PEDAGOGICAL PRACTICES OF MULTIGRADE TEACHERS IN CONDUCTING SCIENCE LEARNING ACTIVITIES

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ABSTRACT

The world is on the verge of recognizing the right of every learner to quality education and learning. It has been part of the United Nations Sustainable Development Goal (UN-SDG) to open the door of equity education for all children, especially in rural areas. Hence, this research discusses how pedagogical practices of multigrade teachers in teaching Science learning activities are facilitated. The qualitative research design was used in collecting data through document analysis and semi-structured interviews. Five teachers from two multigrade schools in Bataan and Quezon provinces were the key informants. Two major themes emerged in the study, namely: following protocol as prescribed by DepEd and challenges in the pedagogical practices of Science teachers. The challenge of complying with the requirements and protocol posted by DepEd, multigrade Science teachers need to adjust to every aspect of the education process. Thus, the perennial situation of multigrade schools made them lag in terms of pedagogical practices as compared to monograde given the limited budget allocated for multigrade schools. However, multigrade teachers are observed to be creative and resilient.Finding revealed that majority of the multigrade teachers need to provide learning materials out of their own pockets to make Science learning activities possible. This study recommended revisiting the policy on School Maintenance and Other Operating Expenses (MOOE) of multigrade schools. In addition, training to multigrade teachers should be conducted so that these teachers will be better equipped with the necessary tools in teaching multigrade Science learning activities.

Keywords: multigrade teachers, multigrade learners, Science learning activities, teachers' training

INTRODUCTION

The world opens the door of equity for all children to proper schooling, learning, and honing the skills they need to thrive (UNICEF, n.d.). Inclusive education covers all facets of society from children with disabilities and those who are traditionally been excluded. Similarly, the United Nations Sustainable Development Goal (UN-SDG) explained how important it is to reduce inequality by focusing on marginalized and disadvantaged people (United Nations, 2015, January 7). SDG No. 4 focuses on the inclusive and equitable quality education, which promotes lifelong learning opportunities for all. Achieving quality education is a driving force to achieve many other SDGs and therefore create sustainable development. According to the United Nations Development Programme (UNDP, 2018), the curse of poverty can break if people have access to quality education and will lead to a decrease in inequalities. More people will be empowered to live healthier and to practice sustainability allowing more improved quality of life. Similarly, an open entry to quality Education for All (EFA) paves the way for locals to contribute to society by giving innovative solutions to the world's greatest problems. Therefore, quality education is undeniably a powerful portal in achieving sustainability.

However, achieving quality education remains to be a challenge for most countries due to an insufficient number of teachers with proper training, ailing conditions of schools, and less opportunity given to rural children (UNDP, 2018). Therefore, UN-SDG No. 4 aims to "build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all" and "substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States" by 2030. This challenge is perennial in the Philippine education system, especially in the equal privileges given to urban and rural children. The continuous battle cry of unprivileged people led the Department of Education (DepEd) which is then known as the Department of Education and Children Services (DECS) established D.O. 96 s. 1997 which discussed the policies and guidelines in the organization and operation of multigrade (MG) classes.

Correlated to this, the establishment of multigrade classes aimed to alleviate the disparity in the opportunities given to urban and rural children. These children are poor, disadvantaged, and in geographically isolated areas. As defined, the multigrade class is a class consisting of two or more grades under one teacher in a complete or incomplete elementary school which does not warrant the mono-grade class. It is clearly stated in D.O. 96 s. 1997 that multigrade schools must adhere to the standards set for school buildings and provide textbooks and other support instructional materials. Likewise, teaching in a multigrade school requires dedication, patience, and passion. Thus, DepEd order no. 81 s.2009 aimed to strictly implement the multigrade program in Philippine education wherein multigrade teachers are given special hardship allowance, training on multigrade instruction through continuing standard-based professional development program, and are provided with Multigrade Training Resource Package (MG-TRP) and the Multigrade Teach-Learn Package (MG-TLP) which contains lesson plans and pupil learning exercises in the different learning areas. The said guidelines were also supported at present administration under DepEd order no. 8. s. 2018. However, multigrade teachers must not be transferred to other schools within a two-year time frame as much as possible. Continuous monitoring and technical assistance on the implementation of multigrade programs must be conducted at the division level. Meanwhile, the report of SEAMEO Innotech (n.d.) mentioned that multigrade schools in the Philippines can be classified into three: complete schools (Grade 1 to 6); incomplete schools (do not provide the whole elementary education); and integrate schools (elementary and secondary education). In addition, a low percentage of completers in Elementary schools was recorded in 2010-2011.

