

Original Research Article

The Use of Open Educational Resources (OERs) among Mathematics Teachers in Public Secondary Schools

Katherine S. Enriquez^{1, 2*}

¹Buhawen National High School, Philippines

²President Ramon Magsaysay State University, Iba, Zambales, Philippines

Article History

Received: 19.08.2023

Accepted: 22.09.2023

Published: 26.09.2023

Journal homepage:

<https://www.easpublisher.com>

Quick Response Code



Abstract: This study investigated the utilization of Open Educational Resources (OERs) among mathematics teachers in selected public secondary schools in Zambales, Philippines for the school year 2022-2023. A survey was conducted with 75 Junior High School Mathematics teachers to assess OERs usage frequency and extent, identify challenges, examine perceptions of OER's effect on mathematics teaching practices, and propose a development plan for promoting OER utilization. Findings revealed that the typical teacher-respondent was a 33-year-old female with a bachelor's degree, supplemented by master's units, and eight years of teaching experience. They held the position of Teacher III and were familiar with OERs. Respondents sometimes used OERs in their math teaching strategies and disagreed with challenges related to OERs use. They agreed that integrating OERs into mathematics teaching had positive effects. The study observed no significant differences in challenges faced by mathematics teachers when grouped by age, sex, highest educational attainment, years of teaching experience, and teaching position. However, significant differences emerged when grouped by OER knowledge. Likewise, there were no significant differences in perceptions of OER effects when respondents were grouped by profile variables. Furthermore, no significant relationships were found between challenges and OER utilization or between perceptions of OER effects and OER utilization among respondents.

Keywords: Open Educational Resources (OERs), utilization, teaching strategies, mathematics teaching, challenges, perceptions, development plan.

Copyright © 2023 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC 4.0)** which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

1. INTRODUCTION

The global education system has been severely disrupted by the COVID-19 pandemic, leading to the closure of schools and universities across the world as a precautionary measure to contain the transmission of the virus. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2020), school closures have impacted over 1.5 billion students worldwide, including over 25 million students, 1.2 million teachers, and 48,000 schools in the Philippines alone (Department of Education, 2020). Consequently, numerous educational institutions and organizations have been compelled to adjust to the "new normal" of virtual and remote learning.

To address the challenges brought about by the pandemic, the Philippines' Department of Education (DepEd) has implemented a blended learning strategy that includes a variety of modalities such as online learning, printed modules, and television and radio

broadcasts. However, the shift to remote and online learning has highlighted the limitations of traditional teaching resources that may not be accessible, relevant, or up-to-date for remote learners. This situation has brought to the forefront the potential of Open Educational Resources (OERs) in supporting learning in the new normal.

Open Educational Resources (OERs) are educational materials that are openly licensed and freely accessible for educators and learners to use, share, and modify without any restrictions. OER can include textbooks, videos, audio recordings, lesson plans, and other resources that can be accessed online (Hilton, 2016). OERs have been increasingly used in various educational settings globally, including the Philippines, to provide quality education and support flexible learning modalities.

Several studies have highlighted the potential benefits of OERs in the Philippine education system. For instance, Wiley and Hilton (2018) found that OERs can improve the quality of education by providing access to high-quality resources and promoting collaboration among teachers. Hilton (2016) discovered that open educational resources (OERs) can help students develop 21st-century skills such as critical thinking and problem-solving.

Mathematics education constitutes a crucial aspect of the Philippine education system, as math teachers play a pivotal role in delivering high-quality instruction to their students. Several studies have found that using OERs in mathematics education can boost students' achievement and motivation (Pawlowski & Clements, 2013). OERs can also provide mathematics teachers with adaptable and easily modified resources to fit different teaching contexts, promoting a more personalized and effective teaching experience.

However, despite the potential benefits of OERs, several challenges still hinder teachers' adoption and utilization in the Philippines. For instance, a study by Cox and Trotter (2017) identified that a substantial hindrance to adopting OERs was the limited awareness and understanding of these resources among teachers. Other challenges included the lack of technical skills and support as concerns around the quality and reliability of OERs. According to Olufunke and Adegun (2014), despite the level of understanding of OERs usage in developed countries, developing countries are still not putting these online learning resources to the expected use. It appears that students and teachers are still unaware of the availability of OERs, that access to OER is limited, and that there are several challenges to using OERs.

OBJECTIVES OF THE STUDY

The study aimed to identify how frequently and extensively mathematics teachers used OERs in their teaching strategies, the challenges they faced in using OERs, and their perceptions of the effects of OER utilization on mathematics teaching practices in public secondary schools in Zambales, Philippines.

Open Educational Resources and its key characteristics

Open educational resources (OERs) are educational materials that can be accessed freely, are openly licensed, and can be used, shared, and adapted by educators and learners worldwide without any restrictions. OER can include a wide range of digital assets such as online textbooks, recorded lectures, web-based textual materials, animations, simulations, diagrams, and graphics. OER can also encompass assessment materials, such as tests with automated answers, PowerPoint slides, or lecture notes in pdf format. The key features of OER are openness, accessibility, and reusability, which allow educators and learners to access and use these materials flexibly (Elder,

2019). The lack of cost barriers and licensing restrictions associated with OER makes them a valuable resource for enhancing teaching, learning, and research. However, for OER to be considered as such, it must be freely available for at least educational use. According to Hilton (2016), open educational resources (OER) are educational resources that are free to use, adapt, and share. These resources can take many forms, including text, images, videos, and interactive modules. The author also mentions six key characteristics of OER: they are free to access, reuse, revise, remix, redistribute, and retain. These features allow educators and learners to use OER to create personalized learning experiences that are tailored to their specific needs and preferences.

Wiley and Hilton (2018) define OER as resources for teaching, learning, and research that are either in the public domain or have been released under an intellectual property license that permits their unrestricted use and adaptation by others. The authors highlight the licensing aspect of OER, which enables educators and learners to utilize and repurpose these resources without any constraints. They also point out that open educational resources (OER) can be used to address issues of affordability, access, and quality in education.

Importance of Open Educational Resources (OERs) in Education

Open educational resources (OERs) are still underutilized despite their increasing popularity. A meta-study of 25 state-funded OER projects in Germany discovered that, while there is interest in OER, legal concerns, and complexity are impediments to adoption. However, OER cannot be ignored in the context of digital teaching and learning. Adoption strategies include encouraging OER integration into existing educational training, emphasizing its value, and establishing central contact points in educational institutions (Orr, Neumann, & Muuss-Merholz, 2017).

