

Academic Performance of Student in Physics subject at SC level during the past decade: Gender Perspective

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ABSTRACT: Eve is known also as Adam's wife and according to the second chapter of Genesis of the Bible , Eve was created by God by taking her from the rib of Adam, to be Adam's companion. Women are no more perceived as sole purpose to be the companion of men. Jane Austen , Anne Frank , Maya Angelou, Rosa Parks have changed the world with their actions. Marie Curie was a Polish and naturalized-French physicist and chemist who conducted pioneering research on radioactivity. Malala Yousafzai is a Pakistani activist for female education and a Nobel Peace Prize laureate. Too often women are not given credit of their intellectual capacities and achievements. This study has put forward the emerging role of women and co education in the society. With new reforms, a change in Educational Policies occurred. Fullan (1992:22) described a change as a process of learning new ideas and things. It is learning to do and learning to understand something new. Bennett and Howlett (1992) stated that policy change refers to incremental shifts in existing structures, or new and innovative policies like the 9 year schooling. The 9 year schooling, reaching maturity in 2021, in Mauritius , co education , or simply schools where both boys and girls are taught in the same classrooms. Co Education imply that there is no difference in the teaching and learning process of boys and girls. They are taught and assessed in the same manner with the same school facilities. The study assessed what was there before that change from single sex education , only boys and only girls schools , in terms of academic performance in Physics. The papers is an overview of the past results. Single sex education had its advantages and co education has also its advantages. Teaching girls and boys together is the new trends in Government schools. Unfortunately even if the Government has given chances to women to shine on the from stages there has bene many gender biasness towards women. In their research on Science and Education, Newall et al (2018) stated that adults are already biased against girls by the time children are 8 years old. Even at that age, adults already have low expectations of girls' potential in physics. Expectations and discrimination can be considered to be difference issues. In Mauritius, as per the Equal Opportunities Act of 2008 , Discrimination based on age, gender , sex, criminal records, race , among many is prohibited under the Equal Opportunities Act and even unlawful in the some areas like Employment activities, Traineeship, Professions, trades or occupations, Education, among some (EOC, 2021).

Analysis of past results in Physics subject at Sc level was performed from available statistics from the MES (2021) before the Coe education batch attempted the SC exams in 2022. An independent sample t test was performed on the mean pass rate of boys and girls during the last 8 years. (mean of the means). p was obtained to be .000. It can be deduced that if the p-value is less than 0.05, we reject the null the hypothesis that there's no difference between the means and conclude that a significant difference does exist and conclude that since 8 years girls have been outperforming boys in Physics. There is a significant difference between their pass rates. For comparing distinctions grade 1 in Physics , almost the same result was obtained. The p was obtained to be .000, If the p-value is less than 0.05, we reject the null the hypothesis that there's no difference between the means and conclude that a significant difference does exist. Since 8 years girls have been outperforming boys in Physics and more girls get distinction grade 1 than boys since 8 years. The study can be considered as a first part , a precursor of a second research after Co education has been in place what now is the new trends. The result of this study will then be compared to the new results when boys and girls were being taught in the same class.

KEYWORDS: co education, single sex education, Sc examination , policy change, discrimination, Physics , Mauritius

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I. INTRODUCTION

Through this research , the existing academic results of boys and girls The gender issue has been a long debated subject of concerned. Women are no more just mothers, sisters, daughters but an integrate member of the work force. The current Government has made education and gender equality one of its priorities. Under