Policies and guidelines set for the implementation of multigrade in the Philippines seem to adhere to the needs of the learners, teachers, and the community as a whole but results of some study reported problems with regard to practices, assistance, implementation, and even contextualization of lesson content. In the study of Taole, & Mncube (2017), the lack of a contextualized and localized multigrade teaching curriculum resulted for students and teachers to be confined to the curriculum prescribed by the government for mono-grade schools. These mono-grade curriculums lack the flexibility that is needed in a multigrade class. Similarly, SEAMEO Innotech (n.d.) discussed the poor performance of multigrade schools when it comes to standardized examinations such as the National Achievement Test (NAT). In 2014, NAT results of Grade 6 pupils of multigrade schools were significantly below the national standard and worse than monograde schools in all subject areas covered by the said test. According to Taole (2018), students in a multigrade class are unique and call for a unique design of assessment activities. Moreover, SEAMEO Innotech (n.d.) said that to improve the learning outcomes of learners, a more relevant and responsive curriculum must be provided. This requires multigrade teachers to have classroom management with an appropriate grouping technique which enhances more improved learning. However, the devastating condition of

multigrade schools in terms of facilities, infrastructures, assistance, and many more piled up which hinders multigrade teachers to facilitate such strategies (SEAMEO Innotech, n.d.).

The less priority to facilities and infrastructures led to a declining number of Science learning activities being conducted in multigrade schools. Multigrade class and Science learning activities are a good match because multigrade classes are avenues for more social and on-task students' interaction (Mulryan-Kyne, 2014; Tiernan, Casserly, & Maguire, 2018). Thus, collaboration is key to a successful Science learning activity. Multigrade schools follow the curriculum guidelines set by the Department of Education (DepEd). It is clearly defined that Science education in the Philippines targets every Filipino students to develop scientific literacy which will let them be informed and participative citizens equipped with good judgments and decisions regarding the applications of scientific knowledge may it be social, health, or environmental in nature (K to 12 Curriculum Guide Science, 2012, January 31). Additionally, the framework of the curriculum is based on the three domains of learning Science: to understand and to apply scientific knowledge in a local setting and global context whenever possible; to perform scientific process and skills; and to develop and demonstrate scientific attitudes and values. Thus, a call for a teacher in a multigrade setting to develop the scientific skills of the students based on the mentioned parameters. To answer such a challenge is to expose students to learning activities such as laboratory experiments. The laboratory is said to be the heart of Science in which a learner can relate the theory learned into practice (de Borja and Marasigan, 2020). However, laboratory experiments seem to be not only the problem of multigrade schools but also regular schools. In the study of de Borja and Marasigan (2020) conducted in a regular public high school, Science teachers have the difficulty in facilitating Science laboratory experiments due to the inadequacy of laboratory materials and equipment, big class size, availability of a Science laboratory room, the time duration of an experiment provided in the curriculum guide, and safety issues with regards the use of laboratory. Consequently, Science teachers improvised laboratory materials or brought their materials for Science experiments to be facilitated to the students and sometimes they downloaded YouTube videos of Science experiments or activities that show Science concepts to be discussed. A study of Aina (2013) said that the inadequacy of laboratory materials and making use of localized materials to improvise Physics teaching materials resulted in students having an interest in improvised materials rather than the standard material is said to be very dangerous because of precision and accuracy of the measurement. It is recommended that the government should deal with the problem with regards to the allotment of the budget for Science experiments (Aina, 2013; de Borja & Marasigan, 2020).

In light of the challenges faced by multigrade teachers in fostering scientific literacy among students, this study investigated the practices of multigrade teachers in conducting Science activities and necessary to address the aforementioned issues in Science teaching and learning as a limited number of researches focused on multigrade schools. It is hoped that this study shed light on how to carry out Science activities in a multigrade class especially that several studies (Brown, 2010; Gabriel, 2015; Taole, & Mncube, 2017; Vithanapathirana, 2006) mentioned that there is a need for teachers to attend more training so that they will be equipped with the necessary pedagogical tools needed in a multigrade class.