Harsasi (2015) discovered that most students found OER to be easy to use and preferred it over traditional textbooks due to the variety of electronic devices available to them. A few students reported minor usability issues, but the most common issue was difficulty accessing the OER via college wifi. Most students said the course readings were on par with or better than traditional textbooks, and they appreciated the variety of learning materials and assignments. Overall, the study discovered that students were willing to use OERs as primary course material and would enroll in a course with similar resources in the future.

In the Philippines, OER has been identified as a critical strategy for promoting equitable access to quality education, particularly in remote and disadvantaged areas. The Philippine government has launched several initiatives to promote the use and creation of open educational resources (OER), including the Open

Educational Resources (OER) Policy Development Program, which aims to promote the development, use, and sharing of OER throughout the country (Department of Education, 2020). Integrating the utilization of OER can address the obstacles faced by public schools, especially the Last Mile Schools, in accessing learning materials and skills to create or repurpose content. This approach offers an alternative method of leveraging technology to connect previously disconnected schools, making education more accessible to students residing in remote regions or facing challenging circumstances.

Use of OERs in mathematics education

Open Educational Resources (OERs) are increasingly being used in mathematics education due to their ability to provide students and teachers with affordable and accessible learning materials. OERs are openly licensed educational materials that can be freely used, shared, and modified by anyone.

Assiri and Alnatheer (2019) conducted a study on the use of open educational resources (OER) in mathematics instruction for middle school students. The findings revealed that both teachers and students viewed the use of OER positively. The OER materials were found to be user-friendly, curriculum-relevant, and beneficial in improving students' understanding of mathematical concepts. However, some challenges were identified, such as a need for more training on how to effectively integrate OER into instruction and a lack of technology access in some schools. Overall, the study suggests that using OER in mathematics instruction can be a promising strategy for improving students' mathematical learning outcomes.

Primary school math teachers in Hong Kong had varying levels of awareness and use of OER during the COVID-19 pandemic, according to a study by Li, Lui, and Huang (2021). Those who have used OER, on the other hand, have found them to be useful and convenient. The study also revealed difficulties, such as adapting resources to their teaching context and evaluating their quality. The authors emphasize the potential of OER to support math teaching while emphasizing the importance of training and support to overcome these challenges.

In their study, Venegas-Muggli and Westermann (2020) investigated the effectiveness of using OER in a first-year mathematical course in higher education. The study found that students who used OER performed better in the course than those who did not use OER. The authors also found that students who used OER had higher levels of engagement and satisfaction with the course material. The study highlights the potential benefits of OER in improving student performance and engagement in higher education mathematics courses.

According to Park and McLeod (2019), the use of multimedia open educational resources (OER) in mathematics has potential benefits for high school students with learning disabilities, including increased engagement, motivation, and achievement. The study also found that the use of OERs was positively perceived by students, and it provided teachers with flexible and adaptable resources to support differentiated instruction.

2. METHODOLOGY

2.1 Research Design

The study employed a descriptive survey design to investigate the utilization of open educational resources (OERs) among math teachers in selected public secondary schools situated in Zone 2 of the Division of Zambales during the academic year 2022-2023. A self-administered questionnaire was employed to gather data from the participants, which was divided into five parts: (1) respondents' profiles, (2) frequency and extent of utilization of different types of OER in teaching strategies, (3) challenges in using OER, and (4) perceived effects of using OER on mathematics teaching. The validity and reliability of the questionnaire were pre-tested.

2.2 Respondents and Location

The study focused on Junior High School Mathematics teachers in selected public secondary schools in Zone 2, Division of Zambales, with a sample size of 75 participants. Purposive sampling was chosen because it allowed for the selection of participants based on specific criteria relevant to the study (Palinkas *et al.*, 2015). Participants had to be (1) currently teaching mathematics in junior high school, (2) employed in public schools in Zone 2, Division of Zambales for the School Year 2022-2023, and (3) willing to participate in the study.

2.3 Instruments

The researcher created a questionnaire by modifying existing surveys to meet the specific requirements of the study. The contents of the questionnaire were derived from previous research studies, including Forgette's (2020) "Teacher Perceptions of Open Educational Resources in K-12 Classrooms" and Assiri and Alnatheer's (2019) "Utilization of Open Educational Resources in Mathematics Instruction for the Intermediate School."

The questionnaire comprised two sections. The first part gathered information about the teacher-respondents' profiles, including age, sex, education level, teaching experience, position, and familiarity with OERs. The second part of the questionnaire dealt with the extent of utilizing Open Educational Resources (OERs) in terms of the frequency of utilization of different types of OER and its utilization in their teaching strategies, challenges in using OER, and perception of the effects of using OER on mathematics teaching.

2.4 Data Collection

The researcher sought permission from the Schools Division Superintendent of DepEd-Zambales, Public Schools District Supervisors, and School Heads of the selected public secondary schools in Zone 2, Schools Division of Zambales. Following the approval of the necessary authorities, the researcher proceeded to distribute the questionnaire. During the administration process, the researcher collaborated with the school heads and requested their help and assistance in the distribution and retrieval of the questionnaires.

2.5 Data Analysis

The data collected were treated, analyzed, and interpreted through statistical tools such as frequency distribution, mean, ANOVA, and Pearson r correlation test.

3. FINDINGS AND DISCUSSION

3.1 Profile of the Student-Respondents

The profile of the teacher-respondents is shown in Table 1.

Table 1: Frequency and Percentage Distribution of the Respondents' Profile

Profile		Frequency	Percent
Age Mean = 33.33 years old	50 – 59 years old	3	4.00
	40 – 49 years old	19	25.33
	30 – 39 years old	27	36.00
	20 – 29 years old	26	34.67
	Total	75	100.00
Sex	Male	30	40.00
	Female	45	60.00
	Total	75	100.00
Highest Educational Attainment	Bachelor's degree	8	10.67
	Bachelor's degree with master's units	39	52.00
	Master's degree	24	32.00
	Master's degree with doctor's units	4	5.33
	Doctor of Education / Doctor of Philosophy	0	0
Total	75	100.00	
Years of Teaching Experience Mean = 7.93 years	31 – 35 years	2	2.67
	26 – 30 years	2	2.67
	21 – 25 years	2	2.67
	16 – 20 years	1	1.33
	11 – 15 years	7	9.33
	6 – 10 years	30	40.00
	0- 5 years	31	41.33
	Total	75	100.00

Age

The calculated mean age of the respondents is 33.33 years old. Among the various age groups, the category of 30 – 39 years old exhibits the highest frequency with 27 respondents, encompassing 36.00% of the participants. Subsequently, the 20 – 29 years old group with 26 respondents represents 34.67% of the sample. The 40 – 49 years old group with 19 respondents accounts for 25.33% of the respondents. The age distribution of the respondents suggests that OER use among mathematics teachers in public secondary schools is not restricted to any age group.

