Addressing socio-economic challenges of science teacher training through virtual and open distance learning in Zimbabwe

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Accepted 03 November, 2012

The paper studied challenges of recent economic melt-down in Zimbabwe on the enrolment of students of science teaching, and the measures instituted by Bindura University of Science Education (BUSE) Virtual and Open Distance Learning (VODL) was therefore instituted in August 2010 to make science teacher training economically affordable and socially convenient are examined in this work. Meagre economic resources and tight social obligations placed the commitment to science teacher training at the bottom of family priorities. The study assessed key VODL documents, carried out key informant interviews and questionnaire surveys were undertaken at seven centres in Zimbabwe. While the introduction of the complementary block release realised a slim increase, the more versatile VODL strategy doubled within one year. VODL proved to be more affordable using the instalment payment method than the earlier two while combining minimum inconvenience of one month relocation with face-to-face interaction with tutors. Students have enough time to work on assignments and individual learning. However, the availability of technical materials remains a challenge hence a computer scheme for students with monthly instalments was initiated. The virtual component needs to be enhanced.

Keywords: Attrition, Bindura University of Science Education, Challenges, science teacher, VODL, Zimbabwe.

INTRODUCTION

Education is an important basic human right. This was underscored by the United Nations (UN) in the millennium development goal (MDG) which highlights universal primary education and inclusion of education for all (EFA) initiative (Aderinoye et al., 2009; Mpofu et al., 2012; UNESCO 2007; Thakrar et al., 2009). UNESCO (Mpofu et al., 2012) estimated that 15 to 35 million new teachers are required globally, by 2015, of which 25% are for Africa. In 2005, the then Secretary General Dr Kofi Annan appealed on the need to train teachers and build up research capacity, strengthen open universities and distance learning programmes and ensure that African institutions have access to the latest technologies (Thakrar et al., 2009). There was a massive expansion of schools to cater for the growing number of youths in developing countries prompting the demand for more qualified teachers (Sikwibele and Mungoo, 2009). African Governments have committed themselves, to provide EFA requiring the use of open and distance learning (ODL) as a viable option to address and match the growing demand for education (Aderinoye et al., 2009). Distance education (DE) is one of the solutions to train
In order to fulfil this mandate, BUSE uses three strategies namely conventional, block release and virtual and open distance learning (VODL) since January 1996, January 2010 and August 2010 respectively (Figure 1).

The VODL is a mode of training science teachers in the diploma and degree programmes using the same human resources, programme regulations, and ultimately attaining university certificates. The VODL was later introduced to complement the other two. BUSE’s VODL is an adapted strategy convenient for learners. VODL complements the enrolment as the other two strategies of learning.

The VODL Strategy

The goal of the VODL strategy is to provide training of science educators in Zimbabwe. VODL develops the country through the advancement of knowledge and skills in science education.

The VODL thrives to provide science education to students by bringing the university to their door-steps at an affordable cost. (BUSE VODL Comprehensive Report, 2010) This fact is consistent with Muirirwa (2009) that ODLs are affordable for educational institutions in developing countries including SSA. The vision of the VODL is to provide teacher education as an intervention to curb the critical shortage of science teachers in Zimbabwe (BUSE VODL Comprehensive Report, 2010). This notion concurs with Ademaye et al. (2009) and Thakrar et al. (2009) who agree that shortage of teachers is a challenge in many countries. VODL aims at curbing critical shortage of science educators in Zimbabwean schools, colleges and universities (BUSE Comprehensive Report, 2011, 2010; Mpofu et al., 2012). It was also designed as a cost-effective strategy in line with Muirirwa’s (2009) and Sampong’s (2009) observations on educational institutions in developing countries especially in SSA training for science. The sub-goals of VODL (BUSE Comprehensive Report, 2011) mode include; to
train and provide adequate science educators that balance off the demand supply gap in Zimbabwean schools, restore quality science education, offer affordable virtual and open distance learning teacher education motivate and restore the science education professionalism and integrity in the teaching fraternity in the country. As in line with many ODL models (Muhiwa, 2009; Sikwibele and Mungoo, 2009; BUSE Comprehensive Report, 2010), the objective of the BUSE VODL strategy was to make science teacher training affordable and convenient for the student teachers. In short, VODL intends to increase educational access and choice, using technology and media for learning (Chipunza BUSE, personal communication).

The pilot VODL project as outlined in Mpofu et al. (2012) targeted the relief teachers and trained teachers wishing to acquire degrees and improve on their professional skills and knowledge (BUSE VODL Comprehensive Report, 2011). Due to economic hardships after the year 2000, brain drain included the majority of science teachers (Chetsanga, 2001 and Nyathi, 2010 in Mpofu et al., 2012). BUSE resorted to adapted three science teacher training modes to suit the prevailing economic conditions (BUSE VODL Comprehensive Report, 2010).

Statement of the problem

Enrolment of students of science at BUSE declined since late 1990s as a result of prevailing economic hardships. The brain drain to regional and international destinations was a huge blow to Zimbabwe’s science teachers. Nationally, the available number of science teachers dropped tremendously and science subjects could not be offered at some schools. The initially controversial and later accepted staff incentives to retain especially science teachers were introduced. The rural-urban schools gap widened and an exodus of teachers especially to South Africa was witnessed. This affected Zimbabwe, once a regional beacon of educational excellence in sub-Saharan Africa (UNESCO 2010). Since independence in 1980, the country’s education was hugely supported by relief teachers, with some trained primary school teachers stationed in secondary schools and good results were realised. More teachers were trained since independence in Zimbabwe.