the Prime Ministership of honourable Pravind Jugnauth , the country has had its first Woman as President of the Republic of Mauritius namely, Dr. Bibi Ameenah Firdaus Gurib-Fakim from to and Mrs Leela Devi Dookhun Luchoomun is the current Minister of Education TE, ST as well as the Vice Prime Minister of Mauritius. The current Chief Judge of the Judiciary of Mauritius is a woman, namely Judge Rehana Mungly-Gulbul appointed in December 2021. The second of the Judiciary of Mauritius is again a woman. Judge Nirmala Devat will be the next Chief judge after Judge Rehana Mungly-Gulbul. It can be said that Mauritius and the Government has give to women its due places in the society from Government positions , parliament , judiciary and even in Education Sector. Catalyst (2020) explains that globally the share of women in senior management is increasing incrementally .In 2019 and 2020, the proportion of women in senior management roles globally grew to 29%, the highest number ever recorded. Eighty-seven percent of global mid-market companies have at least one woman in a senior management role in 2020.The proportion of women in senior leadership differs by role: Women are over-represented in support functions like administration, while men tend to be concentrated in operations, profit and loss, and research and development—all viewed as critical experiences for CEO and board-level positions. In 2020, 40% of human resources directors are women, compared to 17% of chief marketing officers and 16% of chief information officers (Grant Thornton,2020). ILO (2014) argued that the world has seen increasing levels of labour-force participation among women during the last 20 years; however, even in countries where women’s labour force participation has increased; the quality of employment has not necessarily improved. Women continue to be over-represented in precarious, atypical, and informal employment, particularly when compared to men’s patterns of employment. This is because women continue to face difficulties in having equitable access to productive employment opportunities, and while some progress has been achieved, the attainment of gender equality in the world of work remains a major challenge. UNICEF (2021), stated that Worldwide, nearly 1 in 4 girls ranging from 15 years to 19 years are neither employed nor in education or training – compared to 1 in 10 boys. While addressing the disparity and inequalities women faced throughout societies and history, education remain the key. The UN Women activities Bishop (UN Women, 2020) pointed out that for her, education is crucial. After she had been campaigning on this issue for nearly two years , she saw the whole picture. It’s an intricate issue, and there are so many layers where it is needed to address it. But education is where everything begins, and that’s where discrimination begins. It arguably how we raise our children determines whether they become respectful citizens who treat others with dignity and respect their human rights. Bishop (UN Women, 2020) stated that it is about how we are teaching the next generation.

1.1 Research objectives

As part of the educational reform of the government , the nine year schooling continuous education ends with the entering of the students into the Academies. The reform, proposed and applied by the previous regime and current government regime has been widely successful and despite the unprecedented impact of the COVID 19 pandemic, on the country and education system, the first ever National Certificate of education examination took place in March-April 2021, in middle of the lockdown, movement restriction and virus. The objectives of the research is to determine the gap between the existing academic results between both boys and girls in Physics at SC level, the change that now face both gender and how each gender will need to adapt to this change.

The country of Mauritius experienced a second wave of the Pandemic after some months of covid safe country. The preparation of the students, not just at NCE Grade 9, but also at SC and HSC were greatly affected. Among the contaminated people , children were also in great numbers. Despite Covid 19, co-education has become a reality, and the NCE took place. The results of the NCE would certainly be a subject of discussing particularly considering that it’s the first edition and took place during the Covid 19 lockdown. It is the determinant for promotion to Grade 10 and whether the child will go to an Academy or remain in his regional school. A new rat race started with the reform. Another area of debate would be whether children of regional schools will be denigrated and left as the inferior schools students and whether the rat race will once again cause the trauma provoked by the famous CPE that as abolished to make place for the PSAC. Before the Academy feature into the Mauritian State Colleges, co education, also known as mixed education, is not a common mean of education in government secondary schools. To date only LaGaullette SSS situated in the far western region of Mauritius and Mahatma Gandhi Institute are the existing co education government college. Otherwise, coeducation is very common in the private sector, such as the partially aided schools , governed by the PSEA, and Le Service Diocésain de l’Éducation Catholique (SDEC) such as St Esprit College in the Region of Rivere Noire and fee paying secondary schools such as Le Bocage International Schools , Lycee LaBourdonnais College in Curepipe , Le Lycée des Mascareignes in Moka and St Marie College in Palma Quatre Bornes. Co education had been an almost mode of education at primary level and is still the mode of education at Tertiary.

1.2 Research Gap

The gap from primary to Tertiary had been bridged by the reform of the Government. This study examines the performance of students boys compared to girls as they had been at SC Cambridge examinations

in Physics subject before the Academy introduction. Conclusive data to determine whether their performance has been better or less is not yet available. It could be another study in some years. The study also identifies what had been the positive and negative impact of co education in existing literature.