Sex

It can be observed that most of the participants were female, comprising 45 respondents or 60% of the sample population. Meanwhile, male participants numbered 30 constituting 40% of the sample. This indicates that the study had a higher proportion of female participants than male participants.

Highest Educational Attainment

It can be noted that most respondents have completed a bachelor's degree with master's units, comprising 39 respondents or 52% of the sample population. Following this, teachers with a master's degree accounted for 24 respondents 32% of the sample. A small portion of the participants, comprising 8 respondents or 10.67%, have attained a bachelor's degree, while 4 respondents or 5.33% hold a master's degree with doctor's units. These results provide insight into the range of educational backgrounds among the respondents, reflecting the varying levels of academic achievement within the study sample.

Years of Teaching Experience

The computed mean teaching experience of the respondents was 7.93 years. It can be emphasized that most of the teachers have 0-5 years of teaching experience, comprising 41.33% (31 teachers) of the sample population, while 40% (30 teachers) have 6-10 years of teaching experience. The remaining teachers

have 11 or more years of teaching experience, with 9.33% (7 teachers) having 11-15 years, 1.33% (1 teacher) having 16-20 years, and only 8% (6 teachers) having 21 or more years. This finding emphasizes the importance of adequate support and professional development opportunities to assist these teachers in their teaching practices, including the use of OER.

Teaching Position

Of the 75 respondents, 37.33% or 28 teachers were Teacher III, 34.67% or 26 teachers were Teacher I, and 20% or 15 were Teacher II. Master Teachers represented a smaller percentage of the participants. It is important to note that these positions are usually held by early to mid-career teachers, who may be more likely to embrace new teaching methods and technologies, such as OER.

OERs Knowledge

Most of the respondents exhibited a degree of familiarity with Open Educational Resources (OER). Precisely, over half of the participants (50.67% or 38) reported being familiar with OER, while 44% or 33 had a moderate level of familiarity with it. A small proportion of participants (2.67% or 2) claimed to be very familiar with OER, whereas another 2.67% or 2 of respondents reported having no familiarity with it at all. It showed that educators are becoming more aware of and interested in OERs.

3.2 Frequency of Utilization of Open Education Resources (OERs) in Mathematics Teaching

The table shows the utilization frequency of seven different types of OERs in mathematics teaching.

Table 2: Frequency of OERs utilization

	Types of OERS	Mean	Descriptive Rating	Rank
1	Open Courseware (e.g., syllabi, lecture notes, assessments)	2.77	Sometimes	4
2	Learning Modules	3.43	Always	1
3	Open Textbooks	2.72	Sometimes	5
4	Streaming Videos (e.g., YouTube videos)	3.27	Always	2
5	Open Access Journals	2.35	Rarely	7
6	Online Tutorials (e.g., recorded, and interactive tutorials)	3.16	Sometimes	3
7	Digital Learning Objects (e.g., interactive simulations and animations)	2.47	Rarely	6
	Overall Weighted Mean	2.88	Sometimes	

The overall weighted mean of OERs utilization was 2.88, indicating that the use of OERs among math teachers was sometimes. Among the different types of OERs, Learning Modules and Streaming Videos were the most utilized types of OERs (ranked 1 and 2, respectively), with a weighted mean score of 3.43 and 3.27, respectively. Online Tutorials, which ranked 3, had a weighted mean score of 3.16 and were sometimes utilized. Open Access Journals had the lowest mean of 2.35 and a rank of 7, indicating that it was used rarely.

Although math teachers in public secondary schools use OERs, their use is not widespread. Learning modules and streaming videos were discovered to be the most used types of OERs among math teachers. These resources are easily accessible online and relatively simple to incorporate into teaching.

Previous research has highlighted that teachers are more likely to use simple-to-use and easy-to-access types of OERs, such as videos and learning modules (Liyanagunawardena *et al.*, 2013). Similarly, Glance, Forsey, and Riley (2013) discovered that teachers prefer open educational resources (OERs) that are relevant to their specific courses and can be easily integrated into their instructional practices. Other studies, however, have found different results. For example, Kimmons and Veletsianos (2016) discovered that open textbooks were more commonly used by higher education faculty than videos or other types of OERs.

3.3 Challenges Faced by the Mathematics Teacher in Utilizing Open Educational Resources

The table shows the challenges faced by mathematics teachers in utilizing Open Educational Resources (OERs).

Table 3: Challenges Faced by the Mathematics Teacher in Utilizing Open Educational Resources

	Challenges	Mean	Descriptive Rating	Rank
1	I am not familiar with the different types of OER available for use in mathematics teaching.	2.23	Disagree	9
2	I lack the technical skills to effectively use OER in my mathematics lessons.	2.39	Disagree	5
3	I have difficulty finding high-quality OER that aligns with the learning objectives of my mathematics lessons.	2.31	Disagree	7
4	I struggle to keep up with updates and changes to OER resources.	2.49	Disagree	1
5	I find it difficult to determine which OER resources are most suitable for my student's learning needs.	2.48	Disagree	2
6	I have trouble assessing the quality and reliability of OER resources.	2.41	Disagree	4

	Challenges	Mean	Descriptive Rating	Rank
7	I do not have enough time to search for and evaluate OER resources for use in my mathematics lessons.	2.44	Disagree	3
8	I take too long to adapt and integrate OER resources into my mathematics lesson plans.	2.31	Disagree	7
9	I am hesitant to use OER resources in my mathematics teaching due to concerns about their quality and effectiveness.	2.35	Disagree	6
10	I do not see the value in using OER resources in my mathematics teaching, as I prefer to use traditional teaching materials and methods.	2.09	Disagree	10
	Overall Weighted Mean	2.35	Disagree	

It can be noted that the respondents generally disagree with the challenges identified in the study with an overall weighted mean of 2.35. The highest mean score was obtained by the challenge of struggling to keep up with updates and changes to OER resources (mean = 2.49), followed closely by the difficulty in determining the most suitable OER resources for students' learning needs (mean = 2.48), and the lack of sufficient time to search for and evaluate OER resources for mathematics lessons (mean = 2.44). On the other hand, the challenge with the lowest mean score was the perceived lack of value in using OER resources in mathematics teaching, as some teachers prefer traditional teaching materials and methods (mean = 2.09). The overall weighted mean for all the challenges was 2.35, which indicates that, on average, the mathematics teachers disagree with the challenges faced in utilizing OER.

