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THE EFFECT OF REMEDIAL EDUCATION ON BIOLOGY PERFORMANCE AMONG LOWER SECONDARY SCHOOL STUDENTS IN THE MBEYA DISTRICT, TANZANIA.

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Abstract

This research aimed to assess the effect of Remedial education programs (REPs) on students' academic performance in lower secondary schools. 80 form four students from 3 selected community day secondary schools participated in this study. A mixed methods approach was applied whereby observation, documentary review, and pre and post-testing were used to collect data. Data were analyzed through a comparison of mean differences and t-tests. The results showed that teachers rely on traditional teaching methods such as lectures and demonstrations while teaching biology. On the other hand, REP had a positive effect on the performance of low-achieving students in biology. ($p < 0.05$). However, the researcher recommended the utilization of modern teaching methods in remedial classes as well as further research on this topic.

Keywords: Remedial education program, students' performance, Biology, Low achieving students.

Introduction

Biology is a branch of science concerned with the study of life and nature as well as the discovery and exploration of new things (Syafii & Yasin, 2017). It is one of the science disciplines taught in secondary schools, and it aids students in grasping scientific principles, applying them in real-life settings, and resolving related challenges. Knowledge of biology is important in agriculture; for example, creation of drought-resistant crops could help solve the world's hunger crisis. Also in the

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medical field, the establishment of novel processes for disease detection, cure, and prevention has maximized patients' recovery rates (Dermaco & White, 2020; Naicker, 2015). Biology's relevance in real life cannot be overstated, as it has a significant impact on human lives and is well-known for its contribution to the universe's social and economic well-being (UNESCO, 2019). Performance in biology is a predictor of what society is and will be in the future, therefore emphasizing science as a career option provides students with opportunities for further education and recognized employment, which is the backbone of the global economy (Chama & Moses, 2020). Despite its relevance to everyday life, students have been facing difficulties in learning biology. This has been a major concern for various researchers and many studies have been conducted in this area (Chavan, 2016; Çimer, 2012; Dermaco & White, 2020; Gardner et al., 2018; Hallyburton & Lunsford 2010; Mabula, 2012; Mardonov, 2019; Mkalagale, 2013; Muchwe, 2014)

Many biological concepts such as genetics, reproduction, growth, respiration, transportation, nervous system, and others have been difficult for students to learn and comprehend. This has greatly affected students' performance in Biology especially those with low achievement in schools. Various reasons have been advanced as causes of poor performance in Biology: Çimer, (2012) sorted out five factors that contribute to poor performance of students in Biology as follows: (i)The abstract nature and language difficulty (Latin) of biology concepts which promote rote learning rather than deeper comprehension. (ii) The huge content of biology which denies students the opportunity to focus and learn effectively, teachers are also forced to be fast in teaching to cover the planned content. (iii)Ineffective teaching methods such as lecture methods deprive students of the opportunity to investigate and practice on their own as well as teachers' failure to connect theoretical concepts to real-life problems when teaching. (iv) Insufficient learning tools to assist biology study; most schools lack scientific laboratory and equipment that would allow students to conduct experiments and grasp the concepts effectively. (v) Students' perceptions and learning behavior, students' bad attitudes toward biology cause them to close their minds to learning and comprehending biology. In addition to the factors above, Chavan, (2016) mentioned that teachers' incompetency of the subject matter has contributed to students' failure of understanding and misconceptions of biological concepts. Also, the

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shortage of learning resources and poor learning environment make biology studying most difficult. Moreover, teaching without aids increases confusion to students and triggers them to memorize things rather than understand.

In spite of being a mandatory subject, students in Tanzania's lower secondary schools has continued to perform poor in biology (Ministry of education and vocational training, 2014). As a result, the government of Tanzania under the ministry of education has focused on improving the performance of students not only in biology but also in other science subjects (Mkalagale, 2013). Various measures such as teachers' recruitment, construction of biology laboratories and libraries as well as curriculum reform from content to competency-based (URT, 2020). However, these majors does not focus on the process of learning which makes poor performance to continue exist. Therefore, the government instructed the provision of remedial education programs in all schools to compensate for what students lack in regular classrooms and improve science performance among low achievers (URT, 2015). It has been recommended that remedial education should be conducted to help low achieving/slow learners to catch up with others who have high achievement in school. The Research for Improving System of Education [RISE], (2017) also posed a need for schools to implement remedial education to assist underperforming students to improve their performance in particular subjects and gain knowledge and skills that will help contribute to the wellness of their society. Therefore this paper addressed the following question

i. What is the effect of remedial education on students' performance in ordinary level biology in Community secondary schools in Mbeya District, Tanzania?