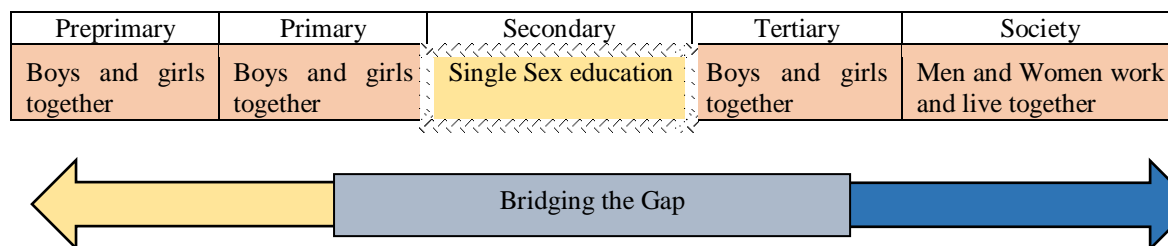


Figure 1. Gap between Single sex schools and Co education in Mauritius

The diagram above shows, that at the different states in the life of the boys and girls they will be studying and working together, except at Secondary level. This anomaly is being corrected by the reforms of the government and the Academies. There are currently 12 co-education academies, namely Dr. Maurice Curé State College, Droopnath Ramphul State College, G.M.D Atchia State College, John Kennedy College, Mahatma Gandhi Institute, Queen Elizabeth College, Royal College Curepipe, Royal College Port Louis, Sookdeo Bissoondoyal State College, Sir Leckraz Teelock SSS, Sir A.R. Osman State School and Forest Side SSS.

II. LITERATURE REVIEW

While addressing to the nation in 2016, through the booklet guide *Inspiring Every Child* (MoE,HR,TE&SR, 2016) the honorable minister of Education, had put into emphasis that the main concept behind the reform is aligned with the Sustainable Development Goal 4 which is that of ensuring inclusive and equitable quality education for all and promoting lifelong learning. Inclusive and equitable, means the new current system takes into consideration the development of knowledge, certainly, but also of skills and values - in itself a cardinal necessity for sustainable development. Government presented to the nation its vision for a new Mauritius, one based on the country's transformation "into a truly forward looking, environmentally sustainable, economically vibrant and innovative country with modern infrastructure, global connectivity, high skills and technology" (Government Programme 2015-2019). This vision was more explicitly presented in the Government's Economic Mission Statement – that of making Mauritius attain high income country status by 2030. Achieving this goal will require an economic model of development that is socially inclusive and that will be driven by knowledge, technology and innovation. In this model, the higher education sector is called upon to emerge as a strong pillar supporting an economy with robust growth. However, the supply of highly-skilled human resource to achieve Vision 2030 will require reforms that will contribute to improving the quality and relevance of the current education and training system. Physics subject is attributed the subject code of 5054 at Cambridge International Examinations. The SC and HSC examinations in Mauritius are normally conducted at either May/June or October/November. Due to Covid 19 change in school calendars, most students henceforth in Mauritius will be taking their exams at June/May , compared to previously at the end of the year. Local University intakes have also shifted their normal intakes from August to October.

UNICEF in 1996 missioned and focused on promoting, education as one of the most critical areas of empowerment for women (UNICEF ,1996). It is an area that offers some of the clearest examples of discrimination women suffer. Among children not attending school there are twice as many girls as boys, and among illiterate adults there are twice as many women as men. Offering girls basic education is one sure way of giving them much greater power of enabling them to make genuine choices over the kinds of lives they wish to lead. This is not a luxury. The Convention on the Rights of the Child and the Convention on the Elimination of All Forms of Discrimination against Women establish it as a basic human right. The article of UNICEF (1996) argued that women might have the chance of a healthier and happier life with education, thus promoting girl's education and the society will benefits as a whole. A woman can developed into an educated member of the society and can acquire the skills, information and self-confidence need to be a better parent, worker and citizen. UNICEF (1996) defined some qualities of an educated woman as, for example, likely to marry at a later age and have fewer children. Cross-country studies show that an extra year of schooling for girls reduces fertility rates by 5 to 10 per cent. And the children of an educated mother are more likely to survive. In India, for example, the infant mortality rate of babies whose mothers have received primary education is half that of children whose mothers are illiterate. Another quality that education will bring is more productivity at work and a better salary. The dividend for educational investment is often higher for women than men. Studies from a number of countries suggest that an extra year of schooling will increase a woman's future earnings by about 15 per cent, compared with 11 per cent for a man (UNICEF,1996). Over recent decades there has certainly been significant progress in girls' education .