OBJECTIVES OF THE STUDY

The study explored the pedagogical practices of multigrade Science teachers in teaching Science learning activities. Specifically, it addressed the following objectives: 1) To describe how Science teaching and learning take place in multigrade classes; 2) To analyze the preparation of multigrade teachers in Science teaching and learning activities with respect to in budget of work (BOW), daily lesson log (DLL) given the allocated budget; and 3) To describe

the challenges in carrying out the teaching and learning activities in multigrade classes.

METHODOLOGY

The qualitative research design was employed in this study through the aid of document analysis and interviews. The method is appropriate to get the practices of multigrade teachers in teaching Science since it provides in-depth analysis through an individualized approach. Utilizing the interview through Facebook Messenger, the researchers were able to investigate the submitted documents of teachers and eventually verified what happened along the way during actual implementation. One of the limitations of the study is class observation because of the Enhanced Community Quarantine (ECQ) in Luzon as being directed by the President of the Philippines due to the Covid-19 pandemic.

The participants of this study were five teachers teaching multigrade Science for the School Year 2019-2020. Three multigrade schools were part of the study located in the provinces of Bataan and Quezon. The schools were determined using purposive sampling since the study is intended only for multigrade schools.

To get pertinent information, the researchers followed an organized procedure to address the objectives set. The researchers first analyze the documents provided by the informants through their daily lesson log (DLL), the budget of work (BOW), and Science curriculum guide as these documents are required by DepEd to be used and prepared for the teaching-learning process. Multigrade schools as mentioned also followed the prescribed K to 12 curriculum guides for regular schools. The researchers then conducted semi-structured interviews one-by-one with the five informants to check the actual preparation, practices, and assessment being conducted during teaching-learning activities in Science classes. A thematic approach was then used to interpret the results. The researchers asked permission to teachers and school authorities before proceeding to interview and document analysis.

RESULTS AND DISCUSSIONS

1. Science teaching and learning in a multigrade class

After analyzing the gathered data, the theme following protocol had emerged. It was observed from the informants' responses that they will do almost anything, make some adjustments, to follow the protocol so that they will be able to carry out the lessons properly for their students. This is very evident from the informants' shared personal experiences in their answers.

A teacher following the protocol is one of the key aspects when it comes to the successful delivery of lessons. The multigrade teachers are willing to follow the prescribed learning outcomes for the students and in preparing and carrying out the lessons despite many challenges. This is a testament to the passion of these teachers. According to Mart (2013), a strong correlation exists between successful student learning and passionate teaching. Teachers' professional engagement together with the commitment to students and their learning plays a significant factor in the development of students. It is a known fact that teachers play a key role in the teaching and learning process. By following what the curriculum requires, add to that, teachers going beyond the call of teaching, students learning will materialize more.

Despite all the challenges in a multigrade school, the teachers are still committed to delivering the necessary Science lessons and activities prescribed from the K-12 curriculum provided by the Department of Education. Although they are in a multigrade class, they are using the curriculum which is designed for a monograde class. There are no available curriculums that are only intended, specifically designed, for a multigrade class. This poses quite a challenge for there is a need to consider competencies that may differ for each class level inside a single multi-grade class. However, no amount of challenges can hinder the teachers in delivering the intended lessons for their students. Though challenging, they are doing their best to meet the standards that the K-12 curriculum

requires. Still, according to informant 4, it would be better and much easier for them if there will be a curriculum that is specifically intended for a multi-grade class.

> *Informant 4: "We cannot do anything about it but to comply with the curriculum from the DepEd. You know it is really challenging on our part and you can't help but wish to have a curriculum, a curriculum which is for a multigrade class."*

2. Analysis in the Preparation of multigrade Science teachers in the budget of work (BOW) and daily lesson log (DLL) as compared to actual practice and in a monograde class.

Samples of daily lesson log and budget of work were checked to analyze the preparation of multigrade Science teachers for the teaching-learning activities. The analysis also has the capacity to examine the preparation and actual practice of Science teachers in facilitating learning activities for students. Likewise, the analysis was also compared to the daily lesson logs of teachers in monograde schools.

When the daily lesson logs and the budget of work were checked, multigrade Science teachers essentially prepared and covered the required competencies needed for the multigrade learners to develop. As mentioned, multigrade schools follow the prescribed learning materials provided by DepEd which is the same as that of the regular (monograde) schools though multigrade schools are given the opportunity to deviate from the norms depending on their own locality and context. Therefore, alignment of learning content and tasks are very evident to the said documents though there are some minor deviations from the standard depending on the context and needs of the multigrade students. However, some alterations or changes were made during actual learning activities depending on the different factors mentioned by informants during the interview. This hinders multigrade Science teachers to facilitate learning activities that are needed to develop the required competencies and skills of students.

