

IMPACT OF WINDOW VIEW CLASSROOMS ON ARCHITECTURE STUDENTS PERFORMANCE

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ABSTRACT

Architecture students spend most of their time in classrooms due to a constant creative workload, eventually leading to attention fatigue. Reports from different learning settings, such as Universities and colleges worldwide, indicate the outbreak of mental health problems amongst students concerning continuous exposure to the classroom environment. Growing research indicates that connection with nature and the outdoor environment contributes to the adult and child's well-being in learning settings. The reported benefits from exposure to nature include increased learning, improved social behaviour, less stress, inattention, hyperactivity symptoms, and absenteeism. However, there is limited evidence that helps us understand the relationship between natural window views and students' stress recovery levels. Therefore, it is necessary to investigate the benefits of nature-based window-view classrooms and their benefits. The study analyses the academic performance of architecture students of a National level Architectural School in Vijayawada based on memory recollection and creativity. The results show that the classrooms holding a view of nature/landscape show significant performance in attention and cognitive skills.

KEYWORDS: *Architecture students; Classroom; Creativity; Performance; Window view*

1. INTRODUCTION

The students of Architecture students spend most of their time in their classrooms with the requirement of directed attention and creativity. Nature helps them to recharge their direct attention, which helps them to develop creative ideas. Research states that humans have spent most of their time with nature throughout evolution. During everyday life, a feeling of comfort can be achieved if our rhythms are synchronized with those of the environments," which states the importance of nature in human life [3]. Scientific research indicates that nature significantly impacts our physiological, psychological, and cognitive health[4]. Nature can benefit education, the workplace, hospitality, and retail spaces. By implementing exposure to nature in educational buildings, one can witness an increase in the learning ability, attendance of students, academic performance, and creativity[5].

a. Background Study

High schools and universities often experience stress due to the high expectations of their peers, examinations, and lack of time, skills, money, sleep, and adequate support[6]. This stress can significantly affect the employees' and students' health, well-being, and academic achievements[7]. The theoretical framework of Abdelaal proposes that including biophilic elements such as plants, natural landscapes, light, and water in learning spaces, such as classrooms, supports learning ability and can generate a sustainable, inspiring, and innovative learning environment[8]. It has been observed that exposure to stress can cause both short-term as well as long-term effects. This influences cognitive abilities, health, comfort, attitude, and productivity[9]. Recent studies examining students' exposure to nature found that the campus's vegetation and surroundings significantly predicted school-wide student performance(i.e., standardized test scores and graduation rates) [10]. Students must focus, absorb information, and actively reflect on it during their classroom time. These tasks call upon students' directed attention and resources, which are susceptible to fatigue. This mental fatigue can lead to a reduced ability to solve problems, difficulties with inhibition, increased distractions, errors, irritable feelings, and susceptibility to stress [11]. Specifically, epidemiological studies provide population-level evidence that greater exposure to greenery is associated with reduced absenteeism in schools; improved academic performance; increased physical activity, improved mental health, brain development, and cognitive functions, reduced symptoms of attention deficit disorder (A.D.D.), and reduced stress [12,5].

Yin virtually experimented virtually with graduate students at Harvard school. Participants were tested in biophilic and non-biophilic virtual environments. The study measured attention capacity using a visual reaction time as an indicator of attention using the Stroop test, which measured attention and cognitive flexibility, and a visual backward digital task to measure direct-attention performance. Participants in the biophilic environment reported lower stress and frustration levels, higher engagement, and excitement than their responses in the non-biophilic environment [13].

Li and Sullivan investigated five public high schools in Illinois for subjective and objective attention. The visual analogue scale (VAS) questionnaire and Digit Span Forward and Digit Span backward tests were performed for subjective and objective attention, respectively. Students in the green window view condition demonstrated a 13.12% increase in attentional functioning after the 10-minute break.

