachers are, the weakest the results. This is particularly emphasised in the GOV sample schools where TQS has a meaningful negative correlation with the pass rates in 5^{th} grade (PR5). This would support the hypothesis raised in the analysis made above, when looking at the correlations by province, where more qualified teachers would tend to implement more rigorous examinations processes. It would be of paramount importance to do further research on this aspect. Based on the analysis made of the 2004 data, it would seem that a significant amount of resources have gone into teacher training and it is important to pinpoint why is it impacting negatively on pass rates.

As one would expect, the district literacy rates have a meaningful positive correlation with the pass rates in GOV schools; a more educated socio-cultural environment would be more conducive for educational activities to thrive. However, the correlations for the other interventions are erratic. One explanation could be that low literacy districts were targeted and interventions nevertheless have had a positive impact for which could appear as a negative correlation between PR5 and district literacy rate as is the case for CON, which has a meaningful negative correlation.

Something similar could be happening with the access to electricity (HHE) where districts with less access seem to be performing better. However, the CON schools again, which tend to have low socio-economic indicators, show a negative correlation between access to electricity and pass rates. The opposite happens with the GOV

sample which is showing, a positive meaningful correlation between access to electricity and pass rates.

Regressions and specific findings by intervention

Regressions were carried out for all interventions. Beyond using the original factors in the four variables (infrastructure, learning resources, human resources and socio-economic conditions) two additional factor were included resulting from the analysis made of the 2004 data: The percentage change in enrolments (PEC) and the Drop-out rate change (DOC). The following are the specific findings by intervention keeping in mind all the process including the compared analysis of 2004 and 2010. All of the individual analyses have got three main tables. The first one shows more specific numbers of the comparisons of data between 2004 and 2010 for that specific intervention. The second one looks into correlations of changes over time for Drop Outs rates Changes (DOC), Percentage of Enrolment Changes (PEC), and Pass Rate Changes (PRC) against the Pass rates in grade 5 and the percentage of change in pass rates. The last table is the summary output of the regression for the sample schools of each intervention.

Aga Khan Foundation (AKF)

Table 11 AKF changes between 2004 and 2010

	Number of Schools	Initial enrolment	Final enrolment	Drop-out rate	Pass Rate
2004	58	18,102	16,855	6.9	73.7
2010	60	21,090	19,202	9.0	76.2
% change	3.4	16.5	13.9	2.1	2.5

As we can see for the specific comparison of the data from 2004 and 2010 for the AKF sample, enrollment increased by 16.5% and number of schools by 3.4% between 2004 and 2010. Despite the increase in enrollments, pass rates have had an increase of 2.5% in the same period. However, dropout has increased by 2.1

percentage points in the same period. All these developments, if compared to the GOV control group are extremely positive keeping in mind that the control group has had a drop out increase of 4.5% and a pass rate drop of 3.6%.

Table 12 AKF- Correlations of changes over time against Pass Rates in Grade 5 and Percentage Change in Enrolments

		Correlations		
		DOC	**PEC**	**PRC**
PR5 (2010)	**76.18**	-0.10	0.24	0.66
PRC	**2.51**	-0.15	0.12	-

The correlation between the growth in learners numbers and the pass rate in 2010 was positive but not meaningful (0,24) while the correlation between the growth in learners numbers and the pass rates in 2004 was negative (-0.15).

Table 13 AKF Regression Summary Output

Regression Statistics	
Multiple R	0.47
R Square	0.22
Adjusted R Square	0.06
Standard Error	13.01
Observations	58

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	10	2264.20	226.42	1.34	0.24
Residual	47	7957.58	169.31		
Total	57	10221.78			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	109.53	88.13	1.24	0.22	-67.77	286.83
PPC	-0.05	0.05	-0.93	0.36	-0.14	0.05
BSM	-4.34	1.66	-2.61	0.01	-7.68	-1.00
TBS	2.02	3.74	0.54	0.59	-5.49	9.54
DOR	0.33	0.34	0.96	0.34	-0.36	1.02
PTR	0.04	0.14	0.30	0.77	-0.24	0.33
TQS	0.59	1.00	0.59	0.56	-1.42	2.60

PMC	-0.10	0.08	-1.25	0.22	-0.27	0.06
HHW	-0.37	1.41	-0.27	0.79	-3.20	2.46
PEC	-0.00	0.05	-0.10	0.92	-0.10	0.09
DOC	-0.01	0.25	-0.03	0.98	-0.51	0.50

As stated before, all the socio-economic indicators were aggregated at district level. Since the AKF has only two districts in the research sample, there were few observations for which co-linearity issues arose among those factors while running the regression. In order to address the issue, four of the factors in the socio-economic variable were dropped and only HHW was kept.