However, science teachers have always been in short supply. This challenge was exacerbated by the above-noted economic situation. The Zimbabwe-Cuba partnership in science teacher training emerged in 1986 to ease this problem. Despite the first graduates returning home in 1991 complementing science teacher training at Gweru, Hillside, Mutare and Belvedere teachers’ colleges, still the demand for science teachers remained high. Although the University of Zimbabwean (UZ) trained science graduates, they were not training science teachers hence the introduced a graduate certificate in education (GradCE) to introduce the professional component to science graduates. The UZ also manages the diploma programmes in many teachers colleges in the country. More diversified universities were built but this could not ease the problem. BUSE was granted university autonomy to replace the Zimbabwe-Cuba training arrangement.

The aim of the study was to assess the impact and challenges of the BUSE VODL strategy in science teacher training. The research asked the following questions;

- How has VODL impacted on the enrolment of student science teachers in Zimbabwe?
- What challenges threaten the VODL strategy in science teacher training in Zimbabwe?
- What counter-measures are in place to mitigate the emergent challenges?

Justification of the study

Most students are either economically and/or socially challenged including married, orphaned, and divorced who cannot afford at least three years of science teacher training outside their homes. This makes distance and virtual learning a viable solution to the problem.

Delimitation of the study

This study focuses on VODL, BUSE’s third strategy to train science teachers for at least secondary school level. The seven nationwide centres were studied. BUSE VODL students were the respondents in the study. Other universities, teacher training and higher learning institutions and non-science teaching programmes were not considered in this study.

LITERATURE REVIEW

Adaptation tended to follow when an education system got threatened. Sikwibele and Mungoo (2009) recommended an exploration of the use of alternative instructional technologies after studying diploma students in a Botswana college.

Virtual and ODLs are the most prevalent modes of teaching in many global institutions of higher learning including in Africa (Boitshwarelo, 2009; Sikwibele and Mungoo, 2009). BUSE VODL attempts what Pellerin and Montes (2012) called a blended teaching (BT) that combines face-to-face (F2F) with online instruction, also known as DL (Boitshwarelo, 2009) which is a move away from involving only F2F to include online delivery. BT is viewed to positively impact in several ways (Pellerin and Montes, 2012). Boitshwarelo (2009) highlights that BL
includes interactions through F2F teaching, online and self-paced online learning. This approach is regarded as the best of both worlds by combining the strengths and limitations of both approaches (Pellerin and Montes, 2012). While BUSE has attained ODL, the virtual component is still under construction.

BL is entails the designing and delivering the right content in the right format using the right mix of media (Debande and Ottersten, 2004 in Boitshwarelo, 2009). Emanating from the western models (Muhirwa, 2009), virtual and ODLs have gained widespread acceptance in many countries including SSA (Sikwibele and Mungoo, 2009). In Zimbabwe many universities have embarked on DL. BUSE however, took this mode further by introducing a classroom environment where 48 contact hours with the tutor guidance is accorded each module. The learner is expected to benefit in the one month long tutorial session where the areas and questions are interacted together between lecturer and students and amongst students themselves.

ODLs have several merits. One obvious merit is its enormous flexibility (Pellerin and Montes, 2012). BUSE capitalises on this strength especially through time-tabling F2F during school holidays as it targets teachers awaiting training and those already trained seeking higher teaching qualifications during school holidays. DL is meant to complement conventional modes of delivery (Sampong, 2009). The benefits of DL have been outlined by in more detail by Sampong (2009) and Sikwibele and Mungoo (2009). DL remains the only viable option for reaching dispersed learners in remote areas. Additionally, it is cost-effective and convenient for learners who cannot leave their work to study on full-time programmes as also reported by Muhirwa (2009) on the AVU programmes in Africa. As an in-service programme, it does not deprive classrooms of teachers who learn as they work. There is a dual benefit from this in-service of learning whilst also earning as learners do not have to leave their jobs (Boitshwarelo, 2009; Sikwibele and Mungoo, 2009). Chute et al. (1999) cited in Muhirwa (2009) identify additional merits of DL including allowing the training of more people, its learner-centeredness as more control of pace and style, caters for students and flexible delivery at convenience of students (Fresen and Hendrikz, 2009). These are important factors to the developing countries including Zimbabwe that make DL a viable option to curb shortages in professionals including science teachers. There are benefits to personal development, professional practice, schools, learners and colleagues (Aluko, 2009). DL augments F2F traditional method of delivery in teacher education (Sampong, 2009).

However DL has its own challenges. While ODLs have several merits Boitshwarelo (2009) argues they are inadequate for the task of quality teacher education. Power outages are common in Zimbabwe which Muhirwa (2009) also highlights of ODL in SSA citing technical problems disrupting virtual classes. Sikwibele and Mungoo (2009) also identified challenges faced by student teachers including the quality of such programmes. Hope et al. (2006) cited in Sikwibele and Mungoo (2009) give a more comprehensive list of these factors including, limited use of technology and more dependence on traditional methods of instruction, lack of awareness of quality parameters of delivery systems among staff, general inefficiency of administrative systems, and lack of standard criteria to measure the quality of services. These challenges result in attrition or dropping out by learners.