VandenBogert et al. experimented in a university, secondary school classroom where potted plants and green walls were used as a stimulus to understand its effect on students' performance. Attention was measured by the digit symbol substitution test (DSST), which showed that students preferred classrooms with an indoor natural environment [14].

b. Effects of Daylight

Lighting design has been used to set the mood for space, and different lighting conditions elicit differing psychological responses. The impact of daylight on performance, mood and well-being

has been studied for years in multiple environments [15]. Students studying for a long time frequently suffer from attentional fatigue. 'Light can affect human behaviour, mood, and health via pathways other than the visual system'[16]. In this sense, classrooms without windows should be avoided for permanent use because they disturb the chronobiological system regulating the production of hormones [17].

In some studies [18-23], measurements of air exchange rates, carbon dioxide levels, and relative humidity were associated with health effects or academic performance, while other researchers found no significant correlation[24-26]. A study by Matsuoka[27] analyzing views of nature among 101 high schools revealed consistent and systematically positive relationships between nature exposure and student performance.

2. METHODOLOGY

a. Experiment setting and participants

This study was carried out in an Architectural School of National importance, the School of Planning and Architecture in Vijayawada. The study was conducted considering the plan of similar classrooms in the institution in terms of dimension but with different window conditions and the view it offered. The layout for the study is a classroom without any windows, a classroom with windows opened onto a built space, and a classroom with windows that open onto green space. For the analysis of the results, codes were provided for different window conditions, such as no window (N.W.), barren window view (B.W.V), and nature window view (N.W.V). The planned institution of architecture was selected based on the criteria that they catered to architectural students and that they contained identical classrooms with different window views. For the study, 50 undergraduate and postgraduate students and their classroom observations were recorded. The session of modules was organized in three different classrooms with the same dimension and similar furniture layout, following the required type of classroom: N.W., B.W.V., and N.W.V. The questionnaire's objective was designed to understand whether nature enhances the participants' recharge their directed attention using five different questions, including testing their cognitive skills at regular intervals. Guilford's alternative Uses test was conducted after all the questionnaire sessions to evaluate the participants' creativity.

b. Procedure

The experiment was conducted for three different days, for the same timeline, with three windows conditions and a constant duration of 30 minutes. The class was split into three durations of 10 minutes to evaluate the student's academic performance. After 10 minutes of the session, the participants were asked to provide their responses for about 5 minutes. Guildford's alternative Use test was conducted towards the end, requiring the participants to devise alternative uses for three given objects within 5 minutes.

c. Measurement of Academic Performance

To measure students' academic performance, a questionnaire was made to test their recollection based on the class they attended. After every 10 minutes of class, a questionnaire was given which

consisted of 5 different types of questions: Multiple Choice Question (MCQ), Multiple Answer Question (M.A.Q.), True or False Question (T-F), Deductive Answer Question (D.A.Q.), and Cognitive Questions (C.Q.). The cognitive question of each session of the questionnaire focused on different aspects:

- **MCQ:** Practicing retrieval of recently studied information enhances the likelihood of the learner retrieving that information in the future. Multiple choice questions are quick and simple to gather and draw insight and conclusions from any quantitative data. Seeing it could trigger a student's memory and enable them to answer correctly if it eludes them.
- **M.A.Q.:** Multiple-answer questions present respondents with a range of answer options from which respondents can choose one or more answers. This helps in understanding several contributing factors or measures awareness among the participants to demonstrate their depth of understanding about a given topic.
- **T-F:** True or False questions are comparatively easy and can be an unreliable assessment form. From the participant's perspective, they require little effort and are non-threatening due to a lack of mental challenge and a high chance of success. These characteristics make them ideal to quickly and easily deploy in the course to enhance student interaction, gamification, self-assessment, feedback, and reflection in a non-graded context.
- **D.A.Q.:** Deductive answer questions activate the participants' thinking ability around a specific subject that is given in a bit of a confusing manner with similar objects or texts. To identify the odd one, one needs to develop logical thinking in classifying those objects based on general concepts.
- **C.Q.:** Cognitive questions are sometimes referred to as reasoning ability and describe a person's ability to learn, adapt, solve problems, and understand instructions. Some researchers have stated that cognitive ability tests help evaluate a person's 'capacity to take stock of their surroundings and determine the appropriate actions.

d. Measurement of Creativity

Guilford's Alternative Uses Test (AUT) was conducted to bring different possible aspects with a time constraint. The AUT intends to have the test taker think creatively and measure a certain level of divergent thinking, exploring multiple answers using creativity [28]. The time allotted was 5 minutes for completing a total of 3 objectives.