This implies that although most mathematics teachers recognize the benefits of utilizing OER materials in their instruction, they face various difficulties in doing so. The high scores for challenges related to updates, suitability, and time constraints reveal

barriers to OER adoption, emphasizing the necessity for strategies to address these issues.

Similar challenges such as identifying appropriate resources, a lack of technical skills, and worries about the quality of resources are issues that have been shown in earlier studies to be obstacles for teachers using OER materials (Baas & Admiraal, 2020; Teixeira *et al.*, 2020). However, other studies have also discovered benefits from adopting OER materials, such as improved student achievement and engagement (Butcher, 2015; McAndrew *et al.*, 2012). According to these findings, even if using OER resources can present certain difficulties, doing so can also significantly enhance teaching and learning outcomes.

3.4 Perception of the Effects of Utilization of Open Educational Resources on Mathematics Teaching Practices

The table shows the perceptions of respondents on the effects of utilizing Open Educational Resources (OERs) on mathematics teaching practices.

Table 4: Perception of the Respondents on the Effects of Utilization of Open Educational Resources on Mathematics Teaching Practices

	Effects	Mean	Descriptive Rating	Rank
1	Utilizing OER in mathematics teaching has improved my understanding of key concepts.	3.19	Agree	6
2	Incorporating OER materials has expanded my knowledge of different approaches to teaching math.	3.15	Agree	8
3	Employing OER has helped me identify areas of math where I need to improve my knowledge.	3.21	Agree	2
4	Integrating OER materials has enhanced my ability to explain complex math concepts to students.	3.07	Agree	10
5	Accessing OER has provided me with a wider range of teaching resources to choose from.	3.16	Agree	7
6	Utilizing OER materials has helped me to personalize my teaching approach for individual students.	3.20	Agree	4
7	Using OER has reduced the amount of time I spend searching for teaching resources.	3.11	Agree	9
8	Incorporating OER materials has allowed me to quickly adapt my teaching materials to different learning needs.	3.20	Agree	4
9	Utilizing OER has increased my enthusiasm for teaching math.	3.24	Agree	1
10	Incorporating OER materials has improved my confidence in effectively teaching math concepts.	3.21	Agree	2
	Overall Weighted Mean	3.17	Agree	

The respondents generally agreed that utilizing OERs in mathematics teaching practices with an overall weighted mean of 3.17. With a mean score of 3.24 and a rank of 1, which indicates strong agreement that utilizing OERs increased teachers' enthusiasm for teaching math received the highest rating. This indicates that OERs can effectively inspire and engage teachers in their lessons emphasizing the importance of perceived usefulness and user engagement. With a mean score of 3.21 and a rank of 2, employing OERs helped teachers identify areas of math where they need to improve their knowledge was another highly rated benefit. This suggests that OERs can serve as a valuable tool for professional development emphasizing the role of self-assessment and learning opportunities in technology acceptance. Furthermore, utilizing OERs materials was found to enhance the ability of teachers to personalize their teaching approach for individual students, with a mean score of 3.20 and a rank of 4. This highlights the potential of OERs to provide teachers with a diverse range of resources to cater to the specific learning needs of their students stressing the importance of customization and adaptability.

On the other hand, integrating OERs materials to explain complex math concepts to students was rated lower, with a mean score of 3.07 and a rank of 10. This

suggests that while OER can be a valuable resource for teachers, it may not always be the most effective tool for explaining complex math concepts to students.

Research has shown several benefits of using OERs in instructional activities. Hilton *et al.*, (2017) found that OERs enhances student learning outcomes, lowers costs, and provides adaptable learning resources. Cox *et al.*, (2016) highlighted that OERs improves teachers' access to high-quality resources and allows for personalized lesson planning. Additionally, Wiley and Hilton (2018) and Kim *et al.*, (2018) noted that OERs offers opportunities for professional growth and strengthens subject matter expertise. Furthermore, Wiley and Hilton found that OERs boost teacher motivation and satisfaction.

3.5 Test of Significant Difference on Challenges of the Mathematics Teacher in Utilizing Open Educational Resources When Grouped According to Profile Variables

The table shows the results of an analysis of variance (ANOVA) conducted to test for significant differences in the challenges faced by mathematics teachers in utilizing open educational resources (OERs) when grouped according to various profile variables.

Table 5: Analysis of Variance to Test Significant Difference on Challenges of the Mathematics Teacher in Utilizing Open Educational Resources When Grouped According to Profile Variables

Source of Variations		Df	F	Sig.	Decision/ Interpretation
Age	Between Groups	3	2.00	0.12	Accept Ho (Not Significant)
	Within Groups	71			
	Total	74			
Sex	Between Groups	1	1.09	0.30	Accept Ho (Not Significant)
	Within Groups	73			
	Total	74			
Highest Educational Attainment	Between Groups	3	1.75	0.16	Accept Ho (Not Significant)
	Within Groups	71			
	Total	74			
Years of Teaching Experience	Between Groups	6	0.77	0.60	Accept Ho (Not Significant)
	Within Groups	68			
	Total	74			
Teaching Position	Between Groups	5	0.38	0.86	Accept Ho (Not Significant)
	Within Groups	69			
	Total	74			
Open Educational Resources Knowledge	Between Groups	3	5.45	0.00	Reject Ho (Significant)
	Within Groups	71			
	Total	74			

The computed P-value for age (0.12), sex (0.30), highest educational attainment (0.16), years of teaching experience (0.60), and teaching position (0.86) were greater than (>) 0.05 Alpha Level of Significance, hence the Null Hypothesis is accepted. Therefore, there is no significant difference in the challenges faced by mathematics teachers in utilizing open educational resources when grouped according to age, sex, highest

educational attainment, years of teaching experience and teaching position.