As we can see in the regression summary above, according to the R Square, 22% of the change in pass rates could be attributed to the variables selected. However, 78% of what impacts on the pass rates in AKF schools remains uncertain.

Text books seem to have the most remarkable effect on pass rates within the AKF sample with an increase of 2% in pass rates for each unit increase in text books per pupil. The AKF intervention of an ECD programme could have provided some school readiness features and early stimulation as well as exposure to books, leading students to make better use of the available textbooks once they reached primary schooling. This would imply that further distribution of books within the intervention districts of AKF would be the factor that would positively influence the most the learning outcomes in this intervention. However, even though the coefficient is the highest, it is not statistically significant.

On the other end, it would appear that schools with lower scores in building school material (BSM) would perform better than those with better infrastructure. An explanation for this is that more deprived schools could be making further efforts than schools better off. Surprisingly, the coefficient for school building material is negative and rather high compared to the other coefficients in the regression. Moreover it is statistically significant and impacts negatively on the pass rates.

Concern-supported government schools (CON)

Table 14 CON Changes between 2004 and 2010

	Number of Schools	Initial Enrolment	Final enrolment	Drop-out rate	Pass Rate
2004	93	35,918	33,350	7.1	76.8
2010	102	44,382	41,513	6.5	71.3
% change	9.6	23.6	24.5	-0.7	-5.5

Concern-supported schools also had an increase in enrolments and number of schools between 2004 and 2010 with a change of 23.6% and 9.6% respectively. Drop outs saw a seven decimal point decrease since 2004 from 7.1 to 6.5. The pass rates of these schools dropped from 76.8% to 71.3% over the six-year period. The control group (GOV sample) also saw a decline in its pass rates over the same period of time. However, despite the increase in enrolments, the CON schools have performed much better in terms of retaining its students if compared to the GOV sample. While drop out has decreased in the CON sample, it has increased in the GOV sample between 2004 and 2010.

Table 15 CON - Correlations of changes over time against Pass Rates in Grade 5 and Percentage Change in Enrolments

		Correlations		
		DOC	**PEC**	**PRC**
PR5 (2010)	**71.3**	0.3	0.2	0.7
PRC	**-5.5**	0.07	0.00	

The CON sample had one of the few meaningful correlations between 2004 data and the pass rates. Interestingly, it was a positive correlation with the Drop Out change, which is the factor where CON is performing better than the GOV control group. Note that the correlation of PRC against PR5 in 2010 is very high. This holds true for all the interventions due to the direct relation between PRC and PR5 for which this correlation will not be analyzed in any of the interventions.

Table 16 CON Regression Summary Output

Regression Statistics	
Multiple R	0.59
R Square	0.34
Adjusted R Square	0.22
Standard Error	13.32
Observations	91

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	14	7074.65	505.33	2.85	0.00
Residual	76	13478.47	177.35		
Total	90	20553.11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-44.19	92.20	-0.48	0.63	-227.82	139.44
PPC	-0.01	0.03	-0.28	0.78	-0.07	0.05
BSM	-1.97	1.95	-1.01	0.32	-5.86	1.93
TBS	3.49	2.84	1.23	0.22	-2.17	9.14
DOR	-0.08	0.36	-0.23	0.82	-0.80	0.63
PTR	0.06	0.12	0.51	0.61	-0.17	0.29
TQS	0.48	0.86	0.56	0.58	-1.23	2.19
PMC	0.01	0.15	0.65	0.52	-0.20	0.40
DLR	0.08	2.51	0.03	0.97	-4.91	5.08
HHE	-3.33	2.36	-1.41	0.16	-8.03	1.36
HHW	1.99	2.46	0.81	0.42	-2.91	6.89
HOM	0.97	7.63	0.13	0.90	-14.2	16.18
HAS	-0.81	0.61	-1.33	0.19	-2.02	0.40
PEC	-0.00	0.03	-0.13	0.89	-0.06	0.05
DOC	0.34	0.17	1.96	0.05	-0.00	0.68

