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Department of Education
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MATRIX BARCODE: A TOOL FOR ENHANCING AWARENESS ON CLIMATE CHANGE: A SCHOOL BASED DRRM PROJECT FOR STUDENTS

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ABSTRACT

The study on "MATRIX BARCODE: A Tool for Enhancing Awareness on Climate Change" reveals a significant and positive impact on students' understanding of climate change. The initial findings pointed to a low level of awareness, where students had only a basic understanding of climate change. However, after the implementation of the Matrix Barcode intervention, there was a remarkable transformation in students' awareness, signified by the shift from 'Low Awareness' to 'Reasonable Awareness.'

These results have important implications for education and climate change awareness initiatives. They emphasize the potential of technology, specifically QR codes like the Matrix Barcode, in providing students with easy access to educational content. The study shows that innovative tools can effectively bridge knowledge gaps, equipping students with the understanding necessary to address climate change challenges.

The study's impact extends beyond the classroom. It provides a beacon of hope for fostering a generation that values and comprehends the urgency of environmental issues. As students develop a stronger foundation in climate change awareness, they become better equipped to tackle the complex environmental challenges of the future. It underscores the pivotal role that technology and innovative teaching methods can play in educating students about global concerns.

In conclusion, the study exemplifies the power of combining technology with education to enhance awareness of pressing global issues. It reflects the importance of preparing the younger generation to become responsible and informed global citizens, ready to address the challenges of a changing world. The Matrix Barcode project has paved the way for a more environmentally conscious future, where the youth are empowered to make a positive impact on climate change and related issues.

Keywords: *Climate Change, Matrix barcode, DRRM*

INTRODUCTION

From school year (SY) 2009-2010 to school year (SY) 2017-2018, data from the Department of Education's (DepEd) Enhanced Basic Education Information System (EBEIS) unveiled a concerning trend. Out of nearly 47,000 public schools across the nation, a staggering 43,810 schools experienced natural hazards at least once every eight (8) years. This unsettling revelation highlighted the vulnerability of educational institutions to environmental challenges. Among the affected schools, 39,738 endured the onslaught of tropical cyclones, 25,191 were submerged by floodwaters, and 5,824 grappled with coastal area concerns. Notably, the data did not take into account the impact of droughts and rising sea levels on the educational sector.

This statistical evidence underscored the profound effects of climate change on the nation's youth, one of the most vulnerable segments of the population. The relentless onslaught of severe weather events, including typhoons and droughts, posed significant risks to the physical, mental, social, and emotional development of these young individuals.

Climate change, with its myriad impacts, had the potential to worsen existing health risks and spawn new public health challenges. The industrial era's progress had come at a cost, with climate change adversely affecting human health through rising temperatures, extreme weather events, and exposure to poor air, food, water quality, and changing infectious agents.

Moreover, climate change had repercussions on health-related social and environmental factors such as air quality, safe drinking water, food security, and shelter. This threat to essential resources was projected to lead to increased drought severity and frequency globally by the end of the twenty-first century.

The World Health Organization's 2018 report highlighted how rising temperatures and unpredictable precipitation patterns contributed to food production reductions, heightened hunger, and increased undernutrition. In this context, Nepal, among other places, was grappling with the rapid emergence of infectious diseases, health inequalities, and the looming specter of climate change.

Studies conducted by Rahman et al. (2018) and Bello (2014) revealed that young people and students had varying levels of awareness about climate change's physical and psychological impacts, underlining the need for educational programs. These initiatives would help students develop problem-solving and decision-making skills related to climate change and foster an understanding of its consequences.

In this backdrop, the idea of creating and developing a Matrix Barcode, a virtual reality Quick Response (QR) code, to raise awareness about climate change among students emerged. This innovative approach could bridge knowledge gaps and equip students with the necessary tools to comprehend and address the challenges posed by climate change. In doing so, it aimed to empower the youth to become active contributors to environmental sustainability.

RESEARCH QUESTIONS

The study focused on utilizing the Matrix Barcode, a QR code that enabled learners to scan, view, and watch videos about climate change. The objective was to increase their awareness of climate change and empower them with knowledge about this critical global issue. This approach aligned with the educational goals of the BEDP 2030, aimed at fostering resilient, informed learners who understand their rights, responsibilities, and the importance of climate change awareness in the context of their education.