On the other hand, the P-value for Open Educational Resources knowledge (0.00) was lower than (<) 0.05 Alpha Level of Significance, therefore the Null Hypothesis is rejected and there is a significant difference in the challenges faced by mathematics teachers in utilizing open educational resources when

grouped according to their level of knowledge of open educational resources.

This implies that the knowledge of open educational resources is an important factor in overcoming the challenges faced by mathematics teachers in utilizing open educational resources. This could be attributed to the fact that teachers who have a good understanding of open educational resources are more likely to know how to use them effectively and efficiently. Moreover, a study by Kweka and Mgaya (2020) found that teachers' gender, age, and teaching experience did not significantly influence their use of

OERs. Similarly, a study by Ramírez-Montoya *et al.*, (2020) found that teachers' age and teaching experience did not significantly affect their adoption of OERs.

3.6 Test of Significant Difference in Perception of the Respondents on Effects of Utilizing Open Educational Resources on Mathematics Teaching When Grouped According to Profile Variables

The table shows the results of an analysis of variance (ANOVA) to test the differences in the perception of respondents on the effects of utilizing open educational resources (OER) on mathematics teaching when grouped according to profile variables.

Table 6: Analysis of Variance to test the difference in the Perception of the Respondents on the Effects of Utilizing Open Educational Resources on Mathematics Teaching When Grouped According to Profile Variables

Source of Variations		Df	F	Sig.	Decision/ Interpretation
Age	Between Groups	3	0.01	1.00	Accept Ho (Not Significant)
	Within Groups	71			
	Total	74			
Sex	Between Groups	1	1.48	0.23	Accept Ho (Not Significant)
	Within Groups	73			
	Total	74			
Highest Educational Attainment	Between Groups	3	0.43	0.73	Accept Ho (Not Significant)
	Within Groups	71			
	Total	74			
Years of Teaching Experience	Between Groups	6	0.32	0.92	Accept Ho (Not Significant)
	Within Groups	68			
	Total	74			
Teaching Position	Between Groups	5	0.62	0.69	Accept Ho (Not Significant)
	Within Groups	69			
	Total	74			
Open Educational Resources Knowledge	Between Groups	3	1.94	0.13	Accept Ho (Not Significant)
	Within Groups	71			
	Total	74			

The computed P-value for age (1.00), sex (0.23), highest educational attainment (0.73), years of teaching experience (0.92), teaching position (0.69), and Open Educational knowledge (0.13) were greater than (>) 0.05 Alpha Level of Significance, hence the Null Hypothesis is accepted. Therefore, there were no significant differences in the perception of respondents on the effects of utilizing OER on mathematics teaching when grouped according to the profile variables tested.

This implies that age, sex, highest educational attainment, years of teaching experience, teaching position, and OER knowledge do not have a significant impact on respondents' perceptions of the effects of using OER on mathematics instruction. This suggests that the advantages of implementing OER in the teaching of mathematics may be widespread and not only applicable to a certain demographic of teachers.

The finding is supported by the literature that suggests that OER can improve teaching and learning outcomes regardless of the teachers' demographic and professional characteristics. Hilton *et al.*, (2016) found

that the effects of OER on student outcomes were not significantly different between courses taught by faculty members with different levels of experience, tenure status, or institutional affiliation.

However, some studies have reported differences in the adoption and use of OER among teachers based on their characteristics. For instance, a study by Cox, Trotter, and Jordan (2018) found that younger teachers were more likely to use OER than older teachers, while teachers with higher levels of education were more likely to perceive OER as high-quality. Another study by Kimmons and Veletsianos (2018) reported that male and female instructors had different preferences for OER materials and that instructors with more experience were more likely to use OER in their courses.

3.7 Test of Relationship between Challenges and Utilization of the Mathematics Teacher of Open Educational Resources

The results of Pearson product-moment correlation coefficient analysis conducted to determine

the relationship between the challenges and utilization of open educational resources are presented in Table 7.

Table 7: Pearson Product Moment Coefficient of Correlation to Determine Relationship between the Challenges and Utilization of Open Educational Resources

CORRELATION		Values	Decision	Interpretation	
Utilization of OERs among Mathematics Teachers	Challenges faced by Mathematics Teachers in Utilizing OERs	Pearson r	-0.02	Ho is Accepted	Very Low Negative Correlation
		Sig. (2-tailed)	0.85		
		N	75	Not Significant	

The computed Pearson r value of -0.02 indicated a very low negative correlation between the challenges and utilization of open educational resources of respondents. The computed P-value 0.85 is greater than (<) 0.05 level of significance, therefore the null hypothesis was accepted. The result signifies that there was no relationship between the challenges and utilization of open educational resources of respondents.

This suggests that the difficulties in adopting OERs do not greatly affect their use. This result implies that despite obstacles like a lack of technical know-how or access to technology, teachers are still ready to use open educational resources. It's vital to remember that a weak correlation rather than an absence of a strong link between challenges and OER use does not necessarily mean that obstacles have no effect on the use of OER.

Previous studies have reported mixed findings on the relationship between challenges and OER

utilization. Some studies have reported a negative impact of challenges such as lack of awareness, access, and technical skills on OER utilization (Mishra *et al.*, 2018; Umar, 2018), while others have found no significant relationship between challenges and OER utilization (Nikoi & Armah, 2017; Okoli & Wang, 2017). The current finding is consistent with the latter group of studies, suggesting that challenges may not be a significant barrier to the utilization of OERs.

3.8. Test of Relationship between the Perception of the Effects and Utilization of Open Educational Resources

The results of Pearson product-moment correlation coefficient analysis conducted to determine the relationship between the perception of the effects and utilization of open educational resources are presented in Table 8.

Table 8: Pearson Product Moment Coefficient of Correlation to Determine the Relationship between the Perception of the Effects and Utilization of Open Educational Resources

CORRELATION		Values	Decision	Interpretation	
Utilization of OERs among Mathematics Teachers	Perception of the Effects of OERs Utilization on Mathematics Teaching Practices	Pearson r	0.20	Ho is Accepted	Very Low Positive Correlation
		Sig. (2-tailed)	0.08		
		N	75	Not Significant	

The computed Pearson r value of 0.20 indicated a very low positive correlation between the perception of the effects and utilization of open educational resources of respondents. The computed P-value 0.08 is greater than (<) 0.05 level of significance, therefore the null hypothesis was accepted. The result signifies that there was no relationship between the perception of the effects and utilization of open educational resources of respondents.