Between 1970 and 1992, combined primary and secondary enrolment for girls in developing countries rose from

38 per cent to 68 per cent -- with particularly high rates in East Asia (83 per cent) and Latin America (87 per cent).

But there is still some way to go. In the least developed countries enrolment rates are only 47 per cent at the primary level and 12 per cent at the secondary level. World Bank (2021) stated that from UNESCO figures, around the world, 132 million girls are out of school, including 34.3 million of primary school age, 30 million of lower-secondary school age, and 67.4 million of upper-secondary school age. In countries affected by conflict, girls are more than twice as likely to be out of school than girls living in non-affected countries. And in many countries, among girls who do enter primary school, only a small portion will reach and far fewer will complete secondary school. Some of the barriers to girls' access to and completion of education are (i) Poverty ,Poor households lack resources to pay for schooling and associated costs (e.g., for textbooks, uniforms, school supplies, and transportation). Poor households with multiple children may choose to invest in boys' education rather than that of girls. (ii)Violence also prevents girls from accessing and completing education, often girls are forced to walk long distances to school placing them at an increased risk of gender-based violence (GBV) including sexual exploitation and abuse and sexual harassment (SEA/SH) and many experience violence while at school. Adolescent pregnancies can be a result of sexual violence or sexual exploitation. Girls who become pregnant often face significant stigma, and even discrimination, from their communities. The burden of stigma, compounded by unequal gender norms, can lead girls to drop out of school early and not return. (iii) Child marriage (iv) Lack of schools, inadequate infrastructure and unsafe environments, Limitations in teacher training and teaching and learning materials (v) COVID-19 is negatively impacting girls' health and well-being. Not many will return back to school (World Bank ,2021).

According to Teese et al. (1995) girls tend to choose subjects with less coherence such as Biology, Humanities, Business Studies and Person Development rather than mutually supporting subjects such as Mathematics, Physics and Chemistry.

In the past parents were giving priority to boys to go to school , then schools opened for girls and the new trend is co education. MIT Pune's Vishwashanti Gurukul School (2021) describe Co-education as a type of educational setup where the boys and girls study together under one roof without any distinction. Both sexes receive physical, moral values and academic education in the same class. Respecting each other and interacting with the opposite sex without any discrimination. They compete with each other and at the same time learn from each other. One of the biggest advantages of co-education is that it prepares the children for adult life. It is believed that sending your child to co-ed school will boosts their self-esteem and social skills along with inculcating better understanding of the diverse world where both the genders live together and this helps to create a well balanced personality in the child. In discordance , India Class (2021) Some of the Disadvantages Of Co-Education are Less Concentration. Boys and girls may get attracted and lead to less concentration in classes or less focus in their studies. Distraction is another problem that can occur between opposite sex the students get distracted from their priorities. Teenage pregnancy is always a danger when boys and girls study together.

Abu-Jawdeh & Sabarwal (2017) mentioned of the myths about 'gendered' learning gaps that persisted since at least the Victorian era. Their research also revealed that the data from internationally benchmarked tests showed that boys lag behind girls on test averages. In six of the 72 countries participating in Programme for International Student Assessment , PISA, it was discovered that 15-year-old boys are more likely than girls of the same age to be low-achievers on the composite average of all three subjects tested. The OECD countries also came up to the same results that , 6 out of 10 underachievers are boys and conclude that despite all this, Despite this higher performance by women, female college students continue to be under-represented in technical fields like engineering and computer science.

III. METHODOLOGY

According to DeWitt Wallace Library (2022), there are mainly four types. Observational data is obtained through observational activities and of human behavior or a phenomenon. Human observations and sometimes surveys can be used. Experimental data are collected is obtained through experimentation and it requires variables alternation. The aim remains to get a causal relationship. Simulation data are obtained through computer test models and simulation. It is normally used to predict weather conditions, economic models, chemical reactions, or seismic activity. Ethics is an important part if any research. It involves obtaining the permissions, informing the sample of the dangers they face, their consent and the aim of the study. Due to ethical constrains such as limitation to obtained fresh data, the set of data used for this research has been available statistics. These are known as Derived and Compiled Data. DeWitt Wallace Library (2022) further argues that derived data involves using existing data from reliable secured sources such as Government portals or verified trustworthy websites like for example the Mauritius Examination Syndicate MES. The disadvantage

is the lack of involvement in actually collecting the data thus there is no originality in the research. For this research , the available statistics from the Mauritius Examination Syndicate(MES, 2021) provide ample information to perform a comparative analysis of the performance of boys and girls at SC in Physics subject. The data have been tabulated, reorganized by subject Physics. Charts and graphs were drawn and the data was analyzed through SPSS. The result was then discussed in the coming chapters.