DL is associated with high attrition rates. Attrition is a major challenge in many education systems in developing countries. Reasons for attrition include poor learning environment and lack of time for already heavily-loaded adult learners due to work, home, and school demands (Sikwibele and Mungoo, 2009). Kember (1989) in Sikwibele and Mungoo (2009) also identified variables linked to attrition including income, gender and distance from the learning institution especially for adult learners. Muhirwa (2009) noted that registered students commuted to AVU campuses. Learners also feel isolated and stressed due to lack of organisational support hence the eventually non-completion (Kember, 1989) in Sikwibele and Mungoo, 2009). Family context, background, personal motivation, depth of commitment to completion, previous educational experience and achievement, and institutional support influence attrition in DL programmes are important factors affecting attrition in DL (Sikwibele and Mungoo, 2009).

Attrition is also influenced by cognitive overload. Tyler-Smith (2006) in Sikwibele and Mungoo (2009) noted that early attrition among first time e-learners was a result of cognitive overload contributing to high drop-out rates. This arises when students learn complex and or technically demanding material requiring building of mental models or cognitive schemas over time, learning new material or a skill for which a schema in long-term memory is undeveloped or non-existent can cause working memory to quickly overload its limited capacity (Sikwibele and Mungoo, 2009). Cognitive overload becomes a ‘mental blackout’ resulting from learning new and varied content for which the mental models are non-existent leading to the adult learners feeling frustrated due to failure to understand the information, and they may not stay the course (Sikwibele and Mungoo, 2009). Sikwibele and Mungoo (2009) argue that adult distance learners in Botswana experience cognitive overload. They explain this to be a result of long time spent out of school and the sudden, large, and varied amount of academic work they have to cope with, often with minimal organizational support and limited time to adjust in addition to their multiple roles as workers and their family roles. Cognitive overload can therefore, besides promoting attrition lead to high failure rate.

Resources are important to reduce attrition. In Nigeria failure rates for teachers enrolled in the ODL programme
is a result of late receipt of learning materials, student involvement in income generating activities to supplement their family incomes, and poor learner support services especially where study centres are under-resourced and overstretched (Sikwibele and Mungoo, 2009). A situation is also evident in the South Africa’s similar programme (Aluko, 2009). F2F interaction as occurring in various centres with qualified personnel, South Africa (Aluko, 2009; Fresen and Hendrikz, 2009), Ghana (Sampong, 2009) is also important component taken during school holidays at BUSE (BUSE VODL Comprehensive Report, 2011). At the seven centres, the instructors of the same module are obviously different. Fast (Sikwibele and Mungoo, 2009) on instruction at different sites found that 60% of remote site students disliked the lack of opportunity to interact one-on-one with their instructors (cited in Simonson et al., 2000). The BUSE VODL employs F2F interaction during the school holidays. An effective learner support services system providing on-site F2F tutorials, timely feedback on student performance and access to library services is important, else student achievement will unavoidably be undermined in favour of higher dropout rates and increased procrastination eroding the merits of DL including cost effectiveness and efficiency. BUSE furnished the computer laboratories to enable their students during practical sessions (Mpofu et al., 2012). However these computers are inadequate to afford one to one hence students take turns to access the computers similar to that reported by Boitshwarelo (2009) in Botswana.

Factors promoting attrition can be overcome by those promoting persistence. Persistence defined as the active enrolment status of learners (Sikwibele and Mungoo, 2009) is the determination to continue despite challenges. Berge and Huang (Sikwibele and Mungoo, 2009) categorised persistence variables in DL into personal, institutional and circumstantial. These are important variables influencing the persistence of learners in DL programmes. A positive relationship between intrinsic motivation and continued enrolment was observed by Fjortoft (Sikwibele and Mungoo, 2009) as motivating adults to continue in their education more than a desire for enhanced salary and career mobility. Intrinsically motivated learners and those with high expectations of completing the program have higher success rates. These findings further showed that older students were less likely to persist in distance learning programs than younger students while high attrition rates amongst adult learners could be attributed to the multiple social roles they play, which leave them with limited time to study.

Many ODLs in developing countries are supported by ICTs. However, there are often challenges associated with technology driven learning. Muhirwa (2009) noted that AVU’s virtual delivery via narrow internet bandwidth only enabled the lecturer’s voice and not video to be synchronised with the presentation slides projected onto a screen on the front wall in the classroom. The technological resources are still a challenge in many developing countries.

While there has been widespread advocacy for adapting technologies into the learning system, the impact of such an approach in low level economies with challenges in internet connectivity (Aluko, 2009; Fresen and Hendrikz, 2009; Muhirwa, 2009), both hardware and software requirements, and low to moderate levels of technology need to be explored. Crucial to examine how the in a continuously globalising world how developing countries are also incorporating technology into their education systems in tandem with the current modes and approaches in learning institutions need be understood. This study therefore intended to fill a knowledge gap of what the situation is in developing countries taking Zimbabwe’s leader in science teacher training education. Technology alone cannot be panacea to learning challenges hence the BT approach by BUSE. The efforts to incorporate technology based learning in developing countries is also a welcome move in bridging the existing geographical distance and digital divide (Matthewson, 1994 cited in Muhirwa, 2009) thus improving what Moore (Muhirwa, 2009) calls ‘transactional distance’ between learner and instructor. General challenges were noted in Mpofu et al. (2012). However economic challenges as the main constraint in enrolment of science teachers were not addressed in that study.

**The Study Area**

The research was carried out in seven centres of the VODL in Zimbabwe. These are the diploma and degree centres for the BUSE involved in the training of science teachers for Zimbabwe’s secondary schools. The VODL centres were literally university campuses with representations of critical offices. A map showing the distribution of the seven VODL centres by December 2011 is shown on figure 2.