According to the regression summary above, 34% of the changes in pass rates for the CON sample could be attributed to the variables used. Once again, we can see that the variable that would seem to have the most meaningful positive impact on the pass rates would be the Text Books per Student one with a positive coefficient of 3.4. Even though it is not statistically significant, it does have one of the highest t-sat values of the summary.

On the negative end of the spectrum, access to electricity would seem to have a negative impact on the pass rates and another one of the highest values of t-stat making it close to significant. It is puzzling though that access to electricity would somehow impact negatively on the pass rates.

The only statistically significant value for this regression is the Drop Out Change between 2004 and 2010. This is quite interesting given the fact that Concern seems to be having the best results in terms of student retention according to the findings in the previous sections. This is in line with CON's intervention which focuses on orphans and vulnerable students which are more prone to drop out. Similarly, the support that CON provides to school councils could be very effective on reducing the drop out rates. Nevertheless, the coefficient for this factor is rather low.

Government Schools with no additional support (GOV)

Table 17 GOV changes between 2004 and 2010

	Number of schools	Initial enrolment	Final Enrolment	Drop-out rate	Pass Rate
2004	159	44,287	41,955	5.3	78.8
2010	176	60,820	54,881	9.8	75.2
% change	10.6	37.3	30.8	4.5	-3.6

The GOV control group sample had a remarkable increase in enrolments of 37.3%. Proportionally, compared to other samples in this research the percentage increase in the number of schools did not grow accordingly. As we can see, the drop out rate has increased by 4.5 between 2004 and 2010 in the GOV sample schools while pass rates have decreased by 3.6% from 78.8% to 75.2. The trend on pass rates decrease could be explained by the introduction of the new curriculum for primary education which began its implementation in 2004. This will result in 2010 having only the second cohort of graduates from the new curriculum. If this hypothesis were to be confirmed by further research, the challenge would apply to all schools and not just the GOV sample. This would be a further positive point for those schools that managed to increase the pass rates over time despite the curricular challenge.

Table 18 GOV Correlations of changes over time against Pass Rates in Grade 5 and Percentage Change in Enrolments

Y values		Correlations		
		DOC	**PEC**	**PRC**
PR5 (2010)	**75.15**	-0.20	-0.23	0.86
PRC	**-3.62**	-0.13	-0.25	

As we can see in the table above, the only meaningful correlation is that between the Pass rate change between 2004 and 2010 and the percentage enrolment change. However it is a negative correlation.

Table 19 GOV Regression Summary Output

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.48
R Square	0.23
Adjusted R Square	0.16
Standard Error	14.87
Observations	159

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	12	9435.524	786.29	3.56	0.00
Residual	146	32287.77	221.15		
Total	158	41723.3			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	73.79	24.78	2.98	0.00	24.81	122.77
PPC	-0.01	0.05	-0.27	0.79	-0.11	0.084
BSM	-0.44	1.24	-0.36	0.72	-2.89	2.01
TBS	-0.23	2.24	-0.10	0.92	-4.65	4.20
DOR	0.08	0.17	0.50	0.62	-0.25	0.41
PTR	0.04	0.06	0.65	0.51	-0.08	0.16
TQS	-0.87	0.65	-1.35	0.18	-2.16	0.41
PMC	0.20	0.09	2.20	0.03	0.02	0.38
DLR	0.67	0.22	3.02	0.00	0.23	1.11
HHW	-0.98	0.44	-2.26	0.03	-1.84	-0.12
HAS	0.88	0.54	1.61	0.11	-0.20	1.96
PEC	0.00	0.03	0.11	0.92	-0.06	0.06
DOC	-0.23	0.07	-3.11	0.00	-0.37	-0.08

Similarly to the AKF sample, the GOV sample had the same co-linearity issue with the socio-economic variables. Even though the GOV sample had a few more observations, it was still very low (four districts) for which two variables (HEE and HOM) were dropped.