IV. FINDINGS

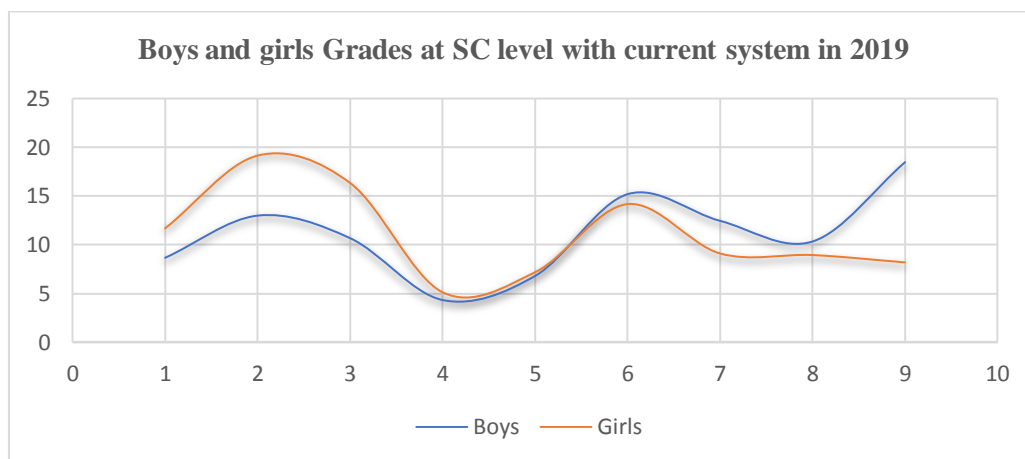


Figure 1: Graph showing boys and girls at SC level with current system in 2019

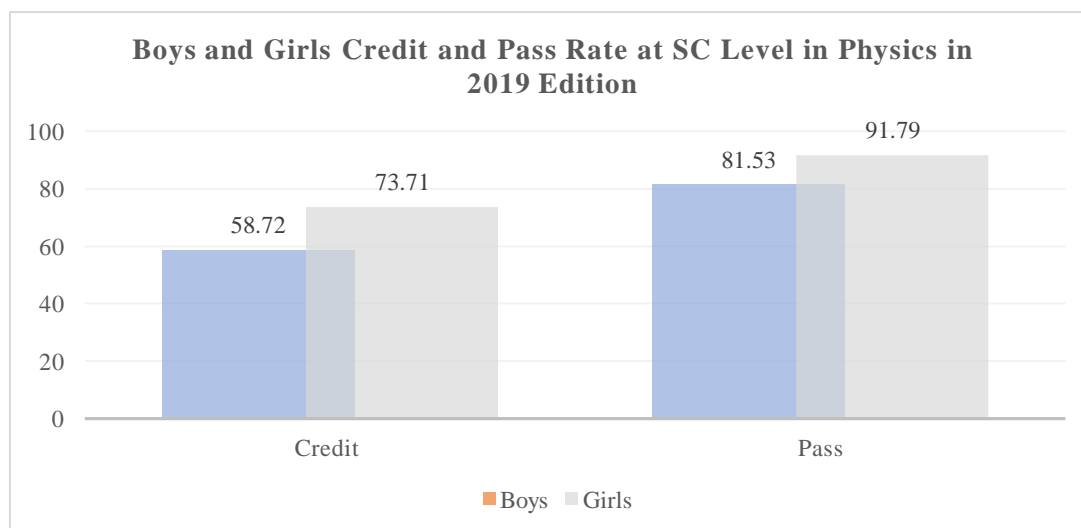


Figure 2: Boys and Girls credit and pass rate at Sc level in Physics in 2019 Edition

On international scene, a study was conducted by OECD (2014) on the Girls' strengths and weaknesses, based on problem-solving process. The figure below shows that girls' success rate on items measuring the process of "representing and formulating" is only 0.89 time as large as that of boys, after accounting for overall performance differences on the test and on average across OECD countries. Hong Kong-China and Macao-China show similar patterns: boys outperform girls in problem solving, and particularly in knowledge-acquisition tasks, but not in tasks that measure how well they use the knowledge they have acquired. By contrast, in many European countries, including those with above-average performance in problem solving, such as France, Germany, Italy and the Netherlands, boys and girls perform similarly across the various problem-solving processes.