Specifically, it seeks to answer the following questions;

1. What is the pre-assessment level of awareness of the students about climate change before using matrix barcode?
2. What is the post-assessment level of awareness of the students about climate change after using matrix barcode?
3. What are the problems encountered by the students while using the matrix barcode?

METHODOLOGY

The researchers employed quantitative research to assess the students' awareness of climate change over a two-week period. The study's participants were selected students from Grades 7–10, with 10 students randomly chosen from each grade level.

To gauge the initial level of climate change awareness, the researchers administered a pre-assessment survey. Following this, they introduced the QR code. After the two-week interval, the researchers conducted a post-assessment survey to evaluate whether there had been an improvement in the students' awareness of climate change. This approach allowed the researchers to measure the impact of the Matrix Barcode intervention on the students' knowledge of climate change within the specified time frame.

The creation and validation of the pre- and post-assessment, as well as the video that students would access by scanning the QR code, were submitted to experts for preliminary validation. The experts provided comments and suggestions for improvement during this phase. Subsequently, the instruments underwent revisions, and the validation process continued until the pre- and post-assessments achieved completion and approval from experts. This rigorous validation procedure ensured the reliability and accuracy of the assessment tools employed in the study. The data also interpreted as follows: 0-10: Very Low Awareness, 11-20: Low Awareness, 21-30: Moderate Awareness, and 31-40: Reasonable Awareness.

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RESULTS

The study focused on utilizing the Matrix Barcode, a QR code that enabled learners to scan, view, and watch videos about climate change. Specifically, the following results were gathered.

Figure 1 displayed the pre-test mean scores of the students in each grade level. The data revealed that the mean scores for Grade 7, 8, 9, and 10 were as follows: 19.27, 18.40, 18.28, and 19.91, respectively. This indicated that, in terms of their awareness of climate change, students had low awareness, signifying that they possessed a basic understanding of climate change but lacked a comprehensive grasp of its causes, impacts, and importance.

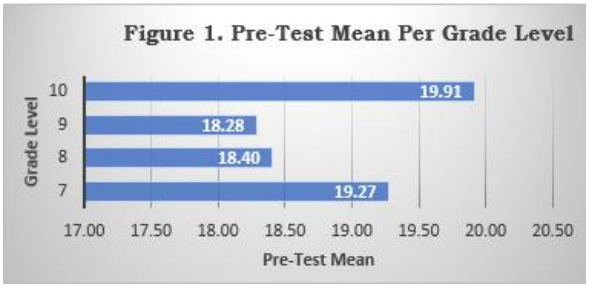

Figure 2 displayed the post-test mean scores of the students for each grade level. Grade 7, 8, 9, and 10 exhibited mean scores of 34.18, 34.44, 34.67, and 37.29, respectively. These scores were interpreted as indicating a 'Reasonable Awareness.' This means that students with scores in this range demonstrated a good understanding of climate change, including its fundamental causes and potential consequences, but their knowledge might not have been extensive.

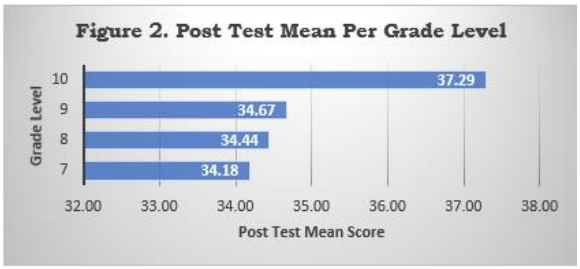

Table 1 displayed the comparison of pre and post-test mean scores per grade level. Before the implementation, the total mean score for the grade levels was 18.97, which was interpreted as 'Low Awareness,' signifying that students had a basic understanding of climate change but lacked a comprehensive grasp of its causes, impacts, and importance.