The summary of the regression above shows that 23% of the changes in the pass rates could be attributed to the variables used for the GOV sample. The coefficients in this regression are all very low with the highest ones being the District Literacy Rate (DLR) and the Household Assets (HAS) with 0.6 and 0.8 respectively. Both of these factors are statistically significant. This is in line with the general literature which supports the idea that better educated communities and higher socio-economic status would lead to better learning outcomes.

Even though the TQS does not have a very high coefficient, it *is* statistically significant. It is interesting to see how it suggests that one percent pass rate is lost for every 0.87 average increase in teacher qualification. As we had seen in previous findings the Teacher Qualifications are negatively correlated to pass rates in some of the interventions, but this is particularly emphasized in the GOV sample.

Progresso-supported government schools (PRO)

Table 20 PRO changes between 2004 and 2010

	Number of Schools	Initial enrolment	Final Enrolment	Drop-out rate	Pass Rate
2004	90	32,715	28,855	11.8	72.1
2010	97	45,852	39,906	13.0	77.0
% change	7.7	40.2	38.3	1.2	4.9

Progresso-supported schools had the second highest increase in enrolments since 2004 with 40.2%. It also had an increase in drop out rates from 11.8 in 2004 to 13 in 2010 which represents a difference of 1.2%. This drop-out rate, however, is below the drop-out rate recorded by the Gov control group. Moreover, the PRO sample shows a remarkable increase in the pass rates of 4.9% during the six-year period. Looking at

the individual intervention, it would point towards bilingual education making the most notable effect on pass rates.

Table 21 PRO Correlations of changes over time against Pass Rates in Grade 5 and Percentage Change in Enrolments

Y values		Correlations		
		DOC	**PEC**	**PRC**
PR5 (2010)	**77.02**	-0.07	-0.14	0.65
PRC	**4.87**	0.04	0.04	

Table 21 above shows that none of the correlations done with the changes recorded since 2004 were meaningful when compared to pass rates in 2010 nor with the percentage change in the pass rates between 2004 and 2010 for the CON sample schools.

Table 22 PRO Regression Summary Output

Regression Statistics	
Multiple R	0.59
R Square	0.35
Adjusted R Square	0.21
Standard Error	13.00
Observations	80

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	14	5910.17	422.16	2.50	0.01
Residual	65	10981.04	168.93		
Total	79	16891.21			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-100.65	59.03	-1.71	0.09	-218.54	17.23
TBS	0.03	3.14	0.01	0.10	-6.24	6.30
PPC	-0.01	0.03	-0.31	0.76	-0.08	0.06
BSM	-3.51	1.54	-2.27	0.03	-6.60	-0.43
DOR	0.25	0.24	1.01	0.31	-0.24	0.74
PMC	-0.03	0.12	-0.25	0.80	-0.27	0.21
PTR	0.03	0.07	0.45	0.66	-0.10	0.16

TQS	1.23	0.92	1.33	0.19	-0.61	3.06
DLR	0.38	0.46	0.83	0.41	-0.54	1.30
HHE	-4.99	2.57	-1.94	0.06	-10.13	0.15
HHW	1.23	0.74	1.67	0.10	-0.24	2.70
HOM	3.22	0.70	4.58	2.19E-05	1.82	4.63
HAS	-0.40	0.35	-1.13	0.26	-1.09	0.30
PEI	-0.05	0.04	-1.26	0.21	-0.14	0.03
DOC	-0.21	0.18	-1.14	0.26	-0.57	0.15

Based on the summary of the regression above, we can see that the R square is telling us that 35% of the possible changes in the pass rate values can be due to the various factors used in the equation. Nevertheless, the other 65% of what impacts on pass rates remains unknown.

On the factors that are positively correlated, this is one of the few cases where we see one of the socio-economic factors (housing material) to have a high coefficient and be statistically significant. However, all the other four socio-economic factors are negatively correlated with the Pass Rates. Access to Electricity has a very high (negative) coefficient (higher than the housing material) and it is also statistically significant.