Literature review

The conception of Remedial education

Remedial education, according to Jimenez et al., (2016), refers to extra lessons given to make up for what was missed in a regular class schedule. Many educational systems use remedial education to help low-achieving, dropout, and adult students, as well as refugees and vulnerable children, fill up the learning gaps caused by their living circumstances (Yolak et al., 2019). Since its inception, remedial

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education has been in high demand in all countries' school systems. For example, remedial programs, also known as developmental education, have been used in the United States of America (USA) to help students go from lower to higher levels of learning (Weisburst et al., 2017). Remedial education has been used as a treatment for low-achieving pupils in other affluent countries such as Turkey, Malaysia, and China (Shults, 2000; Yang et al., 2014; Yolak et al., 2019). Nigeria, Ghana, Zimbabwe, South Africa, Rwanda, Kenya, and Tanzania are also concerned about assisting pupils with low learning abilities through remedial education. (Kalyoma, 2016; Kanamugire & Rutakamize, 2008; Munene & Peter, 2017; Musongole, 2019; Ndebele, 2014; Oyekan, 2013).

Remedial practices in classrooms

Embarking on remedial practices requires a careful and systematic process that would result in positive yields (Oyekan, 2013). Sharma and Kaur, (2016) stressed the need of identifying students' learning faults as a key for remedial classes 'placement. They also mentioned that teachers have the role to monitor their students' progress over time and pinpoint those in need of remedial education.

Low achieving students are the ones who always fall below averages in all subjects (Chitsa & Chimhenga, 2016; Schwartz, 2012). Also, Low achievers are defined by the American Psychological Association [APA] (2021) as children with average intellectual disabilities as well as those with normal intellectual capabilities but limited learning progress. In that manner, it is therefore of great necessity to equip teachers with skills on how to identify low achievers/slow learners to avoid misplacement of students in remedial classes.

Instructions in remedial classes can be provided by both full or part-time teachers, peer tutors as well as community members (Schwartz, 2012). However, proper training is essential for remedial instructors so that they understand how to cope with the unique needs of particular students. in addition to that, differentiating teaching strategies in remedial classes would result in productive results. According to Born et al., (2002), utilizing conventional methods of teaching in remedial programs is less likely to improve learning performance. Remedial

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courses are more productive when modern and active teaching methods are utilized. Some of the teaching methods which are effective in improving the performance of low achieving students are analyzed below:

One to one tutoring

This refers to a kind of instruction that involves one teacher assigned to an individual learner (Baker et al., n.d.). This method has been proven to be advantageous to both low achieving and slow learners since students can learn at their style and pace; it is also easier for the instructor to design instructions according to the demands of the particular student(Cope & Kalantzis, 2016).

Peer support tutoring

Students in this method collaborate and work together in small groups under higher achieving students to accomplish a learning task(Schwartz, 2012). Teachers train students who perform better in the class so that to help low achieving students catch up with what was missed in a regular class. Peer learning promotes good communication and enhances interpersonal relationships which maximize confidence and freedom in the process of learning (Digital Class, 2021). It also promotes critical thinking, problem-solving ability, and innovative skills (Kola & Langenhoven, 2015).

Computer-assisted instructions(CAI)

The Training industry, (2021) defines CAI as the application of computer technology in teaching and learning and this may include simulations, games, and tutorials. Online materials and various learning software have made teaching a most comfortable process and it has promoted students' understanding of particular subjects. In their book of conceptualizing e-learning, Cope and Kalantzis, (2016) identified that the use of CAI has revolutionized the education system from didactic to reflexive learning. They explained that the application of CAI in teaching and learning has enhanced ubiquitous and differentiated learning as well as collaborative learning. According to Manasse and Raphael, (2020), CAI enhances and makes learning more interactive through the use of animations and simulations, videos, and audio sound which results in students' learning motivation and performance improvement to both teachers and learners.

