An Assessment Of The Impact Of High School Digital Divide To Students Performance At Tertiary Education In Botswana

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Abstract: Research on digital divideand its impact reveals that there are several areas affected which require theattention of planners and programme implementers. Many countries have responded to the digital divide by providing the necessary infrastructural development to curb the divide existing between rural areas and urban areas and also between private and public schools a situation that was well managed in Botswana. Some countries have been assisted by the World Bank to unroll ICTs to communities. However the effects of digital divide remain far reaching. There are limited researches that show that digital divide affect academic performance in tertiary education. This paper makesa further contribution towards justifying that indeed digital divide is still noticeable among tertiary students. Students' performance variations at tertiary education level are attributable to the digital divide created at secondary school education.An analysis of first year results for Computer technology students at Botswana Accountancy College revealed that students who did their secondary education at private schools are overally 5.3% better performing in examinations than their counterparts from public schools. The probability that a student will pass the module is 0.76 and 0.51 for students from *private* and *public* schools respectively. In Botswana Private schools are known to be better in availing ICTs than public schools hence the divide created by where one did their secondary education[1].

Key words : Digital divide, tertiary education, students' performance, telecenter

Introduction

Academic performance is a function of an array of factors which affect learners differently. Attendance, time management, attitude, support systems, preparedness, resources, and digital divide are some of the factors which can affect the learner in either a positive or negative way. This paper looks at the extent of how first year computing students' performance is affected by digital divide because of where they did their secondary school education. The Digital Divide has a tremendous impact on the learners sometimes for the better and at times for the worse. The wider the gap, the more are the negatives to those on the lower end of the "have" continuum. [2]have described the digital divide under three main categories namely

i. Digital access divide - is the inequality of access to information technology (IT) in homes and schools.
ii. Digital ability divide - inequality of the ability to exploit IT arising from the first-level divide and other contextual factors like socioeconomic status and education.
iii. Digital outcome divide - the inequality of outcomes, based on exploiting IT arising from the s second-level divide and other contextual factors like motivation and meaningful usage

In a country like Botswana, most ICT infrastructure is in place, as such the access divide in not much of an issue. Most secondary schools have the computers but lack on the capacity to attain the best out of technology.

Related work

A lot of studies have been carried out regarding how the backgrounds of students affect student academic performance. Most studies seem to suggest that family background, parents' education, peer group pressure, student study habit, personality type of the student and the school environment all affect directly or indirectly the students' academic achievement [3],[4],[5],[6]. Nevertheless, when it comes to early exposure to the use of technology, available literature indicate that perhaps the only observable variations are to do with high student confidence in the use of technology, improved communication and presentation skills and comparative better usage of application software and Internet search skills but not in the future academic performance. In fact so far there is no enough evidence to show the impact of Information Communication Technologies (ICT) on the final overall academic performance at university level [7],[8],[9],[10],[11] . Accordingly more effects of digital divide on tertiary student academic performance beseech for more quantitative researches to demonstrate the magnitude of this differential in higher education. In the research involving 'digital natives' first year Australian university students, Kennedy [12] asked 2000 in-coming students about their access to, use of and preferences for an array of established and emerging technologies and technology based tools. The results show that many first year students are highly tech-savvy. However, when one moves beyond entrenched technologies and tools (e.g. computers, mobile phones, and email), the patterns of access and use of a range of other technologies show considerable variation. According to Prensky's[12] 'Digital Natives' had spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age. For this reason there was no marked differences among the students in terms of using technology to support teaching and learning in higher education but rather they were fundamentally different thinkers from their predecessors (the digital immigrants[12]). The work of[1] revealed that there has been a sterling and commendable effort by the government of Botswana to nip in the bud the digital divide between private schools and public schools. The survey showed that the government has largely addressed the first stage of digital divide which deals with availing physical technological access. The research argued that indeed digital divide goes beyond infrastructural provisioning, rather competencies and technological empowerment through capacity building needs to be plugged in to hunk