BUSE opened up four VODL centres in Mashonaland Central in 2010 and three in other provinces in 2011 as shown on Figure 2.

**MATERIALS AND METHODS**

The main method used was documentary analysis on the records of the university enrolments, the BUSE VODL Comprehensive Reports (2011, 2010). Additionally, executive reports, minutes of the VODL meetings and workshop proceedings were collected and analysed in this study. This was followed up using the interviews with key informants including four regional education directors of education and VODL directorate and centre coordinators lecturers, technicians and librarians. The
Table 1. Respondents distribution by VODL centre

<table>
<thead>
<tr>
<th>Centre</th>
<th>Enrolment</th>
<th>Sample</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradley</td>
<td>177</td>
<td>25</td>
<td>12.5</td>
</tr>
<tr>
<td>Chindunduma</td>
<td>303</td>
<td>42</td>
<td>21.0</td>
</tr>
<tr>
<td>Fatima</td>
<td>191</td>
<td>27</td>
<td>13.5</td>
</tr>
<tr>
<td>Mutare</td>
<td>137</td>
<td>19</td>
<td>09.5</td>
</tr>
<tr>
<td>Mushumbi</td>
<td>166</td>
<td>23</td>
<td>11.5</td>
</tr>
<tr>
<td>Umzingwane</td>
<td>182</td>
<td>25</td>
<td>12.5</td>
</tr>
<tr>
<td>St Alberts</td>
<td>282</td>
<td>39</td>
<td>19.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1438</strong></td>
<td><strong>200</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

interviews with staff and students were carried out at all the seven centres. A stratified random sample of 200 students that is, 14% of the student population responded to a structured questionnaire. The student respondents were distributed as shown on Table 1.

Data Analysis

Data collected was analysed using Excel/SPSS software. Descriptive statistics were computed to establish the performance of the VODL strategy in the various centres. SPSS was also used to perform some statistical analysis of the data. A calculation of the dropout rate was done using number of drop outs as a fraction of the centre enrolment converted to a percentage.

RESULTS

The Impact of VODL on the enrolment of students of science teaching

An understanding of the impact of VODL on the enrolment of student science teachers could be noted when graphically presented. The historical record of enrolment of BUSE science teachers clearly showed an increase that levelled out in the early 2000 and declined as shown on Figure 3.

The science teacher training programme’s pioneer intake was four year post A’ Level students enrolled in 1996. In January 2010, block release (Figure 1) was introduced to increase enrolment for science teachers but had little impact.
There was a sharp decline in the number of science student teachers enrolled. The impact of VODL was noticed in the enrolment figures recorded since the inception of the strategy. Enrolment figures of students of science teaching for the first three centres improved sharply and doubled for the four new centres as outlined on Figure 2.

Mutare is a degree only centre while Chindunduma and Mushumbi are centres for diploma studies only. The rest of the centres offer degrees and diploma studies.

Figure 4 shows the increase in the enrolment of BUSE as a result of the VODL strategy. Mutare is an exclusive centre for degrees while Chindunduma and Mushumbi are centres for diploma studies. The rest of the centres offer both degree and diploma studies as illustrated on the students’ enrolment by centres designated ‘old’ and ‘new’ is shown on Table 2. It was noted that the new centres (Figure 2) were operational since August 2011 while those in the rest of the centres were enrolled in August 2010.

The introduction of the four new centres added 716 new students to the 722 already enrolled in the three old operational centres, a 99% increase in the enrolment for the university. There were no new intakes for the old centres by August 2011 as those enrolled in April were still in the first year of study. Figure 5 shows the distribution of the students by gender.

The gender distribution of students shows slightly more male than female students in both the diploma and degree programmes. However, there is nearly a gender balanced enrolment. There were more males (56%) than females (44%). The same applies to study programmes in the VODL with a 57: 43 and 54: 46 male - to - female ratios in the degree and diploma programmes respectively.
Table 3. Dropout of student teachers in VODL (2011) by study programme.

<table>
<thead>
<tr>
<th>Centre</th>
<th>Degree Aug11</th>
<th>Degree Dec11</th>
<th>Diploma Aug11</th>
<th>Diploma Dec11</th>
<th>Total Aug (Dec)</th>
<th>Total Dec11</th>
<th>D/Outs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradley</td>
<td>33</td>
<td>32</td>
<td>143</td>
<td>120</td>
<td>177 (152)</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Chindunduma</td>
<td>-</td>
<td>-</td>
<td>303</td>
<td>291</td>
<td>303 (291)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Fatima</td>
<td>49</td>
<td>41</td>
<td>142</td>
<td>120</td>
<td>191 (161)</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Mushumbi</td>
<td>-</td>
<td>-</td>
<td>137</td>
<td>125</td>
<td>137 (125)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Mutare</td>
<td>166</td>
<td>148</td>
<td>-</td>
<td>-</td>
<td>166 (148)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Umzingwane</td>
<td>65</td>
<td>55</td>
<td>117</td>
<td>101</td>
<td>182 (156)</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>St Alberts</td>
<td>153</td>
<td>150</td>
<td>129</td>
<td>125</td>
<td>282 (278)</td>
<td>07</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>466</strong></td>
<td><strong>426</strong></td>
<td><strong>971</strong></td>
<td><strong>882</strong></td>
<td><strong>1438 (1311)</strong></td>
<td><strong>129</strong></td>
<td></td>
</tr>
</tbody>
</table>

The Challenges faced in the VODL strategy

High attrition rate by students is a major challenge that emerged from the study. Various causes of dropouts in the VODL strategy noted include economic, social and academic.