Table 1. Comparison of Pre and Post Test Mean Score Per Grade Level

Grade Level	Pre-Test Mean	Post-Test Mean
7	19.27	34.18
8	18.40	34.44
9	18.28	34.67
10	19.91	37.29
Total	**18.97**	**35.14**
Interpretation	**Low Awareness**	**Reasonable Awareness**

On the other hand, after the implementation of Matrix Barcode, the post-test mean score was 35.14, which was interpreted as 'Reasonable Awareness.' This indicated that students with scores in this range demonstrated a good understanding of climate change, including its fundamental causes and potential consequences, although their knowledge might not have been extensive.

DISCUSSION

The use of Matrix Barcodes as a tool to enhance awareness of climate change among school students is a promising endeavor that warrants attention. The results presented in this study are indicative of the positive impact that innovative technology can have on environmental education. In an era where climate change poses a significant threat to our planet, it is crucial to equip the younger generation with the knowledge and awareness needed to address this global challenge effectively.

1. What is the pre-assessment level of awareness of the students about climate change before using matrix barcode?
    - Based on the data presented, it is clear that there was an initial lack of comprehensive awareness among students. The mean scores indicate low awareness, suggesting that students possessed only a basic understanding of climate change. This highlights the need for educational interventions that extend beyond the traditional classroom setting. This study provides a compelling example of how technology can address this gap.
2. What is the post-assessment level of awareness of the students about climate change after using matrix barcode?
    - The data showed a more encouraging picture, as post-test mean scores reflected a significant improvement. The shift from 'Low Awareness' to 'Reasonable Awareness' suggests that the Matrix Barcode implementation effectively enhanced students' understanding of climate change. These results imply that the Matrix Barcode served as an engaging and informative tool, enabling students to develop a deeper appreciation of the causes and consequences of climate change.
    - In addition, the transformation from a total mean score of 18.97 (Low Awareness) to 35.14 (Reasonable Awareness) highlights the effectiveness of the Matrix Barcode in elevating students' awareness. This transition not only signifies a substantial improvement but also underscores the importance of adopting innovative approaches in disaster risk reduction and management projects within school curricula.

In conclusion, the use of Matrix Barcodes in this school-based DRRM project has proven to be a valuable tool for enhancing awareness of climate change among students. The results provide a strong rationale for integrating technology-driven educational tools into school programs to equip the younger generation with the knowledge and awareness required to address climate change and related issues. This study serves as a beacon of hope for a more informed and environmentally conscious future.

The use of Matrix Barcode as a tool for enhancing awareness of climate change in a school-based DRRM project for students has yielded significant improvements in students' understanding of this critical issue. The findings from this study clearly demonstrate the effectiveness of this innovative approach.

The initial pre-test mean scores indicated that students had a limited understanding of climate change, characterized by low awareness. They possessed a basic grasp of the concept but lacked comprehensive knowledge of its complexities, causes, and consequences. However, after the implementation of Matrix Barcode and the exposure to educational videos, the post-test mean scores showed a substantial increase, indicating a transition to a state of reasonable awareness.

This transformation from low to reasonable awareness is noteworthy. It demonstrates the potential of using

technology, like Matrix Barcode, as an educational tool to bridge knowledge gaps and enhance students' understanding of critical global issues, such as climate change. While the post-test scores did not indicate an extensive level of knowledge, they did show that the students had acquired a strong foundational understanding of climate change, its causes, and potential impacts.

This project serves as a testament to the power of innovative teaching methods in the digital age. It underscores the importance of leveraging technology to empower the younger generation with knowledge about environmental issues, enabling them to become informed and responsible global citizens. Further research and broader implementation of such approaches could contribute significantly to addressing the challenges of climate change and other pressing global concerns.

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REFERENCES

Ortega, J. and Klauth, C.(2017, July). *Climate Landscape Analysis for Children in the Philippines. UNICEF Philippines.*

Rahman, M.S., Hossain, M.A., Zaman, M.H. & Mannan, M. (2018). *Awareness on climate change: Perceived physical and psychological impact among the young generation. least developingcountry's perspective.* Interdisciplinary Environmental Review, 1(19), 91–101. s

Rahman, M. S, Mohamad, O. & Zarim, Z.B.A. (2014). *Review of health impacts and perceived awareness of climate change by young citizens.* Global Journal of Health Science, 6(4), 196-204. doi: 10.5539/gjhs.v6n4p196