Meanwhile, after carefully looking at the sample daily lesson logs of multigrade class, it was found out that lesser competencies for each grade level were covered. If this will be compared to the daily lesson logs of monograde teachers, a greater number of competencies were covered given the same length of time. If a grade 3 in a monograde class was able to cover four learning competencies in a week, a grade 3 in a multigrade class was able to cover only two learning competencies. This may be due to the fact that multigrade teachers need to cover competencies from two or more grade levels in a single multigrade class as compared to a monograde teacher who is only focused on achieving the needed competencies for a single grade level. Multigrade teachers are now challenged to cover all of the learning competencies that are required by the curriculum. In this scenario, multigrade students are more likely to be at risk of finishing the school year with lesser competencies than those in students in a monograde class. If the multigrade teachers will be able to cover all the competencies for the students, the next thing that we need to look at is the quality of teaching and learning. Thus, this resulted in low performance of Grade 6 pupils of multigrade schools which are significantly below the national standard and worse than monograde schools in all subject areas covered during the National Achievement Test in 2014.

3. Challenges in carrying out the teaching and learning activities in multigrade classes.

The data revealed some of the challenges that these multigrade teachers are having namely: difficulty in the preparation of lesson plans; the need to prepare so many worksheets or activity drill cards; costly reproduction of self-study materials for the students; curriculum materials not suitable to multigrade class; and misalignment of the budget of work.

To meet the needs of the K-12 Science curriculum multigrade teachers had to adjust on how they deliver the lessons. Teachers also must

make some sacrifices. Multigrade teachers are challenged to cover all of the learning competencies that are required by the curriculum. Multigrade students are more likely to be at risk of finishing the school year with lesser competencies than those in students in a monograde class. If in case the multigrade teachers will be able to cover all the competencies for the students, the next thing is to consider is to ensure the quality of teaching and learning. Thus, potential problems towards the acquisition and delivery of learning competencies may arise. Ganal and Guiab (2014) tried to determine and analyze the different problems encountered by students towards mastering learning competencies in mathematics. Their study revealed that in mastering learning competencies, problems such as students developing negative attitudes or lack of interest towards a subject, development of stress and low self-esteem on students, teachers' difficulty in motivating the students, and lack of teachers' creativity in delivering the lessons may arise. We should look at different ways on how we can monitor and assess the quality of competency-based schools. Students moving up from one grade to the next year after year without the needed skills or knowledge to be successful should not be allowed (Sturgis & Casey, 2018). However, considering the sample of multigrade teachers' budget of work, it covers all the competencies needed by the curriculum just like any other monograde schools. One striking difference between their budgets of work is when it comes to the allotted time for each competency. There are times wherein a competency in a multigrade class will take two weeks while it will only take a week in a monograde class or vice versa. This only shows the adjustments made by multigrade teachers.

Most of the time, multigrade teachers take money from their own pockets just to buy the needed materials for their Science learning activities. The same result was found in the study of de Borja and Marasigan (2020) that in order to facilitate Science learning activities to the students, teachers were the ones who were providing the materials needed that cannot be found in the school laboratory. Orale and Quejada (2018) also found out that teachers in a remote area in the Philippines give out some portion of their salaries to buy the needed materials to facilitate learning. If they do not do this, students will not be able to experience Science activities which are very important in the learning of Science. Harman, Cokelez, Dal, & Alper (2016) found out that Science learning activities like experiments enhance the quality of teaching and learning Science. According to the informants, their schools do not have a specific budget for these Science learning activities that is why the teachers are the ones who often provide the needed materials. Materials can be requested from the schools but most of the time, these are not available.