the digital divide. If developing countries are to wage a winning battle against digital divide then the warning from [13],[9] that where policy makers ignore the multi-level, multi-actor processes by which technology and society co-evolve, opportunities may be missed to render the use of ICTs meaningful to would-be users need not be glossed over. Fostering desirable and imperative ICT skills to early learners will fortify the technological foundation upon which college and University ICT tuition would leverage on to unleash to the world of work technologically apt graduates. The hallmark of technological determinism depends on how ICTs are incorporated into the early childhood curriculum and their subsequent innovation, adoption, and diffusion [14],[15]. Courtesy of the World Links for Development Program (WorLD) Program, the government of Zimbabwe managed to establish over 25 telecentres throughout the entire country with each of the 10 provinces establishing at least two WorLD centres. WorLD program is an initiative by the World Bank to help countries to develop sustainable solutions for mobilizing the equipment, training, educational resources and school-to-school partnerships required to bring students in developing countries online and into the global community. Through ICT, it links thousands of students and teachers in secondary schools in developing countries with their counterparts in industrialized countries and elsewhere, for collaborative research, teaching and learning projects [16]. Some of these Telecenters have devolved into ICT Diploma and certificate awarding centres with graduates assuming Information Technology positions. The Centres are open to community members as well to learn computer basics and to access the Internet at highly subsidized costs. This has empowered community members who can now use social network forums to engage with their relatives and friends in the diaspora as well as get agricultural information and tips, ordinarily which could be received from community agricultural extension officers. Rothenberg-Aalami and Pal [17] outlined a list of numerous telecenter models in which they articulated what programmes the kiosks offer to communities and how they are governed for their long term sustainable development. One thing that is clear about these projects is that they have proved to be success stories and are living testimonies about to what extend expropriating ICTs can take a society or community. Developing countries must not seat back and count on their ICT acquisition fortunes yet; tenacious war about meaningful uptake and inclusivity is still ranging on. Policy makers must know or at least be made to know that digital divide has far-reaching consequences in all sectors of human endeavour including academic performance at tertiary education.

Methodology

First year results for 2012 students pursuing a Bachelor of Science Honours in Computer Systems engineering at Botswana Accountancy College were analysed to ascertain the impact of digital divide exposure in high school to their performance in their first year of college studies. The reason for using first year results is because it is the linking level from high school to tertiary education and the results would really give a better picture of the impact of digital before on students before the “learning curve principle” takes its toll. Missing information about the type of school (Private of public) the students attended was collected using a questionnaire which was administered to the students. Records analysed consisted of results for 181students, and an entry level module called *Computer Technology* was used in all the cases. The choice of the *Computer Technology module* is that it is the first computing module and is the closest to what is done in high school computing.Four sets of marks (Mid-semester examination, assignment, final examination and the Module mark)were used for analysis. The mid semester mark is obtained after sitting for the mid-semester examinations’ approximately half way into the semester. An assignment mark is obtained after doing a month to two long take home practical assessments, whereas the final exam mark is a result of an examination taken at the end of the semester after the entire module syllabi has been covered. The three assessment components will help in showing both the theoretical understanding as well as the practical application of concepts done in class. The mid semester exam as well as the assignment make up the coursework mark and contribute 40% to the overall module mark. The remaining 60% of the module mark is contributed by the final examinations as can be seen in table 1. For all the assessments, the minimum pass mark is 40%.

Table 1 : Showing weighting of assessment components to Course work and module marks

Assessment component	Contribution to coursework (%)	Contribution to module mark (%)
Assignment	60	24
Mid-Semester exam	40	16
Final Examination	0	60
Totals	100	100

Table 1 above show contribution of each assessment components towards the overall module mark. The overall module mark determines if the student has passed, supplementing or failing the module. A fail applies when the student has less than 35 percentage score for the module mark. A supplementary is given to those whose marks range from 35 to 39, otherwise they pass the module.

Analysis of Results

From the records analysed, 140(77.34%) students went to public schools while 41 (22.66%) did their high school at private schools. Results indicate that students who went to private schools have an overall performance edge over their counterparts from public schools as reflected in Table 2 below.

Table 2 : Showing percentage pass rate per assessment component

		Type of school			
		Public		Private	
		Count	Column N %	Count	Column N %
Mid Semester	pass	61	45%	32	78%
	fail	76	55%	9	22%
	total	137		41	
Assignment Outcome	pass	92	72%	32	80%
	fail	36	28%	8	20%
	total	128		40	
FinalExam Outcome	pass	66	48%	24	59%
	fail	71	52%	17	41%
	total	137		41	
Module Outcome	pass	71	51%	31	76%
	fail	69	49%	10	24%
	total	140		41	

From table 2 above 45% of students from public school passed the first assessment (mid-semester) component compared to a 78% pass rate by students from private schools, indicating a 33% difference between the two groups of students. Both groups did exceptionally well on the assignment(public = 72%, private = 80%). A good pass rate can be attributed to the nature of the assessment(Assignment) component as it is take home and gives room for students to share ideas. An 11% pass rate difference has been noted for the final exam with private students higher at 59% pass rate. The gap on pass rates seems to be narrowing as the semester progresses, a phenomenon which can be with time which can be attributed to the *learning* and*experiencecurves* theories.
The average marks for the three assessment components are just above the pass mark (40%) as can be seen in table 3 below.