It is rather puzzling that some of the socio-economic indicators have a positive effect while others have a negative one. It is likely that cultural differences in the various provinces have a different perception of status from some assets or features that are meaningless in other context. Despite the colinearities found in some of the samples for the factors in the Socio-economic variable, in some cases these factors may actually be measuring different aspects of the socio-economic status of the communities in these districts.

Once again, the BSM is showing a negative impact on the Pass Rates with a negative coefficient of 3.5 which is statistically significant.

United Nations Children Fund-supported government schools (UNI)

More than 100 schools appeared in the districts where the UNI intervention is being implemented which is also reflected in the highest increase in enrolments with 57.5%

between 2004 and 2010. Despite the massive increase in the enrolments, UNI has been able to retain its students and decrease the drop out by 1.4%. This is opposite to the GOV control sample which has seen an increase in drop out rates over the same period.

Table 23 UNI changes between 2004 and 2010

	Number of schools	Initial enrolment	Final Enrolment	Drop-out rate	Pass Rate
2004	521	173,934	158,485	8.9	76.0
2010	624	273,866	253,422	7.5	76.5
% change	19.8	57.5	59.9	-1.4	0.6

As far as Pass Rates are concerned, the UNI schools show a slight increase of 0.6% which despite being relatively low, is still on a positive trend compared to the GOV sample schools which have had a decline in pass rates of 3.6% since 2004.

Table 24 UNI Correlations of changes over time against Pass Rates in Grade 5 and Percentage Change in Enrolments

Y values		Correlations		
		DOC	**PEC**	**PRC**
PR5 (2010)	**76.54**	-0.01	0.16	0.77
PRC	**0.58**	0.00	0.07	

Table 24 above shows that none of the correlations done with the changes recorded since 2004 were meaningful when compared to pass rates in 2010 nor with the percentage change in the pass rates between 2004 and 2010 for the UNI sample schools.

Table 25 UNI Regression Summary Output

Regression Statistics	
Multiple R	0.36
R Square	0.13
Adjusted R Square	0.09
Standard Error	14.11
Observations	333

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	14	9351.15	667.94	3.35	4.73E-05
Residual	318	63341.26	199.19		
Total	332	72692.41			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	135.41	33.22	4.08	5.79E-05	70.05	200.77
TBS	2.82	1.33	2.11	0.04	0.19	5.44
PPC	-0.01	0.01	-0.88	0.38	-0.04	0.01
BSM	-1.65	0.74	-2.21	0.03	-3.11	-0.18
DOR	0.04	0.14	0.31	0.75	-0.24	0.33
PMC	-0.00	0.08	-0.06	0.95	-0.16	0.15
PTR	-0.06	0.02	-2.35	0.02	-0.10	-0.01
TQS	-0.54	0.42	-1.28	0.20	-1.37	0.29
DLR	-0.32	0.14	-2.36	0.02	-0.59	-0.05
HHE	1.57	1.06	1.48	0.14	-0.52	3.66
HHW	0.48	0.61	0.79	0.43	-0.71	1.68
HOM	-1.26	0.62	-2.02	0.04	-2.48	-0.03
HAS	-0.58	0.25	-2.32	0.02	-1.08	-0.09
PEC	0.03	0.02	1.74	0.08	-0.00	0.06
DOC	0.05	0.09	0.55	0.58	-0.13	0.23

Only 13% of the change in the results in pass rates could be attributed to the variables in this analysis. As in other interventions, more textbooks would seem to have a positive impact on the pass rates. In the case of UNI, the Text Book per Student factor has the highest coefficient in the regression and it *is* statistically significant. The package that UNI offers which include teacher training and support to schools and management issues could be leading to maximizing the use that teachers are making of textbooks resulting in a significant positive impact on pass rates for the UNI schools.

The access to electricity in the households (HHE) is also positively correlated to the pass rates and it is close to statistically significant. However, three of the other factors within the socio-economic variable are negatively correlated and are statistically significant as well.

On the negative end, we have once again the school building material (SBM) factor which has the second highest (though negative) coefficient and it is also statistically

significant. Better built schools could be more urban and thus be bigger in terms of students enrolled, which could be impacting negatively on learning outcomes.