Student Dropout by Centre

The enrolment of students increased upon the VODL expansion by opening up one centre each in Mashonaland Central and Mutare and two in Matabeleland by August 2011. The distribution of dropouts by centre is shown on Table 3.

The role of the tutors initially needed to be defined especially before modules were completed. BUSE also has already taken cognisance of these concerns since modules are prepared, edited and exercises and tests and final examinations centrally prepared. BUSE module writers are inducted into the module writing through workshops. This improves tutor competence in delivery of course materials. The deployment is primarily by qualification and attendance of the pre-deployment workshop held before each session initially was poorly attended. Chipunza (BUSE, personal communication) gave an example stimulating discussion of VODL in one of the workshop presentations is given below:

Mrs. Dota is an untrained secondary school teacher with 5 children all under the age of 7 years. She is one of the only 3 teachers teaching at a satellite farm school in Mvurwi. The school has 150 students. Mrs. Dota wants to upgrade her teaching qualification so she can effectively teach science. However she cannot leave her 5 children nor can she leave the students under the care of just 2 teachers. The only way for her to study her diploma in science education is through distance learning. Would VODL work in this situation? Table 4.

Three categories of dropout rate can be noted. These are the high at least 15% located in Matabeleland, the moderate category includes those in the nine to 12 percent and the low attrition rate has less than five percent.

Reasons for Dropouts in VODL

The reasons for dropout were varied. The important reasons were economic, social and academic challenges (Figure 6). Some dropouts did not report their challenges hence presumed withdrawn. Reasons for dropping out from three centres are shown on Figure 6.

The predominance of social problems combined is noted in Figure 6. These include pregnancy, illness and bereavement. The majority of students withdrew on bereavement grounds and a small proportion due to financial problems. Transfers were noted although in the university these are not considered a dropout since these students remain in the register of the same university.

Economic challenges include funding of the study. Most
Table 4. Dropout rate by centre and study programme

<table>
<thead>
<tr>
<th>Centre</th>
<th>Degree Dropout rate (%)</th>
<th>Diploma Dropout rate (%)</th>
<th>Ave Dropout rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradley</td>
<td>1</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>Chindundumuma</td>
<td>-</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Fatima</td>
<td>8</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Mushumbi</td>
<td>-</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Mutare</td>
<td>18</td>
<td>-</td>
<td>11</td>
</tr>
<tr>
<td>Umzingwane</td>
<td>10</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>St Alberts</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 6. Reasons cited for attrition.

students enrolled sought for relief teaching posts in their districts in order to meet their fees requirement. Twenty-two percent indicated that they face deployment challenges and cite scarcity of teaching posts. Additionally, the Ministry of Education, Sport and Culture is making a strict requirement that without mathematics at O’ Level cannot be deployed worsening the financing of the studies. Seventy-eight percent of the students are family persons with obligations to support themselves. They also require computers to enable their online linking and e-learning. The cost of the unit laptop is way above the salary of a teacher.

A heavy workload was noted amongst academic challenges that lead to attrition. One module is covered over one month period with various assessments including at least two assignments, a test and group work which is also accompanied by a group presentation. However, modular system has examinations after every semester. Students take at least six modules in a semester of which each be assessed as outlined above. For the August teaching block, courses could have assignments submitted about one month later and this arrangement is comfortable for students. Furthermore, this pressure of work is also true for the tutors who also have other commitments of research, conventional and block release teaching (Figure 1).

Students indicated that the programme of study is difficult ‘especially’ those enrolled bridging their mathematics. This adds to their already loaded study menu. Some have carried-forward courses failed during previous examinations. In some modules, failed courses are prerequisite hence cannot proceed to the second level till they have passed that module.

Linked to the academic challenges dropouts by degree subject is illustrated using the results from Mutare centre. Dropouts were also categorised by subject of study as was the case at Mutare VODL centre (Figure 7). While there were no dropout cases in Geography. However, Physics and Agriculture, Mathematics, Biology, Chemistry and Computer Science had dropouts on the August 2011 enrolment noted in December the same year. There were no dropouts in Agriculture, Geography and Physics. A subject based drop out was also assessed for Mutare centre is shown on figure 7.

Addressing the challenges in VODL

For the challenges noted above, solutions including student support, financing and time convenience are attempted. The strategy was adapted to suit adults who cannot leave their families and work to stay in university for at least three years.

The social challenges noted include pregnancy. The university has a provision for students who cannot continue due to pregnancy. Pregnant students can defer
without losing their accumulated credits. Affected students can attend classes without prejudice. Additionally, a fund has been allocated to cater for emergencies such as sudden illnesses. The same applies to students falling sick during a session. Student’s excuses, for instance, to attend funerals are also entertained. However arrangements have to be made so that the student cannot be prejudiced. At each centre social support structures have been established. These include dean of students, chaplain, centre coordinator, who help the student by counselling and advisory services. This also applies to academic challenges as well. Sports and recreation is also availed at each centre, with the directorate and administration ensuring that these are established as in the traditional campus set-up.