This implies that perception of the effects of OERs does not significantly impact their utilization. It may imply that educators and learners may not consider the perceived effects of OERs as a significant factor when deciding to use them. However, it is important to note that the lack of a significant correlation between these two variables does not necessarily indicate that perception of the effects has no impact on OER utilization.

The results of this study are consistent with other earlier studies that claimed there was little to no correlation between perception and OER usage. For instance, neither Mishra *et al.*, (2018) nor Umar (2018) found a connection between how OERs are perceived and how they are used. However, according to certain studies (Mtebe & Raisamo, 2014; Nkuyubwatsi & Bouchard, 2021) perception has a favorable effect on the use of open educational resources.

4. CONCLUSION

The study concluded that a typical teacher-respondent profile is a 33-year-old female with a bachelor's degree and master's units, possessing 8 years of teaching experience, holding the position of Teacher III, and demonstrating familiarity with Open Educational Resources (OERs). These teachers occasionally incorporate OER into their mathematics teaching strategies and generally express disagreement with the challenges associated with OER utilization, while agreeing on the positive effects of integrating OER into

math teaching practices. Furthermore, the study found no significant differences in the challenges faced or perceptions of the effects when teachers were grouped by age, sex, highest educational attainment, years of teaching experience, and teaching position, except when grouped by OER Knowledge. Additionally, there was no significant relationship observed between the challenges faced and the utilization of OER or between the perception of OER effects and utilization among respondents.

RECOMMENDATIONS

Based on the preceding conclusions of the study, recommendations include support, technology access, professional development, collaboration opportunities, policy development, ongoing resources, partnerships, incentives, and access to high-quality OER materials. Moreover, further studies may be conducted to explore the use of OERs among Mathematics teachers involving a wider scope of sample and research locale.

REFERENCES

- Allen, I. E., & Seaman, J. (2014). Opening the curriculum: Open educational resources in U.S. higher education, 2014. Babson Survey Research Group. Retrieved from <https://www.onlinelearningsurvey.com/reports/openingthecurriculum2014.pdf>.
- Allen, M. (2017). The SAGE Encyclopedia of Communication Research Methods. SAGE Publications.
- Assiri, E. A., & Alnatheer, M. A. (2019). Utilization of Open Educational Resources in Mathematics Instruction for the Intermediate School. *Journal of Educational Issues*, 5(2), 193-207. Retrieved from <https://eric.ed.gov/?id=EJ1241648>
- Baas, M., Admiraal, W., & van den Berg, E. (2019). Teachers' adoption of open educational resources in higher education. *Journal of Interactive Media in Education*, 2019(1), 1-11. <https://doi.org/10.5334/jime.510>
- Bhandari, R. (2021). Quantitative Research: Definition, Methods, Types and Examples. The Business Journals. Retrieved from <https://www.bizjournals.com/bizjournals/how-to/growth-strategies/2021/05/quantitative-research-methods-types-examples.html>
- Bliss, T. J., & Smith, M. (2017). Investigating the perceptions, use, and impact of open textbooks: A survey of post-secondary students in British Columbia. *Open Praxis*, 9(2), 151-162. <https://doi.org/10.5944/openpraxis.9.2.539>
- Bliss, T. J., Robinson, T. J., Hilton, J., & Wiley, D. A. (2013). An OER COUP: College teacher and student perceptions of open educational resources. *Journal of Interactive Media in Education*, 2013(1), Art. 4. Retrieved from <https://jime.open.ac.uk/articles/10.5334/2013-04>
- Butcher, N. (2015). Open educational resources and educational sustainability: An overview. In C. J. Bonk, M. M. Lee, & T. C. Reeves (Eds.), *MOOCs and open education around the world* (pp. 47–55). Routledge. <https://www.routledge.com/MOOCs-and-Open-Education-Around-the-World/Bonk-Lee-Reeves/p/book/9781138807419>
- CHED (Commission on Higher Education). (2013). Guidelines on the utilization of open educational resources for higher education institutions. CHED Memorandum Order No. 27, s. 2013. <https://ched.gov.ph/wp-content/uploads/2017/09/CMO-No.-27-s.-2013.pdf>
- Chen, C., & Lambert, A. D. (2019). The impact of gender and race on faculty members' use of technology in higher education. *Journal of Women and Gender in Higher Education*, 12(1), 41-60
- Commission on Higher Education. (2013). Open Educational Resources for Higher Education Institutions (OER@CHED) Project. Retrieved from <https://ched.gov.ph/oer/>
- Conole, G. (2013). Designing for learning in an open world. Springer Science & Business Media.
- Cox, G. (2013). Researching resistance to open education resource adoption in US higher education. *Educational Policy Analysis Archives*, 21(60). Retrieved from <https://chat.openai.com/c/3b225205-3497-4742-b681-6ea39b18bf8c>.
- Cox, G., & Trotter, H. (2016). Institutional culture and OER policy: How structure, culture, and agency interact with policy implementation. *Journal of Interactive Media in Education*, 2017(1), 1-12. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1117433.pdf>.
- De los Arcos, B., Farrow, R., Pitt, R., & Weller, M. (2017). OER Hub research report 2013-2014. The Open University. <https://oerhub.files.wordpress.com/2017/06/oer-hub-research-report-2013-2014.pdf>
- Deimann, M., & Farrow, R. (2013). Rethinking OER and their use: Open education as Bildung. *International Review of Research in Open and Distributed Learning*, 14(3), 344-360. <https://doi.org/10.19173/irrodl.v14i3.1534>
- Department of Education. (2017). DepEd Order No. 22, s. 2017: Policy guidelines on the adoption and implementation of the Open Educational Resources (OER) in the Department of Education. Retrieved from https://www.deped.gov.ph/wp-content/uploads/2017/11/DO_s2017_022.pdf
- Department of Education. (2020). DepEd Education in the time of COVID-19. <https://www.deped.gov.ph/covid-19/>
- Department of Education. (2020). Learning continuity plan: Policy guidelines for continuous learning in times of COVID-19. https://www.deped.gov.ph/wp-content/uploads/2020/07/DepEd_LCP_July3.pdf
- DeRosa, R., & Robinson, S. (2017). From OER to open pedagogy: Harnessing the power of open. In R. S. Jhangiani & R. Biswas-Diener (Eds.), *Open: The philosophy and practices that are revolutionizing education and science* (pp. 115-124). Ubiquity Press. <https://doi.org/10.5334/bbc.i>
- Dias-Lacy, S. L., & Guirguis, R. V. (2017). Challenges for new teachers and ways of coping with them. *Journal of*