Another hypothesis raised before has to do with communities which are highly involved in educational activities and schools. Often when this is the case the communities 'chip-in' to school by building additional classrooms with local materials. From a numeric point of view, these schools would have a lower School Building Material (SBM) score but in practical terms, these more committed communities could be positively impacting on the quality of learning activities by making teachers and principals more accountable to them, ensuring better use of resources at the school level or even just motivating both teachers and students to do better. This hypothesis could be particularly applied to the UNI intervention given the fact that their multi-sectorial package includes support and involvement of communities in schooling activities.

World Food Programme-supported government schools (WFP)

Table 26 WFP changes between 2004 and 2010

	Number of schools	Initial enrolment	Final Enrolment	Drop-out rate	Pass Rate
2004	104	64,044	60,973	4.8	77.8
2010	108	78,335	72,777	7.1	74.5
% change	3.8	22.3	19.4	2.3	-3.3

The WFP sample had an increase in enrolments of 22.3. Even though it has an increase in the drop out rates of 2.6%, this is still below the drop out increase of the GOV control group which stands at 4.5%. In a similar way, the pass rates of the WFP sample have seen a decline between 2004 and 2010 of 3.3%, however, this declines is equally lower to that recorded by the GOV sample (3.6%) over the same period. This means that even if the results for WFP are rather weak in the punctual analysis of 2010 against the GOV sample, if we were to evaluate the performance over time, that of WFP would be slightly better than that of the control group.

Table 27 below shows that none of the correlations done with the changes recorded since 2004 were meaningful when compared to pass rates in 2010 nor with the percentage change in the pass rates between 2004 and 2010 for the CON sample schools.

Table 27 WFP Correlations of changes over time against Pass Rates in Grade 5 and Percentage Change in Enrolments

Y values		Correlations		
		DOC	**PEC**	**PRC**
PR5 (2010)	**74.46**	-0.04	-0.20	0.84
PRC	**-3.31**	-0.10	-0.21	-

Table 28 WFP Regression Summary Output

Regression Statistics	
Multiple R	0.50
R Square	0.25
Adjusted R Square	0.14
Standard Error	13.47
Observations	104

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	14	5486.31	391.88	2.16	0.02
Residual	89	16158.04	181.55		
Total	103	21644.35			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	53.25	31.78	1.68	0.10	-9.90	116.40
PPC	0.00	0.02	0.24	0.81	-0.03	0.04
BSM	0.73	1.56	0.47	0.64	-2.37	3.84
TBS	1.83	2.81	0.65	0.52	-3.75	7.41
DOR	-0.63	0.22	-2.87	0.01	-1.07	-0.19
PTR	-0.05	0.04	-1.24	0.22	-0.13	0.03
TQS	1.60	0.75	2.13	0.04	0.11	3.10
PMC	0.16	0.22	0.71	0.48	-0.29	0.60
DLR	-0.23	0.14	-1.59	0.12	-0.51	0.06
HHE	-0.88	0.52	-1.68	0.10	-1.91	0.16
HHW	-0.20	0.37	-0.55	0.58	-0.93	0.53

HOM	1.05	0.54	1.96	0.05	-0.02	2.12
HAS	-0.14	0.29	-0.49	0.63	-0.71	0.43
PEC	-0.07	0.03	-2.23	0.03	-0.14	-0.01
DOC	0.08	0.07	1.18	0.24	-0.06	0.22

The R square of the WFP sample schools regression is telling us that 25% of the possible changes in pass rates can be attributed to the variables used in this analysis.

Once again the highest positive coefficient is the number of textbooks per student. However, it is not statistically significant.

In the case of WFP, Teacher Qualifications are positively correlated with the pass rates with a rather high coefficient which *is* statistically significant. Unfortunately, the WFP intervention is not linked to Professional Development of teachers so it is difficult to relate this correlation to the intervention.

Another factor which is statistically significant and has a relatively high (positive) coefficient is the housing materials (HOM). Nevertheless, all the other factors within the socio-economic variable are negatively correlated to the pass rates in this sample.