The university has negotiated with ministry to employ students so that they can raise fees for their education in all the provinces where VODL is operating. The strategy was well received in all the provinces with Matabeleland provincial educational director visiting and addressing students emphasising importance of the training. The students were assured they would get the relevant economic support to get them deployed so that they can alleviate science teacher shortages resulting from brain drain. The tuition charged for VODL students is less than the resident student who has residential charges in addition. VODL students are resident only for one month at the local or nearest centre.

The university has also attempted to negotiate for laptop scheme. This would enable students acquire laptops and pay in monthly instalments. The scheme is yet to be finalised. Laptops are important especially when students have to go online and study using e-resources. Furthermore, a cadetship scheme was also announced and students have submitted their forms. However, no single student has yet benefited from this government scholarship. In addition, 60% of the centres installed have internet facilities for the students and tutors.

In recognition that the students are economically challenged, the university has facilitated instalments that the students can spread their payment. This is an important arrangement and the students find it affordable. The distribution of centres nationwide is cost saving.

To the academic challenges, a number of solutions have been sought. These include the provision of modules at seven dollars or at least draft modules to the student in either soft or hard copy. This has helped students to academically prepare for their assessments and study. Additional resources are also provided in the mobile library that is established at each centre. The library carries materials that also tally with the modules that are in session. Academic advice also sought to the team at the centres. E-learning is under construction but it is in the planning. The problems including library and laboratory materials were rectified by the university. Each of the seven centres has a library that is installed during the teaching learning block and laboratory materials and equipment and computer laboratories.

Teaching media have been improved. Two LCD projectors from VODL office supplemented by those from departments involved. White boards and markers. This is helping the students while the virtual environment is being established.

In addition to the student-focused solutions, tutor capacitating is also ensured. VODL has a directorate that ensures it is well functional. The number of staff members involved in VODL has increased as the new centres have opened up additional enrolment. Figure 8 shows the staff figures for the VODL during the year 2011.

**Addressing causes of attrition**

At every centre the student affairs, chaplaincy, and other important departments are well represented. Students’ social and health challenges are solved, with each centre allocated a contingency budget to handle emergencies such as illness, rushing sick and pregnant students to hospitals in cases of emergencies. Those students who fall ill can resume studies at any other centre where the modules are currently offered without charges or penalties.
Centre administration helps counsel students who need that help. Bridging courses for mathematics are offered to help those students who feel the studies especially mathematics. However, some students opt to join other professions including the police and army upon passing the mathematics. No measures to hold these are in place. For students who experience bereavement, they are allowed to excuse and heal up. But special arrangements are made by the centre coordinator, lecturers and the concerned students so that they can cover up the work. Sometimes, even missing an exam a student can apply special examination for reasons of sickness, and bereavement.

BUSE holds pre-deployment seminars and workshops that define the route the tutors are taking. Workshops for centre coordinators and another for teaching staff are held before each deployment session. VODL has held three pre-semester workshops a week before deployment of staff to the respective centres. The objectives of the workshops involved orienting staff members on their execution of their duties and the code of contact to take care of. Speakers from the deanery, registry and administration have been actively facilitating these workshops.

In view of the big numbers of students and workload rationalisation, it was resolved to have two courses per lecturer per teaching block. Intensification of the module writing with outsourcing of module writing to complement the staff efforts in different departments has been initiated. University e-learning webpage is under construction to cater for the VODL students as well.

In Geography for instance, maps local to each centre are preferred so that learners appreciate their local environment before introduction to other areas, such as was the case with the Mutare centre where the local aerial photos of Nyanyadzi irrigation and the local urban areas were used for this centre. Materials are highly adapted to suit the learners’ needs.

### Laptop and Cadetship Schemes

The end of the year has seen over 90% of VODL students applying for the laptops to be acquired using through the university facilitated laptop scheme. This will facilitate the virtual method of teaching as envisaged by the VODL. There is also over 70% VODL students’ application for the government sponsored cadetship scheme to sponsor their education. The cadetship applications are still waiting response from the Ministry. This scheme helps the economically challenged students meet their financial obligations. In addition BUSE is engaging with the government to enhance preference for the student teachers in the vacant posts in the country. Favourable results have been realised in all the seven centres. This has helped to mitigate against the economic challenges significantly.

At BUSE, one of the foundation courses is Introduction to Computer Applications for both diploma and degree students to bridge students without or with inadequate computer background. This helps to prepare them for the future university life with courses and work related to be accomplished on the computer systems.

Students used ICT devices to do their course work. This was also the case in the centres with some students typing assignments (25%), surfing internet resources (45%) for assignments and presentations (58%), social networking on facebook and twitter (71%), the major challenge was unavailability of printing and photocopying materials as the centre coordinators revealed in the interviews. Majority of the students constituting 68% had either laptops or smart phones especially in Mutare where ‘Mutare VODL’ is situated. Computers were used to download internet resources such as textbooks, presentations, notes and other resources. This was popularised through the use of such terminologies as “Googling” and “Facebooking” as the students indicated when they responded to what they use their techno
devices for. There are only two out of the seven with internet connectivity hence a major drawback to students (91%) and tutors (70%). Tutors (90%) were using their dongles to connect to internet and largely for communicating rather than educational purposes. Those who accessed internet used their smart phones (68%) and cellular provider services rather than broadband or wireless.

Social networks form when virtual classes emerge. Already an online virtual community is taking shape, having been introduced by Dr Chingombe, the centre coordinator of Mutare. This community uses ‘Facebook’ social platform to post all classes and out of class materials such as discussion fora, e-resources, time tables and even general notices on BUSE_VODL group. This is proving to be important for the learner support. Furthermore, the installation of fibre optics is going to see improved connectivity and while internet service providers are increasing and becoming cheaper, with cellular line companies now also introduced internet on mobile phones, the widespread acquisition and use of smart phones all is going to improve the virtual technological based learning environment of the Zimbabwean science teacher student.