Table 3 : Showing mean mark for assessment components

		Mid Semester Exam	Assignment Mark	Final Exam Mark	Module Mark
N	Valid	181	169	179	190
	Missing	9	21	11	0
Mean		40.72	47.05	40.11	38.94
Minimum		17	5	10	1
Maximum		72	74	77	69

The average marks for closed book(mid semester and final exam) assessments are just above the pass mark threshold while the overall module outcome is 1.06% shy of 40% at 38.94%, however the individual(private and public) average marks are different as can be seen in table 4 below.

Table 4: Comparison of Average marks for private & public students to the group

Group type	Mid Semester Exam	Assignment Mark	Final Exam Mark	Module Mark
Public	39.09	46.43	39.41	39.31
Group	40.72	47.05	40.11	38.94
Private	46.50	49.18	42.80	44.61

From the table above, students from private schoolsproduced a higher average marks than their counterparts. For the mid semester exam the average marks are (private = 46.5%, public 39.09%) giving a difference of 7.41%, a figure that can be used to make a generalised conclusion that learners from private schools are 7.41% better in Mid-semester examinations than those from the public schools. The same can still be said for the *assignment, final exam* and *module mark* whose average mark differences is 2.75% , 3.39% , 5.3% respectively , favouring private students. Another interesting analysis shows that most of the students from private schools are above average as reflected in table 5 below.

Table 5 : Showing percentages of students above average from either public or private

	Mid semester	Assignment	Final exam	Module mark
Average mark	40.72	47.05	40.11	38.94
%public	38.13%	55.47%	47.45%	56.43%
%private	76.6%	57.5%	58.54%	82.9%

Overally, 82.9% of students from private schools are above average in Computer Technology at BAC compared to 56.43% for students from public schools.If the average mark is used as the pass mark, we can safely conclude the probability of passing as 0.56 for public students and 0.83 for private students.

Recommendations

The effects of digital divide created by where one did their secondary education to their performance at college have been made bare by this paper, and the magnitude of the effect though small can't just be ignored. This paper therefore puts forward what can be done at secondary schools as well as at university to bridge the digital divide gap. Some of the strategies can be:

i. Secondary school curriculum needs standardisation to ensure the high school graduates are the same regardless of which school they attended.
ii. There is a need to for diversity in medium of instruction since English language might be a problem for some in Botswana.
iii. All stakeholders of society have to be creators in order to have as much diversity available on the Web.

iv. Public schools can benchmark with private schools on the overall offer of computing.
v. More investment on ICT infrastructure for public schools may help address the divide.
vi. Collaboration between tertiary and secondary education institutions needs strengthening since they are both in the education value chain.
vii. Colleges may consider offering pre-university computing classes to all students to bridge the gap created at secondary schools.
viii. When ICT resources (Hardware and Software) are acquired, there is need to incorporate universal design features so that students with special needs are also catered for.
ix. A budget must be created by both private sector and public institution to fund researches that assess the effectiveness and appropriateness of technology supported practices in the classroom, across various academic degree programmes for the benefit of education practitioners.

Conclusions

From the beginning of the information age up until now, there has been a gap in this digital era affecting different people in different ways. Students are one such group affected by their level of exposure during high school education to their performance at university. Students performance is a function of many factors, with exposure to technology as one the many factors. Those exposed to technology early comprehended concepts faster at their first year of college life compared to those exposed later or not exposed at all. There is a lot of evidence including success stories concerning a myriad of potential opportunities that can be gained from properly integrating ICTs in our day to day lives. Students and members of the communities lack skills that are necessary to derive maximum benefits from the use of ICTs. Policy makers must work hand in gloves with educators and researchers to formulate strategies to mitigate the new type of digital divide which is now predominantly competency-based. Many initiatives to address the digital divide are not all inclusive for in the majority of cases people with special needs are not catered for. There is no one size fit all when it comes to implementation of ICT related issues; different situations need to be accorded with solutions relative to them. This research would advocate for an all stakeholder participation in a bid to socialise digital divide since government cannot seem to be finding solutions for the poor without the poor, solutions for women without the women and solutions for the youths without the youths.

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