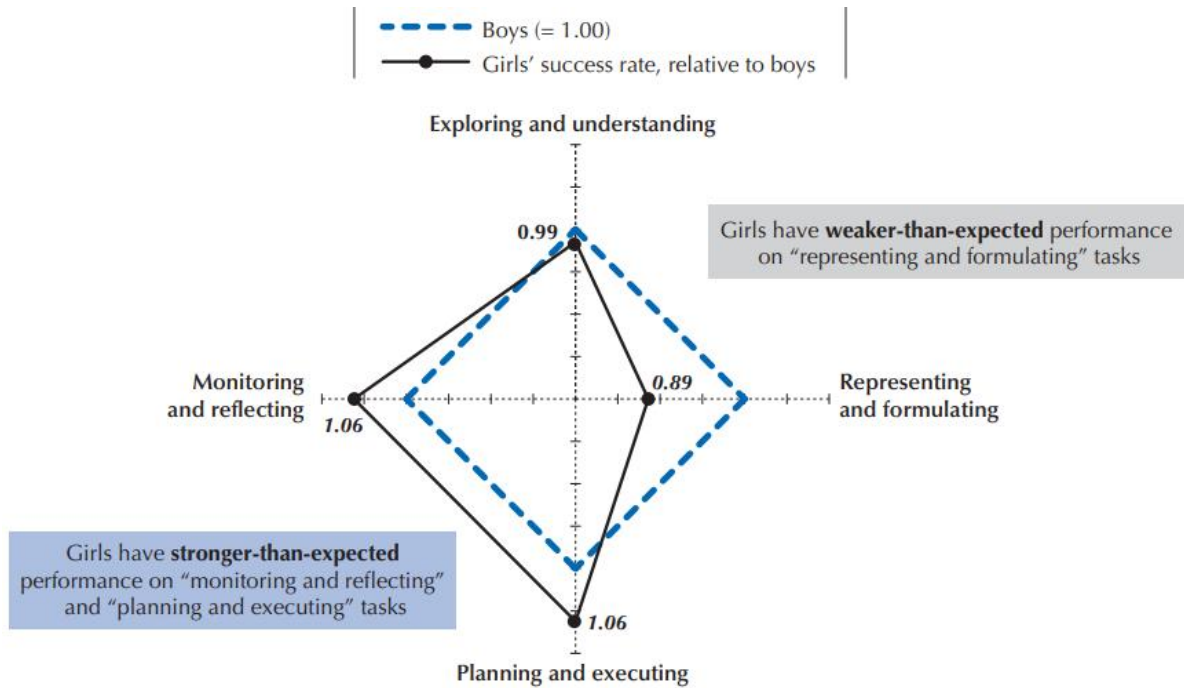


Figure 3 showing girls' success rate (OECD , 2014)

An analysis was performed on local statistics on the performances of boys and girls.

Pass Rate on Boys and Girls at SC level in Physics from 2011 to 2020

Group Statistics					
PassRate	Gender	N	Mean	Std. Deviation	Std. Error Mean
	Boys	8	79.9763	1.33100	.47058
	Girls	8	92.5138	.74898	.26480

Table 1 showing Mean percentage of pass rate boys and girls at SC level in Physics Subject

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PassRate	Equal variances assumed	3.340	.089	-23.219	14	.000	-12.53750	.53997	-13.69562	-11.37938
	Equal variances not assumed			-23.219	11.029	.000	-12.53750	.53997	-13.72558	-11.34942

Table 2 showing Independent T test, percentage of pass rate boys and girls at SC level in Physics Subject

Percentage of Boys and Girls at SC level obtaining Distinction One in Physics from 2012 to 2020

Group Statistics					
	Gender	N	Mean	Std. Deviation	Std. Error Mean
PercentageDistinction	Boys	8	8.7450	1.09162	.38595
	Girls	8	13.0488	2.17147	.76773