**DISCUSSION**

Poor attendance of pre-deployment workshops was a challenge to the VODL. The April 2012 session had a successful launch as a wide and informative two day pre-deployment workshop held in March. Non-attendance meant no deployment and since lecturers are paid allowances, the workshop was well subscribed. The presenters ranged from the VODL directorate, deanery, chaplaincy and academic staff. The specific topics covered included defining VODL, content development, writing smart objectives, module writing template interpretation, student guide development for ODL and customising module template. To refresh lecture delivery, professionalism and application of motivation theories were also presented.  Additional global scale information supplementing the workshop for instance included principles and practice of assessment in ODL, case studies of adult learning criteria and scientific writing were also provided to all workshop participants.

The reduction in the enrolment of student science teachers in the BUSE conventional and block release strategies (Figure 1) led to the introduction of the VODL. VODL has since reversed this trend with wide acceptance of the strategy in all the seven centres in Zimbabwe. The VODL is a clearly adapted teacher training strategy which appears suitable to meet the economically challenging and socially attached (married) potential student for science teacher training (Table 2). VODL strategy catapulted university enrolment of student science teachers to 1438 students in only one and half years of operation. This explosive enrolment (Figure 4) confirms the impact of the VODL in the training of science teachers in Zimbabwe. The impact has already reached nearby English speaking Botswana as was revealed at the Plumtree VODL Centre during the December 2011 session unlike the Portuguese speaking Mozambique. The other five centres are far from the national borders. Cite any other studies where ODL has increased enrolment. Therefore BUSE’s VODL is a success story for BUSE since its inception in 2010 prompting opening up of four additional centres across the country (Figure 2) by August 2011.

VODL is widely accepted in the country. Many national universities are following suit. The response of the Ministry of Education, Sport and Culture shows the Zimbabwe Government’s commitment to support the strategy. The strategy reverses the brain drain that occurred since the year 2000. In all the provinces, VODL science student teachers are given preference for relief positions and placements. BUSE students in the VODL strategy are not segregated from the national cadetship scholarship programme. The advantages are that most of the time the student is learning and concurrently the work experience is built up.

The involvement of VODL students into the national cadetship government scholarship programme and also the university’s lap top scheme of the university is a measure to ensure the conditions for the VODL students parallels that of their colleagues in the conventional and block release strategies of study. This paper argues that with technology being the “in-thing” for the time is to revolutionise science teacher training using VODL is the norm. The virtual classroom is the mode taken by most progressive universities today (Muhirwa, 2009).

DE has been noted to be capable of providing effective pre-service and in-service training (Aderinoye et al., 2009; Sampong, 2009) in Africa. Muhirwa (2009: 19) citing consistent with the conclusions reached by the Working Group on Canada's Policy with Regard to Agricultural Biotechnology and Developing Countries (2005) “a new technologies are introduced into a foreign environment in the absence of a clearly understood demand and careful preparation with the risk of the tool taking priority over the purpose. This is consistent with the BUSE virtual component which seems to be taking longer to fully establish than was planned. The modules are student centred, written in a manner so that the student has self-help materials, with exercises and tests materials and questions. However, the BUSE VODL case is currently more of DE than VE. Muhirwa (2009) commented that in the AVU model, registered students still commuted to campus which is also true for the BUSE VODL although in the latter, learners travel shorter distances to the local provincial holiday campuses. The ‘virtual’ component in the VODL is still under construction.

While there has been more praises than bruises on DL
and VL, this mode is not a panacea to learners’ problems. For instance it seems to be a western model cross cutting into African countries and Muhirwa (2009: 6) cites Jorgensen (2006) arguing that it is a “one size does not fit all model.” VE and DE is not a straight jacket and whenever adapted, there should be modifications to suit the local cultural and contextual situations. It is however encouraging that the digital divide is fading as broadband internet, fibre optics being laid in the country and the ministry of information and communication technology is empowering educational and other institutions with better and improved connectivity. Muhirwa (2009) cites that the technological landscape by AVU seems inappropriate for SSA. The cost of broadband in Africa is much higher 50 times more in Africa than in Europe yet the former is poorer than the latter. However, it is important to note as Moore (1999) cited in Aluko (2009) argues that good monitoring and evaluation is key to the success of DE. Evaluating DE is important their redesign Cyrs (1998) cited in Aluko (2009) and also as institutional accountability (Aluko 2009). This helps in improving the delivery of the DE prevalent globally.

There are some signs of dropping out (figure 6). It seems too early to conclude the dropout rate of the strategy since there is no intake that has finished in strategy yet. Drop out is a major problem with different strategies, especially in developing countries. Even under the softer payment arrangements, the dropouts cite payment challenges leading to their pulling out of the programmes.

There is limited time approximately one month to capitalise the school holidays which is also consistent with (Sikwibe and Mungoo, 2009) study. BUSE is also enrolling lecturers for the VODL strategy so as to complement the staff establishment in the university. Although the level of aptitude for the VODL students is competitive, however, some are lower and require the preparatory study for these to cope up with university education. VODL is also learner tuned enrolling learners for bridging course to enable their enrolment into the conventional study programmes. It is a requirement to pass Mathematics, science and English before enrolling into the study programmes at BUSE in addition to subject specific requirements. Those without mathematics are enrolled into a bridging course to help cover the deficiency. Older students had difficulty catching up (Sikwibe and Mungoo, 2009) and seemed to suffer from cognitive overload as (Sikwibe and Mungoo, 2009) cite Tyler-Smith and required trained tutors to motivate them. Dropouts, though small numbers have already begun to surface.