- Education and Learning*, 6(3), 265-272. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1141671.pdf>
- Dopico, A. (2021, March 19). How do we write input-process-output conceptual framework? Retrieved from How do you write input-Process-Output conceptual framework? – JanetPanic.com
 - Dutta, P. (2016). Open educational resources: An opportunity and a challenge for students. *Journal of Education and Practice*, 7(25), 106-111.
 - Elder, A. (2019, July 1). Introduction to Open Educational Resources – The OER Starter Kit.Pressbooks. Retrieved from <https://iastate.pressbooks.pub/oerstarterkit/chapter/introduction>
 - Forgette, R. (2020). Teacher Perceptions of Open Educational Resources in K-12 Classrooms. *The Journal of Educational Research*, 113(2), 192-204. <https://doi.org/10.1080/00220671.2018.1460636>
 - Ganapathi, J. (2018). The effectiveness of open educational resources in enhancing teaching and learning. *International Journal of Educational Technology in Higher Education*, 15(1), 1-12.
 - Glance, D. G., Forsey, M., & Riley, M. (2013). The pedagogical foundations of massive open online courses. *First Monday*, 18(5). <https://doi.org/10.5210/fm.v18i5.4350>
 - Harsasi, M. (2015). The use of open educational resources in online learning: A study of students' perception. *Turkish Online Journal of Distance Education*, 16(3), 67-80. ISSN 1302-6488. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1092848.pdf>
 - Heath, H. (2019, November 6). What is an input-process-output model in research? Retrieved from What is an input-process-output model in research? – Rampfesthudson.com
 - Hilton III, J. (2016). Open educational resources and college textbook choices: A review of research on efficacy and perceptions. *Educational Technology Research and Development*, 64(4), 573-590. Retrieved from <https://link.springer.com/article/10.1007/s11423-016-9434-9>
 - Hilton, J. (2016). Open educational resources and college textbook choices: A review of research on efficacy and perceptions. *Educational Technology Research and Development*, 64(4), 573-590. <https://doi.org/10.1007/s11423-016-9434-9>
 - Hilton, J., & Laman, C. (2012). One college's use of an open psychology textbook. *Open Learning: The Journal of Open, Distance and e-Learning*, 27(3), 265-272. Retrieved from <https://www.tandfonline.com/doi/abs/10.1080/02680513.2012.716657>
 - Hilton, J., Wiley, D., Stein, J., & Johnson, A. (2016). The four “R”s of openness and ALMS analysis: Frameworks for open educational resources. *Open Learning: The Journal of Open, Distance and e-Learning*, 31(3), 261-276. <https://doi.org/10.1080/02680513.2016.1192667>
 - Hodgkinson-Williams, C. A., & Trotter, H. (2018). A social justice framework for understanding open educational resources and practices in the Global South. *Journal of Learning for Development*, 5(3), 204-224.
 - Huy, P. Q., Ismail, I. A., & Alwi, N. H. (2018). Predicting OER usage: A multi-cultural study. *Education and Information Technologies*, 23(6), 2625-2642. <https://doi.org/10.1007/s10639-018-9761-1>
 - Ingersoll, R. M., & Strong, M. (2011). The impact of induction and mentoring programs for beginning teachers: A critical review of the research. *Review of Educational Research*, 81(2), 201-233. Retrieved from: https://repository.upenn.edu/cgi/viewcontent.cgi?article=1127&context=gse_pubs
 - Jones, C. (2018). The potential of open educational resources (OERs) and open educational practices (OEPs) in primary and secondary education. *OECD Education Working Papers*, (169), 1-28.
 - Kaufman, E., & Campana, K. (2016). The challenges of Open Educational Resources: Making OER work for educators. *Journal of Educational Technology Development and Exchange*, 9(1), 1-14. <https://eric.ed.gov/?id=EJ1136948>
 - Khlaif, Z., & Trimi, S. (2019). Principal support in the adoption of open educational resources (OER) in K-12 schools. *The International Journal of Information and Learning Technology*, 36(2), 132-142. <https://doi.org/10.1108/IJILT-07-2018-0079>
 - Kimmons, R., & Atkins, C. (2016). OER quality and adaptation in K-12: Comparing teacher evaluations of copyright-restricted, open, and open/adapted textbooks. *International Review of Research in Open and Distributed Learning*, 17(6). Retrieved from <https://www.irrodl.org/index.php/irrodl/article/view/2341>
 - Kimmons, R., & Veletsianos, G. (2016). A cross-sectional investigation of instructional design practice. *Journal of Computing in Higher Education*, 28(1), 17-34. <https://doi.org/10.1007/s12528-015-9107-2>
 - Kortemeyer, G. (2013). Massive open online textbooks (MOOTs) and their impact on higher education. *Journal of Interactive Media in Education*, 2013(1), 1-13. <https://doi.org/10.5334/2013-01>
 - Kursun, E., & Kocdar, S. (2018). Investigating the awareness and capacity of teacher candidates regarding open educational resources. *International Journal of Educational Technology in Higher Education*, 15(1), 49. <https://doi.org/10.1186/s41239-018-0126-1>
 - Kweka, J., & Mgaya, R. J. (2020). Open educational resources: Tanzanian teachers' level of awareness and potential predictors of their use. *Open Praxis*, 12(2), 193-206. <https://doi.org/10.5944/openpraxis.12.2.1049>
 - Li, M., Lui, F. K., & Huang, R. (2021). Primary school mathematics teachers' awareness and use of open educational resources during the COVID-19 pandemic in Hong Kong. *Journal of Computers in Education*, 8(1), 1-20. Retrieved from <https://www.mdpi.com/2227-7102/12/11/744#>
 - Liyanagunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: A systematic study of the published literature 2008-2012. *The*