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The effect of remedial education on students' performance

The analysis on remedial education and students' achievement by Jacob and Lefgren, (2002) in Chicago identified that summer remedial programs improved the performance of students in Math and reading by 20% and the effect persisted for two years whereby students in the second year increased their performance to about 25%-40%. Also, an evaluation on the short-term effects of remedial education programs for low achieving high school students in Israel indicated a slight improvement in matriculation rate by 2 or 3% than earlier (Lavy & Schlosser, 2004). In addition to that, the study on the effect of remedial programs on low fourth-graders achievers in Palestine resulted in the performance progress of such students (Jarrar, 2014). Besides, a study by Yang et al., (2014) on the effect of remedial instructions on low achieving students in Mathematics indicated a positive impact on students' performance in Mathematics. Students in the experimental group increased their performance from 16.8% to 58.8% while those in the control group improved from 16.1% to 41.6% only. Moreover, the quasi-experimental study by James and Folorunso, (2012) of 240 junior secondary school II which assessed the effect of feedback and remediation in Ondo states Nigeria, revealed that remedial sessions and timely feedback had effects on students' performance in Mathematics. Furthermore, the qualitative study on the contribution of remedial education to students' achievement in Turkey revealed that the programs had promising effects on students' performance both in academic and social lives.

However, the descriptive survey on the effectiveness of the remedial program in Zimbabwe showed adverse effects on students' academic achievement in English. Because just 15 percent of remedial students graduated from the program, the statistics indicated that the program was ineffective. Insufficient teaching abilities in remediation, teachers' and students' negative perceptions of remedial education, inadequate evaluation methods, and a lack of enthusiasm all contributed to the program's dismal performance (Ndebele, 2014)

In Tanzania, remedial programs have taken hold across the board. One type of remedial education, namely private tutoring, has been popular and widespread for many years. To make a living, private tutoring is a type of remedial program delivered by employed or unemployed teachers, form six leavers, and recent graduates

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(Anangisye, 2018). Parents pay fees for their children to attend remedial classes after school hours, on weekends, or during vacations. Private tutoring has improved students' grades in a variety of areas; nevertheless, it demonstrates learning bias because some parents cannot afford to pay for their children to attend this extra instruction, denying some students the opportunity to learn alongside others. (Kabage, 2015). To address the issue, Tanzania's government, through the ministry of education, decided to create remedial programs in public secondary schools to assist pupils in improving their academic performance. Students in public secondary schools have had remedial education classes before and after school, as well as on weekends and during vacations. According to a study conducted in the Lindi region by Kalyoma, (2016), remedial education had a positive impact on pupils' mathematics performance. Unfortunately, these findings cannot be generalized due to the small sample size, and there is no additional evidence to support the impact of remedial instruction on student advancement in Tanzania. This is why the researcher is interested in working on this subject.

Research Methodology

Research design

The embedded research design was employed for this study taking a pragmatic view (Kumar, 2011). The design allowed for the combination of qualitative and quantitative research methods and it assumes that one type of data is not enough; so then additional data set would be required to support the other one to strengthen the findings(Creswell and Cresswell, 2017) In this study qualitative data provided a supportive secondary role to quantitative data set

Population and sample

The study was conducted in Mbeya district, Tanzania whereby three community secondary schools were selected purposively based on their performance in form four national examinations. The target population comprised biology teachers, academic teachers, and form four students at Mbeya district. However, the sample size was 148 participants comprising of 140 students from a pool of low achieving students, 3 academic masters, and 5 biology teachers. The students were randomly

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selected using random numbers while academic masters and biology teachers were purposively selected based on their roles teaching biology and monitoring the teaching process respectively.

Research Instruments

Data collection was through pre and post testing whereby test-retest method was conducted and the correlation coefficient was 0.97 which indicated a strong positive relationship and consistency of results for the selected population.

Ethical considerations

This study adhered to the University of Rwanda's research ethics guidelines and procedures (Directorate of research and innovation, 2014). Ethical clearance was sought from the University of Rwanda, and the Prime ministers' office-regional and local government (PMO-RALG) in Dodoma, Tanzania. Permission was also sought from Mbeya regional administrative office to allow data collection in selected schools.

Results and discussion

Students' performance in pre-test between control and experimental groups

There was no significant difference of performance in the pre-test between control and treatment groups at 95% confidence interval ($p > 0.05$, $df= 69$, $N=80$, mean in control group = 22.5, mean in experimental group = 19.4). This proved the performance equivalency of students before remedial interventions and offered insurance that the study dealt with students of the same learning ability.

