Exploring teacher improvisation and its influence on learner performance in an under- resourced Grade 11 Life Science class.

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Short Abstract

The decline in learner performance in science education in South Africa is a perennial problem. Resource paucity in government schools is ubiquitous and reflects inherent challenges that pervades science classrooms. Scientific resources are imperative to the success of content delivery; however, South African government schools face many challenges in procuring these standardised instruments and resources, therefore educators must innovate by employing improvised resources. This study illuminates the relationship between improvised resources and learner performance. A quasi-experimental design is adopted. A local school in Gauteng was used for the basis of this study with a total of 40 Grade 11 Life Science students and 1 Life Science educator participating in the project. A pre-test and post-test were administered to comparatively evaluate the effect of improve resources. The ANOVA two factor analysis tool demonstrated significant results of performance between the experimental and controlled group as a statistical difference is seen in the mean scores, further accentuating the invaluable use of improvised resources.

Extended summary

Introduction

Contemporary South African schools are still bound by the ramifications of the apartheid era in which geographic location determined availability of teaching resources. A vast majority of schools in rural areas still lack adequate apparatus in science classrooms to conduct experiments. Therefore, the responsibility lies solely with the teacher to employ improvised materials as a substitute for the much-needed equipment. Under resourced schools would often employ behavioural pedagogical approaches (because of resource deficits) which juxtaposes the constructivist paradigm, a preferential method that facilitates scientific inquiry of learners. There is a paucity of scientific resources in South African public schools which engenders educators to often use innovative methods to conduct scientific investigations. The subsequent result is the use of improvised resources; a substitute for scientific apparatus with cost-effective materials for practical work since schools are not equipped with resources.

South African schools, particularly those located in agrestic areas have deficiencies in scientific resources. The advent of apartheid has left rural schools with scant resources. Mamutse and Ramnarain (2016) document gradational improvements of physical resources in under resourced schools, however, transformation and reform are subdued by the dire need of resources imperative for practicality in science classrooms. Ultimately, the ramifications of a repressive system are now prominent presently as township schools have a dearth of instructional materials while schools in the suburb, previously reserved only for whites, have provisions for apparatus and chemical equipment needed to conduct scientific investigations. Mamutse and Ramnarain (2016) controvert the assumptions that pragmatic applications in science require laboratory equipment and in so doing, the effective use of improvised resourced has been promulgated as an alternative. Government schools cannot make provisions for the
shortage of apparatus and chemicals required in science classrooms, but it is noteworthy that teaching materials need to supplement and augment explanations for effective teaching and learning.

Abdullahi, Ibrahim, Ibrahim and Ya’u (2019) concur that a teacher’s competence, skill and ingenuity precipitates the viability of improvised resources in class and affects student performance. Furthermore, competency of the low-cost materials is required so that technicalities such as the accuracy and precision is not jeopardised during the experiment. Misapplication of instructional materials could potentially engender and perpetuate learner misconceptions (Ogbe & Omenka, 2017). Ibrahim et al. (2019) emphasise critical engagement through inquiry-based teaching and learner-oriented tasks as a vital facet to teaching and learning via improvised resources. Conversely, Ibrahim et al. (2019) augment this sentiment by echoing the inaccessibility of laboratory equipment which perpetuates the use of lecture methods as opposed to guided inquiry. The discernible problem stems from financial constraints; however, Utibe-Abasi (2015) identifies teachers’ lack of exposure to improvised resources as a pedagogical factor since implementation is the skill they have yet to develop.

Mahlatse and Ramaila (2020) conducted a study utilising semi-structured interviews to determine Life science teachers’ inclination or proclivity to use improvised resources; the authors tabulated the data and found that a vast majority of participants employed improvised resources due to resource paucity, affordability and accessibility of materials and educational value of integrating phenomena into real life contexts. This study illuminates the dire need for improvised resources in science classrooms to mitigate underperformance.

**Purpose of the study**

The following research question guided this study:

- What is the relationship that exists between the Grade 11 Life Science teacher’s use of improvised resources and learner performance?

**Methodology**

This study employed quantitative research which accentuates numeric and statistical outputs (Eyisi, 2016). A quasi-experimental design was used. The designated tool for data collection was the pre-test and post-test. Both Life Science classes completed the pre and post-test. This research was orientated by a comparative study. The method adopted in the proposed study was comparative and quantitative. Learners’ response to a pre-test and post-test were compared in which one group was taught using improvised resources and one group was taught using the lecture method. An ANOVA Two Factor Analysis was generated to comparatively determine the threshold for significance. Although the use of controlled groups is deemed controversial, progression in frontiers of knowledge were possible through participation. As such, participants in control groups invest in the advancement of knowledge and are accommodated just as those assigned to experimental groups. Equitable standards were observed during this study. Additionally, informed consent exists to divulge possible harm or negative influence during which participants may withdraw. Henceforth, by including a control group and introducing a treatment, the effects could inform and modify pedagogical practices.

**Results and Discussions**

An ANOVA two factor analysis was generated using Microsoft Excel. An alpha of 0.05 was used to determine the significance threshold. Since the P-value is less than the alpha of 0.05, this
study can reject the null hypothesis and accept the alternative hypothesis. In other words, the statistics produced show significant value. A comparison between the F statistic and F critical value is needed to determine significance. If the F statistic value is greater than the F critical value, the test is deemed significant. This study directly contrasts with Ndayambaje, Ndihokubwayo and Uwamahoro’s (2018) findings as reports of data show no statistically significant results. But aligns with Ndayambaje, Ndihokubwayo and Uwamahoro’s (2019) study that used a t-test to exemplify their data which demonstrated and generated an elevated mean score for students taught using improvised resources. Therefore, this study reveals that indeed, students’ academic performance is elevated when taught using improvised resources. Qualms with the robustness in gleaned data can be overcome if the same participants are assessed at two different points in time to ensure validity. The type of reliability applicable to this study is stability, in which a test and re-test were conducted.

Conclusions

The findings in this study suggest the use of improvised resources to augment academic performance. There is perceptible decline in the sciences as learner performance in under resourced schools tend to plummet. The implementation of improvised resources fills the desperate need for learners to grasp scientific concepts. Improvisation improves didactics, however, an educator’s propensity to improvise comes into question as it taps into their pedagogical content knowledge. The socioeconomic context in which South Africa finds itself is entrenched in effects of a repressive past, however, the science educator has responsibility to mitigate cognitive barriers and makes science more palatable in the classroom.
References