Against straight jacketing western ICTs into educational situations Muhirwa (2009) commented the case that with political will, pedagogy, instructional design know-how and only a fraction of the resources dedicated to ICT-based IDE, it would be possible to transform traditional media such as radio and video into productive educational technologies in SSA and in oral cultures around the world. This view points towards a need to adapt some of the technology and suitably fix them into the learning environment in Africa. The ‘one size fits all’ does not apply in this DE and VE scenario. (Jorgensen, 2006 in Muhirwa, 2009).

In Botswana, one of the problems included crash programme, in which they attend lessons seven days a week, consult tutors, and write examinations (Sikwibe and Mungoo, 2009). However the argument by (Sikwibe and Mungoo, 2009) that learning content should be trimmed is not welcome. Rather improving on the time of contact or increasing the resources to the disposal of the learner is more meaningful. Otherwise graduates are half-backed science teachers and that is not welcome in a country championing for excellence in education as the recently Zimbabwe Council for Higher Education (ZIMCHE) body has been institutionalised to regulate and quality control all education in Zimbabwean institutions of learning.

First year university students arrive in schools with different expectations, skills, and needs than those the traditional education system was designed to teach (Gabriel et al., 2012). These differences highlight the requirement for an examination of appropriate pedagogies to meet the literacy and learning needs of these new learners (Kinzer, 2010; Oblinger and Oblinger, 2005) cited in Gabriel et al. (2012). Gabriel et al. (2012) acknowledge that there is escalating access to and use of digital information and communications technologies. Citing various studies, Gabriel et al. (2012) noted various names coined for these generations including Digital Natives, Net Generation, Information Generation, Millennials, and Neo Millennials provoking an education delivery system that is adapted and adjusted to this generation of learners. Gabriel et al. (2012) also highlight in their literature review how both hardware based, through ready access to such devices as smart phones, tablets, and high-speed connectivity, and software based, through social media, Web 2.0 or the “read/write web,” and digital audio/video production tools, this digital immersion has contributed to significant numbers of young people who are comfortable creating, distributing and transforming knowledge in a digital context.

The challenges include the prohibitive cost of laptop computers to most of the learners. Muhirwa (2009) highlighted the predicament of African institutions citing the AVU’s problem being hindered by infrastructure and lack of ICT equipment. The family financial base is still fragile as the economy is not yet fully recovered. While the fee structure and instalments have improved enrolment, internet connectivity and access to some of the remote areas is still a challenge.
Limitations of the study

The study could not conduct the dropouts to establish the causes of their attrition. It was not yet possible to evaluate the impact of the strategy since there is not yet a single intake that has completed their programme of study. Materials for the VODL is still being developed progressively hence the findings are not based on a fully set complement of factors.

CONCLUSION

In conclusion, the graduates from the conventional programme for the last eleven years totalled 1087 and the enrolment from the VODL programme alone for both 2010 and 2011 have surpassed the figure. The conventional programme would obviously fail to meet the national demands for science teachers, whereas the VODL programme if expanded to cover the whole country can meet national demands in a shorter period.

VODL has registered huge success despite some constraints. There has been cooperation amongst various administration and various departments. VODL is a success story aiming at bringing science teacher training to the doorstep of the student. While there has been a registered success overall, the task to educate the science educators is not over, and it calls for our sustained support and commitment to enlighten Zimbabwe through science education. The Ministry of Education Sport and Culture has welcomed this ODL model pledging further support by preferring BUSE VODL students obtain relief teaching posts thereby helping them raise their finances to capacitate them pay their fees and buy resources to support their education. This move has helped enrolment of more student science teachers. More aspiring candidates have also indicated their willingness to enrol and were only hindered by the periodic intakes unlike the South African Advanced certificate in education (ACE) programme enrol students anytime (Aluko, 2009).

RECOMMENDATIONS

This study recommends the introduction of internet resources to learners. More Virtual learning environmental resources should be quickly availed so as to benefit the learners. Computer empowerment especially helping learners’ access computers as is the case in most institutions providing such facilities and services. While there are efforts to connect students to the social networks such as Facebook, there should be a university portal where students can access materials such as modules, assignment questions, and additional reading materials. The contact with tutors is still important despite the physical distance. Technology should bring the tutor to virtual proximity hence enhancing chances of learning. Student should have confidence not only in the strategy, but in the entire university way of conducting business. Students should be able to even check updates, events and even results among other on the university website upon logging in their registration credentials.

ACKNOWLEDGEMENTS

The researchers would like to acknowledge the university administration for allowing the research to take place. The university authorities are acknowledged for their financial and academic support. VODL office directorate and seven centre coordinators and their respective deputy centre co-ordinators are acknowledged. The researchers would also like to extend their gratitude to VODL Centre coordinators, teaching and non-teaching staff, and the. The crucial role of School Development Committees at the centres housing our VODL students is appreciated. Special thanks to the Government of Zimbabwe establishments including Provincial and Regional educational directors and their respective officers, for Mashonaland Central, Manicaland, Matabeleland, the VODL students and their guardians.

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