Control group students' performance in pre-test and post-test

Results indicated a no significant difference of performance in the pre-test and post-test of the control group at 95% confidence interval ($p > 0.05$, $df= 39.9$, $N=20$, mean in pretest = 22.5, mean in posttest = 25.7). The results depicted a picture that students in the control group did not improve their performance in Biology after the interventions

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Experimental students' performance before and after remedial interventions

Specifically, results revealed a significant difference in the performance of low-achieving students in treatment groups before and after remedial interventions at 95% confidence interval (p-value < 0.05, df = 110, N = 60, mean in pretest = 19.4, mean in the posttest = 45.7). This indicated that students improved their performance after attending remedial interventions and thus REP had a positive impact on improving student's performance in Biology.

Students' performance in post-test between control and experimental groups

Results revealed a significant statistical difference of performance in post-test between the experimental and control groups at 95% confidence interval (p-value < 0.05, df = 77, N = 80, mean in control group = 25.8, mean in experimental group = 45.7). REP positively impacted students' performance in the experimental group; unlikely the control group who attended regular classes as per school routine.

Treatment variations between the two groups might have influenced their performance differences. The control group went to regular classes as part of their usual school routine whereby the class size was big and they also continued to learn using traditional teaching methods such as lecture. The experimental group was taught by using modern teaching strategies such as peer tutoring, group discussion, 5Es, and computer-assisted instructions (CAI); the class size was also limited to twenty students. This is supported by Born et al., (2002) who elaborated that when modern teaching strategies are used, remedial education can significantly enhance the performance of slow learners. Also, Saxon et al., (2007) indicated in their work that, promoting classroom interaction by using modern teaching methods such as CAI, group discussions and practical works make remedial education more successful and productive to low achieving students.

Furthermore, the minimal number of students in experimental groups helped to improve their results. This is per Ehrenberg et al., (2001); Hoxby, (2000), Khan and Iqbal, (2012), and Krueger et al., (2002) who stressed the importance of having the small remedial class size to enhance individualized instructions and meet every learner's demand. Moreover, a lower class size would allow for more teacher-

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student and student-student contact, allowing teachers to better organize class instructions and choose the best teaching tactics for their students' requirements. As Nghambi, (2020) stipulated, due to the enormous number of students, it is difficult for teachers to assist individual students or use small groups.

The gain in performance could also indicate that students were more interested and engaged in learning biology as a result of the learning activities conducted in experimental remedial sessions through learning by doing, field visits, computer simulations, and pictures. This correlates with the results of Porozovs et al., (2019) who mentioned that to a large part, a teacher's ability to engage students' interest, choice of teaching methods, and capacity to lead the learning process determines academic performance and learning motivation. Additionally, the constructivism learning theory promotes focusing on students by allowing them to construct information based on prior knowledge. Students should be more interactive and engaged in the learning process, rather than being seen as empty vessels by teachers who impart knowledge to them through traditional teaching methods (Bada, 2015).

Moreover, Schools with more experienced teachers demonstrated higher abilities in integrating various methods of teaching students in remedial classes. This factor had probably influenced students' performance because there was a higher performance of students in schools with more than 5 years' experience than in schools with less experienced teachers. For instance, school N which has > 15 years experienced teachers had better performance in pre and post-tests compared to school L and S which had moderate and less experienced teachers. Generally, the results in this study showed improvement of performance in biology for low achieving students. This is second-handed by the findings of James and Folorunso, (2012), Jarrar, (2014), Kalyoma, (2016), Munene and Peter, (2017); Yang et al., (2014), and Yolak et al., (2019) who conducted research on this area and reveal that remedial education can positively impact students' academic achievements especially those with low performance. However, the study of Jacob and Lefgren, (2002) and Ndebele, (2014) contradicts this fact by indicating that, regardless of teachers' best efforts, remedial education had little or no impact on low-achieving students. Conclusions and recommendations

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Conclusion

This work intended to look into the effect of remedial education on students' performance in lower secondary school biology in Tanzania. The findings revealed that the study was more effective because students in Biology classes improved their performance than it was before remedial interventions. It was also revealed that learner-centered teaching strategies such as small group discussions, field works, computer-assisted instructions, one to one instructions, and others have a great impact on students' performance and they help students to learn and do things on their own which strengthens their knowledge and understanding of Biology. This research was conducted in one district (Mbeya district) and only three community secondary schools were selected. I would like to recommend other researches which will cover other areas in Tanzania with a larger sample. Also, other research can be conducted in other subjects such as Mathematics, history, and others; moreover, studies can be done on other levels, such as higher secondary, primary, and tertiary schools. Further research can also be done in private secondary schools to see what they do about remedial education.

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