> *Informant 1: "Science activities, mostly if there are materials needed and if our pockets can afford it, we are the one who buys and provides the materials."*
>
> *Informant 2: "None. We do not have a budget which is primarily intended just for Science experiments. It's from our personal money, just so we can execute the experiment and they, the students, can experience it. The school does not give an extra budget for that. Although, there are times that we are able to ask for materials in the office, if and only if there is available, if not, we will take it from our personal pockets. It's always like that, even if you ask other multigrade teachers"*

Every school in the country has a Maintenance and Other Operating Expenses (MOOE) budget. MOOE can be used on expenses like necessities that support learning programs and school activities. A school's MOOE budget will be depending on the number of teachers, students, and classrooms (Llego, 2016). Therefore, the greater number of students that are enrolled, the greater the number of teachers or classrooms, the higher the MOOE of the school. However, multigrade schools have a low number of students, teachers, and

classrooms, therefore, a very low budget is being allotted in multigrade schools. Because of the limited MOOE that their schools have, the budget is allocated to more important aspects such as maintenance of schools, training of teachers, instructional materials, and many more instead of spending funds on Science learning activities.

Moreover, in order to provide the needed materials for the Science learning activity just like an experiment, there are also times that these multigrade teachers need to go back to the town, not minding how far or hard the travel is. Mobilization or travel would be difficult because there are no roads that any type of vehicle can be used and there are those who need to pass by a river or hike. The same case is experienced by teachers in the study of Orale and Quejada (2018).

There are times wherein the number of materials which they bought from the teacher's own pockets is not enough for the students. This, in return, sacrifices the amount of learning that the students receive. The students are not able to do the Science learning activity well, since the ratio of the number of materials to students is not appropriate. So, the multigrade teachers have no choice but to resort to improvisation just to carry out the activity. They also often choose the Science learning activities which are the most needed by the students and those which require less sophisticated materials.

CONCLUSIONS

Based on the salient findings, the following conclusions were drawn:

1. With the passion and dedication of multigrade Science teachers, adjustments were made to carry out learning activities at the expense of providing materials to facilitate learning.

2. The challenge of complying with the requirements or following protocol posted by DepEd, multigrade teachers need to adjust to go with the flow of the norms.

3. Documents submitted as proof of preparation of multigrade Science teachers reiterated how the learning process should take place during teaching-learning activities. However, the hurdles faced by these teachers made them modify what they prepared during actual practice and worse some learning activities especially the Science experiments were not being implemented to adjust to the situation.

4.In addition, multiple learning activities that should be facilitated for different grade levels in one class seem to challenge the pedagogical practices of the multigrade Science teachers. Thus, it resulted in the low performance of multigrade students in standardized tests. The perennial situation of multigrade schools made them to lag monograde schools as fewer number of learning competencies were being covered and developed. This can be attributed to the same curriculum as monograde schools and a lesser budget is being granted to multigrade schools.

5. Science teachers in multigrade schools are more familiar with the needs of every student in the class. They have the motivation to help the progress of each student and at the same time increase the level of empathy that can be observed from them. Likewise, the ability of the multigrade teachers to adapt to the challenging needs of every learner in the class helps them develop their creativity, resilience, and competence.

RECOMMENDATIONS

The researchers hereby recommend the following:

1. The Department of Education should revisit the policy on School Maintenance and Other Operating Expenses (MOOE) of multigrade schools.

2. Additional training to multigrade teachers should be conducted so that these teachers will be better equipped with the necessary tools in teaching multigrade classes whatever the challenges are.

3. A curriculum that is specifically designed for multigrade classes but comparable to the curriculum of monograde classes should be created.

4. Future researchers may explore the effectiveness of teaching and learning, with the learning competencies as a point of reference, in

a multigrade class as compared to those in a monograde class.

REFERENCES

Aina, K. J. (2013). Instructional materials and improvisation in physics class: Implications for teaching and learning. *IOSR Journal of Research & Method in Education (IOSRJRME*), 2(5), 38-42. https://doi.org/10.9790/7388-0253842

Brown, B. A. (2010). Teachers' accounts of the usefulness of multigrade teaching in promoting sustainable human-development related outcomes in rural South Africa. *Journal of Southern African Studies*, *36*(1), 189-207. https://doi.org/10.1080/03057071003607428

De Borja, J. A., & Marasigan, A. C. (2020). Status of science laboratory in a public junior high school. *International Journal of Research Publications*, 46, 8. http://ijrp.org/paper-detail/959

Department of Education. (1997, November 14). Policies and guidelines in the organization and operation of multigrade (MG) classes (DO 96, S. 1997). https://www.deped.gov.ph/1997/11/14/do-96-s-1997-policies-and-guidelines-in-the-organization-and-operation-of-multigrade-mg-classes/

Department of Education. (2009, July 24). Strengthening the implementation of multigrade program in Philippine education amended by (DO 81, S. 2009). https://www.deped.gov.ph/2009/07/24/do-81-s-2009-strengthening-the-implementation-of-multigrade-program-in-philippine-education-amended-by/