- International Review of Research in Open and Distributed Learning*, 14(3), 202-227. <https://doi.org/10.19173/irrodl.v14i3.1455>
- McAndrew, P., Scanlon, E., & Clow, D. (2010). An open future for higher education. *EDUCAUSE Review*. Retrieved from <https://er.educause.edu/articles/2010/3/an-open-future-for-higher-education>
 - McLeod, S. (2018). Questionnaires. *Simply Psychology*. Retrieved from <https://www.simplypsychology.org/questionnaires.html>.
 - Middleton, J. A. (2022). Reliability and Validity in Research. In J. A. Middleton (Ed.), *Encyclopedia of Educational Research* (pp. 1-7). Springer. https://doi.org/10.1007/978-981-15-4739-5_249-1
 - Mishra, S., Sharma, M., Sharma, R. C., & Singh, A. (2014). Adoption of open educational resources (OER) by Indian higher education faculty: An empirical study. *Journal of Educational Technology & Society*, 17(4), 1-15.
 - MIT OpenCourseWare. (n.d.). About MIT OpenCourseWare. Retrieved from <https://ocw.mit.edu/about/>.
 - Mtebe, J. S., & Raisamo, R. (2014). Investigating students' perception on the use of open educational resources in Tanzania. *International Review of Research in Open and Distance Learning*, 15(6), 90-102.
 - National Science Digital Library. (n.d.). Digital Learning Objects. Retrieved from https://nsdl.oercommons.org/search?f.search=digital+learning+objects&f.general_subject=&f.sublevel=&f.alignment_standard=
 - Nidoy, R. G., Espanola, M. S., & Jacinto, E. (2017). Factors influencing the adoption of open educational resources among rural public high school teachers in the Philippines. *Journal of Educational Computing Research*, 55(5), 651-674. <https://doi.org/10.1177/0735633116651086>
 - Nikoi, S., & Armah, F. A. (2017). Demystifying OERs: A review of the literature from 2000 to 2016. *International Review of Research in Open and Distributed Learning*, 18(7), 69-86. <https://doi.org/10.19173/irrodl.v18i7.3096>
 - Nkuyubwatsi, B., & Bouchard, P. (2021). Open educational resources (OER) use among higher education faculty members in Rwanda. *International Journal of Education and Development using Information and Communication Technology*, 17(1), 95-110.
 - Okoli, C., & Wang, N. (2017). The growth of open access publishing: A bibliometric analysis of selected disciplines. *PLoS ONE*, 12(1), e0170195. doi: 10.1371/journal.pone.0170195
 - Olufunke, A. A., & Adegun, O. A. (2014). Open educational resources and higher education in Nigeria: Emergence, strategy, and the way forward. *Journal of Educational and Social Research*, 4(6), 43-50. Retrieved from: https://www.saide.org.za/documents/OER_Policy_Nigeria_with_metadata.pdf
 - Orr, D., Neumann, J., & Muuss-Merholz, J. (2017). German OER practices and policy: From bottom-up to top-down initiatives. *International Review of Research in Open and Distributed Learning*, 18(7), 99-115. Retrieved from https://iite.unesco.org/wp-content/uploads/2017/09/OER_Germany_www.pdf
 - Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Administration and Policy in Mental Health and Mental Health Services Research*, 42(5), 533-544. doi:10.1007/s10488-013-0528-
 - Park, H., & McLeod, L. (2019). The use of multimedia open educational resources for high school students with learning disabilities in mathematics. *Journal of Educational Technology & Society*, 22(1), 200-211. https://www.jstor.org/stable/pdf/26915116.pdf?seq=1#page_scan_tab_contents
 - Pawlowski, J. M., & Clements, K. I. (2013). User-oriented quality for OER: Understanding teachers' views on re-use, quality, and trust. *Journal of Computer Assisted Learning*, 28(1), 4-14. Retrieved from <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2729.2011.00450.x>.
 - Ramirez-Montoya, M.S., Garcia-Penalvo, F. J., & Martinez – Abad, F. (2020). Factors that influence the adoption of open educational resources by higher education teachers in Spain. *The International Journal of Information and Learning Technology*, 37(4), 169-181. <https://doi.org/10.1108/IJILT-12-2019-0135>
 - Rolfe, V. (2016). Open educational resources: Staff attitudes and awareness. *Research in Learning Technology*, 24, 1-13. <https://doi.org/10.3402/rlt.v24.29920>
 - Teixeira, A. M., Mota, J., & Nunes, C. (2020). Open educational resources and higher education: A disruptive potential or simply a buzzword? In A. L. Alves & M. T. Lopes (Eds.), *Open education: A path to the future* (pp. 13-28). Springer. https://doi.org/10.1007/978-3-030-43435-1_2
 - Umar, I. N. (2018). Utilization of open educational resources (OER) among academic staff in Nigerian universities: Implications for sustainable open education development. *The International Review of Research in Open and Distributed Learning*, 19(3). doi: 10.19173/irrodl.v19i3.3452
 - UNESCO. (2020). COVID-19 educational disruption and response. <https://en.unesco.org/covid19/educationresponse>
 - Venegas-Muggli, J., & Westermann, G. (2020). The effectiveness of using open educational resources in a first-year mathematics course in higher education.

- Journal of Computing in Higher Education*, 32(3), 531-548. <https://doi.org/10.1007/s12528-020-09246-5>
- Villanueva, L. A. S., & Dolom, M. C. (2018). Adoption of open educational resources among teachers in a rural public high school in the Philippines. Retrieved from: https://www.researchgate.net/publication/328918207_Adoption_of_Open_Educational_Resources_among_teachers_in_a_rural_public_high_school_in_the_Philippines
 - Wiley, D., & Hilton, J. (2018). Defining OER-enabled pedagogy. *International Review of Research in Open and Distributed Learning*, 19(4). Retrieved from <https://www.irrodl.org/index.php/irrodl/article/view/3601>
 - Wiley, D., Williams, L., DeMarte, D., & Hilton, J. (2017). The Tidewater Z-Degree and the INTRO model for sustaining OER adoption. *Education Policy Analysis Archives*, 25(23). <https://doi.org/10.14507/epaa.25.2466>
 - Yount, W. R., & Heckert, A. (2019). Validation of Research Instruments. In K. B. Ajayi (Ed.), *Handbook of Research on Validity and Reliability in Social Science Research* (pp. 1-28). IGI Global. <https://doi.org/10.4018/978-1-5225-5357-1.ch001>

Cite This Article: Katherine S. Enriquez (2023). The Use of Open Educational Resources (OERs) among Mathematics Teachers in Public Secondary Schools. *East African Scholars J Edu Humanit Lit*, 6(9), 434-446.