Drop Out rates are negatively correlated to the pass rates and the t-stat value makes this correlation statistically significant. In some cases, the weakest students are the most prone to drop out, which would tend to have a positive effect on Pass rates. However, a negative correlation combined with the relatively low pass rates of the WFP samples could hint towards quality concerns.

Overview of regressions

If looking at the regressions simultaneously, we can see that despite them being all very different, there are a few patterns that can be drawn from them. For instance the TBS is always positive and in many cases amongst the highest coefficients.

As expected, all of the Pupils Per Classroom (PPC) correlations are negative except for that of WFP that shows a positive correlation though it has a rather low coefficient. However, none of these correlations is statistically significant.

All of the BSM coefficients in the regressions but one (WFP) are negative. In many cases they are rather high and in three of them, they are statistically significant. This goes against the notion that schools with better infrastructure would do better. It would seem that schools which are more deprived are somehow making more effort. There are cases in which communities mobilize to construct additional classrooms. These are often of poor quality given the limited resources of the community and thus could "bring down" the BMS score of the school. However, this same involvement and commitment of the community could also impact on the way teachers work and ultimately on the pass rates. Teachers performance can improve if there is a perception that they are accountable to the community. Further research would be required to determine the extent to which community involvement affects learning outcomes.

As expected, most of the PTR coefficients in the regressions are negative meaning that the higher the PTR the lower the scores. However, none of the coefficients is meaningful.

DOR values are negative in three interventions showing some relation between better pass rates as there are less drop outs. However, the interventions where DORs are negative could point towards schools loosing their weakest students having a positive impact in pass rates. Note that the three interventions with positive coefficients are those implemented in the most difficult and deprived districts (PRO, CON, AKF) which would support the hypothesis that schools losing its weakest students due to the poverty conditions have as a result a better outcome in pass rates.

Surprisingly, in four out of the six regressions, the percentage of multi-level classrooms has a positive coefficient. Given the fact that teachers are ill-prepared to handle these kinds of classrooms, one would expect a negative correlation with the pass rates. In this case as well, the negative correlation is found in some of the

interventions implemented in the most difficult and deprived districts (PRO and AKF intervention schools). In order to make a final analysis of how this overview reflects the whole data set, a final regression was ran using the whole data set from the research schools. *Table 29* below shows the summary output of that regression.

Table 29 Research Sample Regression Summary Output (all Interventions and Control Group)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.24
R Square	0.06
Adjusted R Square	0.05
Standard Error	15.05
Observations	1167

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	12	16552.23	1379.35	6.09	1.95E-10
Residual	1154	261435.5	226.55		
Total	1166	277987.7			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	72.34	11.47	6.30	4.12E-10	49.82	94.85
PPC	-0.01	0.01	-0.65	0.52	-0.02	0.01
BSM	-1.56	0.41	-3.77	0.00	-2.37	-0.75
TBS	1.11	0.78	1.44	0.15	-0.41	2.64
DOR	0.01	0.04	0.27	0.79	-0.07	0.10
PTR	-0.02	0.01	-1.50	0.13	-0.04	0.01
TQS	-0.28	0.21	-1.34	0.18	-0.68	0.13
PMC	0.00	0.03	0.05	0.96	-0.06	0.07
DLR	-0.24	0.06	-3.74	0.00	-0.37	-0.12
HHE	-0.47	0.31	-1.50	0.13	-1.09	0.15
HHW	0.18	0.13	1.35	0.18	-0.08	0.44
HOM	0.61	0.21	2.85	0.00	0.19	1.02
HAS	-0.47	0.10	-4.65	3.79E-06	-0.67	-0.27

The R square for the whole dataset diminishes significantly and only 6% of the changes in pass rates can be attributed to the variables in the equation. This is related

to the very low correlations that result from the individual samples.

If we look at the regression of the whole sample above, it would seem according to the coefficients, as if the textbooks per student would have the highest positively correlated to pass rates. Even though it is not statistically significant, the t-stat value is close to significant.

On the negative side, the whole sample seems to confirm what was verified in most of the individual interventions regarding the building school material which seems to have over and over a negative impact on the pass rates. In this case the coefficient is of -1.5 and it *is* statistically significant.