Department of Education. (2018, February 15). Guidelines on the utilization of the 2018 financial support for multigrade schools (DO 08, S. 2018). https://www.deped.gov.ph/2018/02/15/do-08-s-2018-guidelines-on-the-utilization-of-the-2018-financial-support-for-multigrade-schools/

Gabriel, A. (2008). Multigrade teaching: Implications for the universal basic education in Nigeria. *Sophia: An African Journal of Philosophy*, *9*(2). https://doi.org/10.4314/sophia.v9i2.38784

Ganal, N. N., & Guiab, M. R. (2014). Problems and difficulties encountered by students towards mastering learning competencies in Mathematics. Researchers World, 5, 25-37.

Harman, G., Cokelez, A., Dal, B., and Alper, U. (2016). Pre-service science teachers' views on laboratory applications in Science education: The effect of a two-semester course. *Universal Journal of Educational Research,* 4(1), 12 - 25. DOI: 10.13189/ujer.2016.040103.

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.Mcleod, S. (2019).

K to 12 curriculum guide Science. (2012, January 31). https://www.gov.ph/documents/20147/233614/SCIENCE-K-12-Curriculum-Guides-Grade7.pdf/02c5020b-a9df-cc74-598b-e6f979d5bb32

Lam, B. H., & Chan, H. L. (2013). Experiential learning. The Education University of Hong Kong (EdUHK). https://www.eduhk.hk/aclass/Theories/ExperientialLearning.pdf

Llego, M. (2016, April 11). Computation of public schools MOOE. TeacherPH. from https://www.teacherph.com/computation-public-schools-mooe/

Mart, T. C. (2013). A passionate teacher: Teacher commitment and dedication to student learning. *International Journal of Academic Research in Progressive Education and Development*, 2(1), 226-348.

Mulryan-Kyne, C. (2014). Teaching and Learning in Multigrade Classrooms: What Teachers Say. *The Irish Journal of Education*, 35(2004), 5–19.

Quejada, A. B., & Orale, R. L. (2018). Lived experiences of elementary teachers in a remote school in Samar, Philippines. *Journal Of Academic Research*, 3(3), 1-13. https://jar.ssu.edu.ph/index.php/JAR/article/view/7

SEAMEO Innotech. (n.d.). Profile of multigrade schools in the Philippines. https://www.seameo-innotech.org/wp-content/uploads/2014/01/PolRes_ProfileofMultigradeSchoosInThePhilippines.pdf

SEI-DOST & UP NISMED, (2011). Science framework for Philippine basic education. Manila: SEI-DOST & UP NISMED.

Song, R., Spradlin, T. E., & Plucker, J. A. (2009). The advantages and disadvantages of multiage classrooms in the era of NCLB accountability. Center for Evaluation and Education Policy: Education Policy Brief, 7(1), 1-8. https://files.eric.ed.gov/fulltext/ED504569.pdf

Sturgis, C. and Casey, K. (2018). Designing for equity: leveraging competency-based education to ensure all students succeed. Vienne, VA: International Association for K-12 Online Learning.

Taole, M. J. (2018). Diversity and inclusion in rural South African multigrade classrooms Diversity and inclusion in rural South African multigrade classrooms. *International Journal of Inclusive Education,* 0(0), 1–17. https://doi.org/10.1080/13603116.2018.1520310

Taole, M., & Mncube, V. S. (2017). Studies of Tribes and Tribals Multi-grade Teaching and Quality of Education in South African Rural Schools : Educators ' Experiences Multi-grade Teaching and Quality of Education in South African Rural Schools : Educators ' Experiences. 151–162. https://doi.org/10.1080/0972639X.2012.11886653

Tiernan, B., Casserly, A. M., & Maguire, G. (2018). Towards inclusive education : instructional practices to meet the needs of pupils with special educational needs in multi-grade settings. *International Journal of Inclusive Education*, 0(0), 1–21. https://doi.org/10.1080/13603116.2018.1483438

United Nation. (2015, October 21). United Nations official document. http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/1

United Nations Development Programme. (2018). Goal 4: Quality education | UNDP. http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-4-quality-education.html

Vithanapathirana, M. (2006). Adapting the primary mathematics curriculum to the multigrade classroom in Rural, Sri Lanka. 127-153

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