Table 3 showing mean of percentage distinction of boys and girls

Independent Samples Test										
PercentageDistinction		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
PercentageDistinction	Equal variances assumed	5.932	.029	-5.009	14	.000	-4.30375	.85928	-6.14672	-2.46078
	Equal variances not assumed			-5.009	10.326	.000	-4.30375	.85928	-6.21019	-2.39731

Table 4 showing Independent T test, percentage of boys and girls at SC level getting distinction One in Physics Subject

An independent sample t test was performed on the mean pass rate of boys and girls during the last 8 years. (mean of the means). p was obtained to be .000. It can be deduced that If the p-value is less than 0.05, we reject the null the hypothesis that there's no difference between the means and conclude that a significant difference does exist. Since 8 years girls have been outperforming boys in Physics. There is a significant difference between their pass rates. For comparing distinctions grade 1 in Physics , almost the same result was obtained. The p was obtained to be .000, If the p-value is less than 0.05, we reject the null the hypothesis that there's no difference between the means and conclude that a significant difference does exist. Since 8 years girls have been outperforming boys in Physics. There is a significant difference between their performances. More girls get distinction grade 1 than boys since 8 years.

It is acclaimed that despite the education levels of women having increased dramatically relative to men in recent decades (Goldin et al. 2006), women are still greatly underrepresented in science, technology, engineering, and mathematics (STEM) college programmes and occupations. Delaney & Devereux (2019) conducted a study on Gender and STEM and concluded that women are much less likely to study STEM degrees at university. The graph below shows the proportion of boys and girls choosing a STEM subject in secondary school.

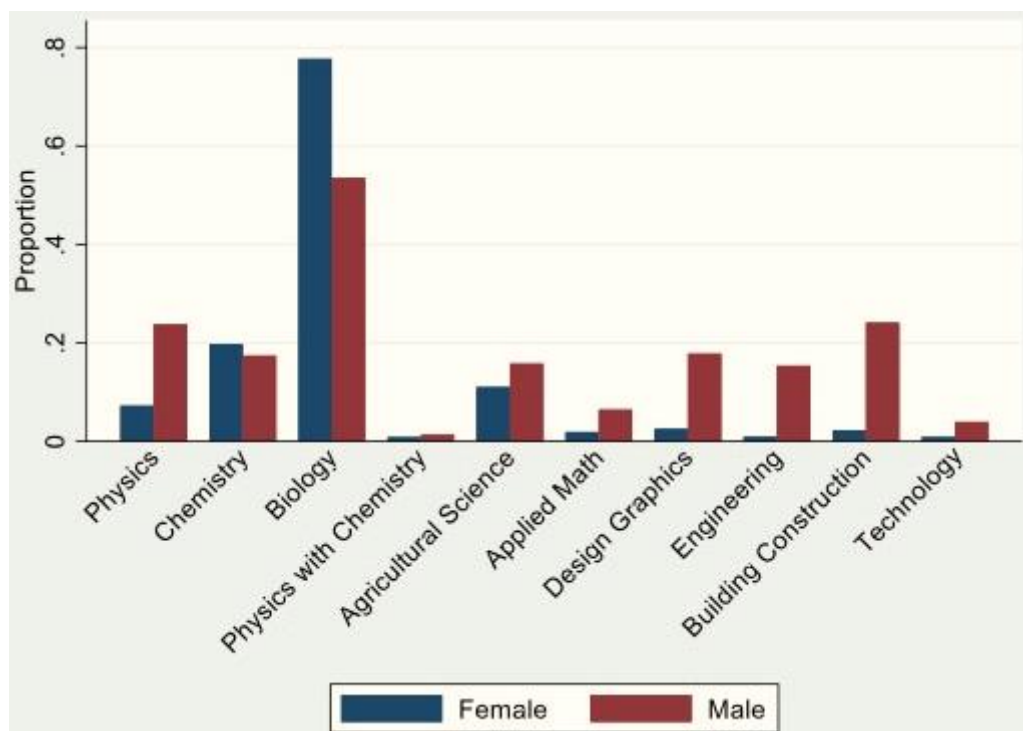


Figure 4 Proportion of boys and girls choosing a STEM subject in secondary school. Source Delaney & Devereux (2019)