The housing material has a relatively high (positive) coefficient in the regression and it is statistically significant. However, it is very puzzling to see how some of the socio-economic factors have a positive effect on the pass rates while others have a negative one. There doesn't seem to be a clear pattern when looking at the individual interventions. It is likely that if interventions are being implemented in some of the poorest and most deprived areas, the poverty factor becomes irrelevant since everyone is poor (which is very likely in rural Mozambique). This could explain why the coefficients of the socio-economic variables would come randomly positive or negative.

Conclusions

It is very difficult to answer conclusively the first research question regarding the factor or input that impacts the most on the pass rates. In some cases and some interventions, individual factors do seem to have an effect, but it can not be generalized to the whole context. From this point of view, the research can only partially respond to the first research question. This would actually support the research by Nannyonjo (2007) in Uganda which provides various indications of limited correlations between supplies to schools and learning outcomes.

The only factor that seemed to have a relatively constant positive impact on the pass rates across most interventions is the number of textbooks per student. This is in line with what concluded by Murillo F.J. & Román M. (2011) in the literature regarding schools in Latin America.

As far as the other end of the spectrum is concerned, the various regressions and the overall one seem to confirm the odd negative impact of building school materials against the pass rates. It is difficult to gather from the data or the interventions the reasons behind this, but communities and/or teachers could play a role in it. There is nothing in the literature consulted that shows similar findings but further research would be necessary to find the reasons behind this.

Despite the extensive literature showing socio-economic factors to have a high correlation with learning outcomes (Hungi and Thuku 2010; Laigalig et al 2010) and more specifically Castanheira's (2007) findings related to socio economic status of students in Mozambique strongly influencing reading scores, the same conclusion can not be drawn from the pass rates in this research sample schools. Some factors seem to have more or less importance depending on the intervention and the context but there is not a clear pattern. It could be that the socio-economic factors lose importance

given the general widespread poverty of rural districts in Mozambique or that the specific factors used, vary culturally across the country. It is important to remember that SACMEQ looks into specific socio-economic status of each student, which could be more revealing, while this research had socio-economic factors aggregated at district level.

On the same point of reading scores against Pass Rates in this research, one needs to keep in mind that SACMEQ is an externally administered test which ensures a number of quality aspects in terms of the data used to assess the learning outcomes and factors influencing it. The pass rates in this research proved to have severe limitations in describing the learning outcomes.

As far as the second research question is concerned, the interventions of UNI, AKF and PRO schools are yielding better results (measured by pass rates) than both the national average pass rate and the GOV control group of the sample when analyzing the data of 2010.

When looking at the results by intervention over time, we can confidently say that the bilingual intervention of PRO is having the most notable positive effect on pass rates. The fact that PRO schools provide the possibility to learn in local languages is in line with the literature, where Passos (2009) argues that in her model used for Mozambique with SACMEQ data, students speaking the language of instruction at home tend to get higher scores.

One of the most important findings on the changes over time was the fact that despite a significant increase in teacher qualification, the pass rates in government schools seem to be in decline. Similarly, the fact that teachers qualification scores are negatively correlated in a significant way in government schools calls for further research to understand the reasons behind this.

In a situation like the one described in the background of this research report where the quality of education is weak and there are significant financial constraints, any

policy suggestions that are made such as increasing the years of pre service training, need to be tested before going to scale.

Probably one of the most solid conclusions of this research is the fact that the pass rates in grade 5 are providing very limited information in terms of learning outcomes or the quality of education that students are receiving. The processes to calculate the pass rates along with the limited harmonization of student assessment processes before grade 5 are a weak starting point. We need to add to that the different rigor applied in different schools to test marking. Last but not least, the limited incentives that teachers have to use the examinations as a means to measure student performance and not their own, present yet another hindrance to the whole process.

As a result of the conclusion above, the findings of this research are helpful to understand the factors and interventions that are having an impact on pass rates but it does not have enough elements to draw conclusions on what impacts on the learning outcomes. As predicted by Levacic and Vignoles (2002), the quality of data is crucial to carry out an exercise like this one. The pass rates as such are not providing much information on the quality of the education system in Mozambique, but rather is highlighting the limitations that it has to properly measure student cognitive skills and competences that students are acquiring after completing the first cycle of Primary Education.

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