V. CONCLUSION

This study has shown that, in Mauritius the performance of girls in Physics is undoubtedly much better than that of boys during the past decade, particularly in Physics subject. An overview on international level also brought the same conclusion of girls doing better. Boys and girls are not biologically the same but their achievements can be compared academically. Abu-Jawdeh & Sabarwal (2017) stated that a cognitive process theories suggest that teachers may have different academic expectations of boys and girls, and students may be responding to these as a Pygmalion effect. Now as they are in Co education in operating Academies in Mauritius as from 2021, it will be interesting to see, to assess, what the new results of boys and girls will be, comparatively between them and between the past and new results. Another study, in coherence with this study will surely enlighten this situation. Within the same class setting, how boys and girls perform will need to be assessed and the results compared with this paper. The new reform that has reached maturity in 2021, has brought this change of new Academies and co education. The nature of change is adapt or perish. If girls were doing better before the change, it is up to the girls to adapt to this new settings and maintain their better performance rather than allow the change to overlap them. The same can be said about boys who now are in direct competition with girls in the same class, with the same lesson and teaching. Boys need to adapt to this change and improve their performance and equal the performance of girls and try to better them. The diagram below illustrate this concept of change in Policy and the new settings that boys and girls are into. H. G. Wells was trained as a biologist and was influenced by Darwin. He famously brought the concept of 'adapt or perish' to a change.

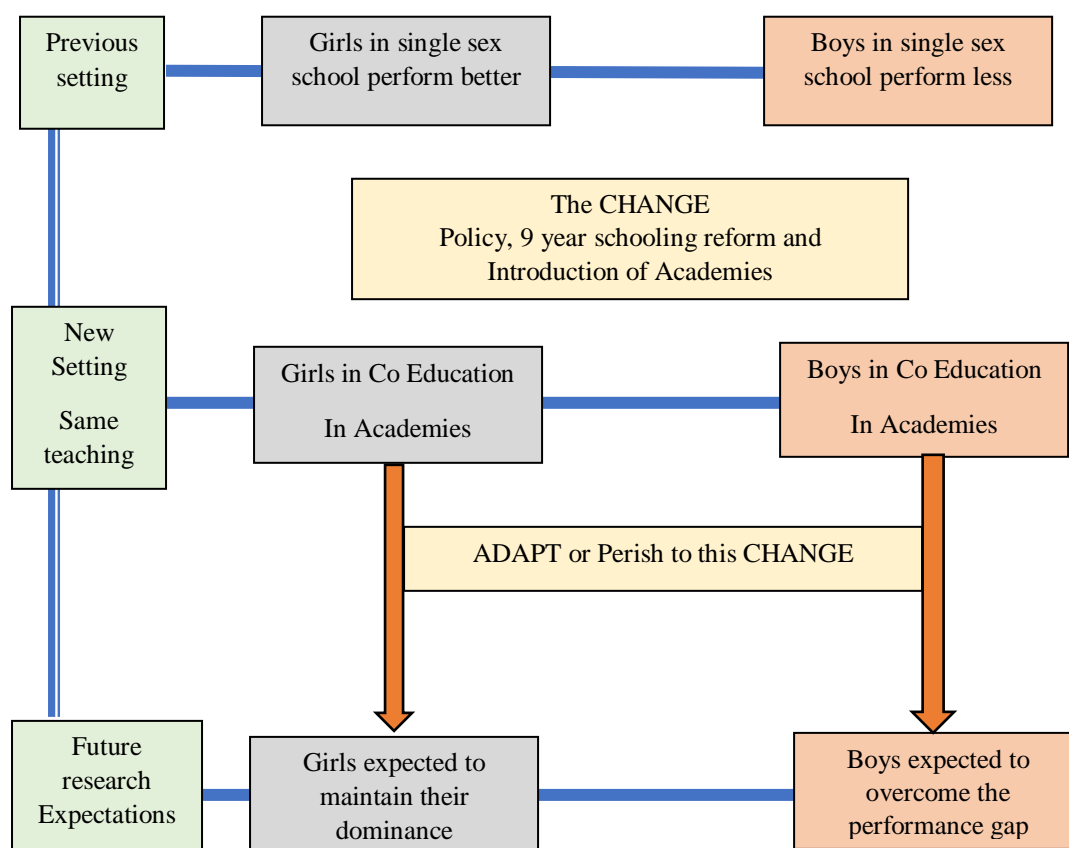


Figure 5 showing Challenges that boys and girls have to face in the new Co education set up

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