3. RESULTS AND DISCUSSION

The results are presented in five sections: classroom type compared with the question type, classroom type compared with questionnaire set 1, classroom type compared with questionnaire set 2, classroom type compared with questionnaire set 3, and classroom type compared with the AUT test results.

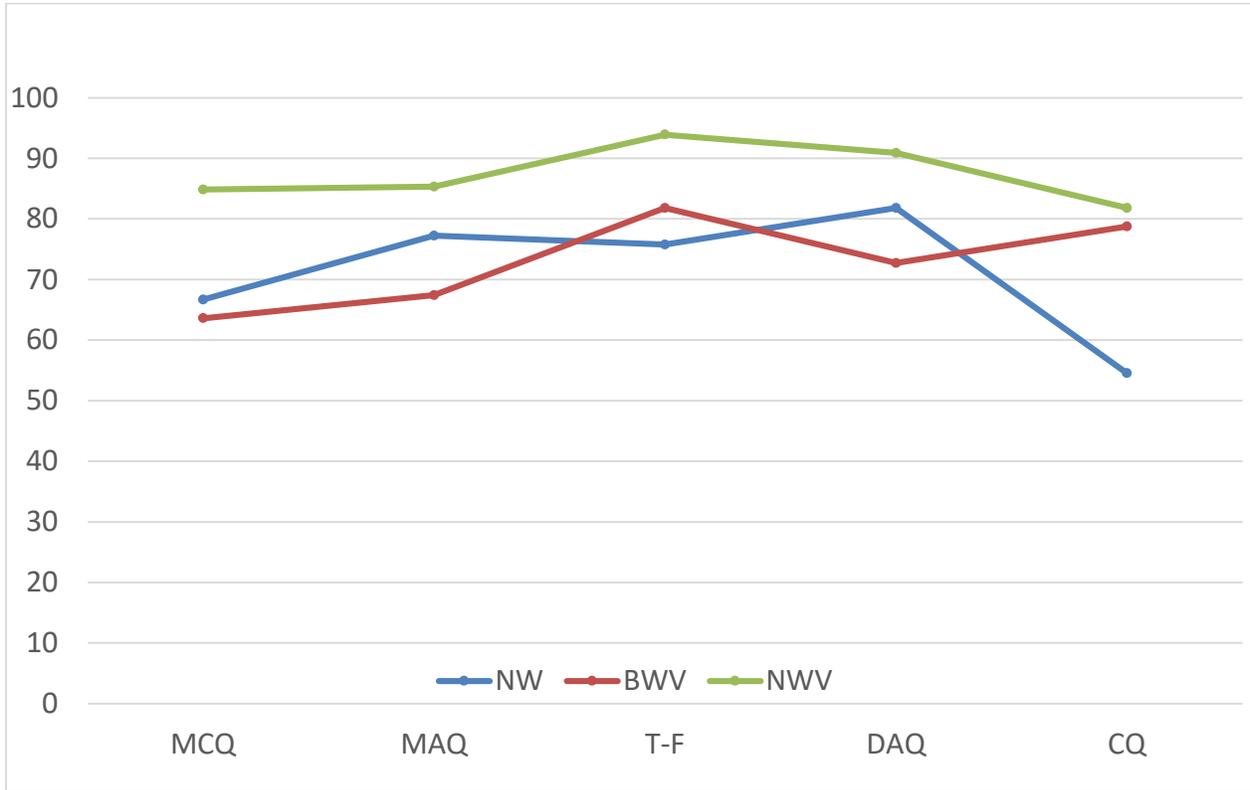


Figure 1: Question type comparison for the entire session

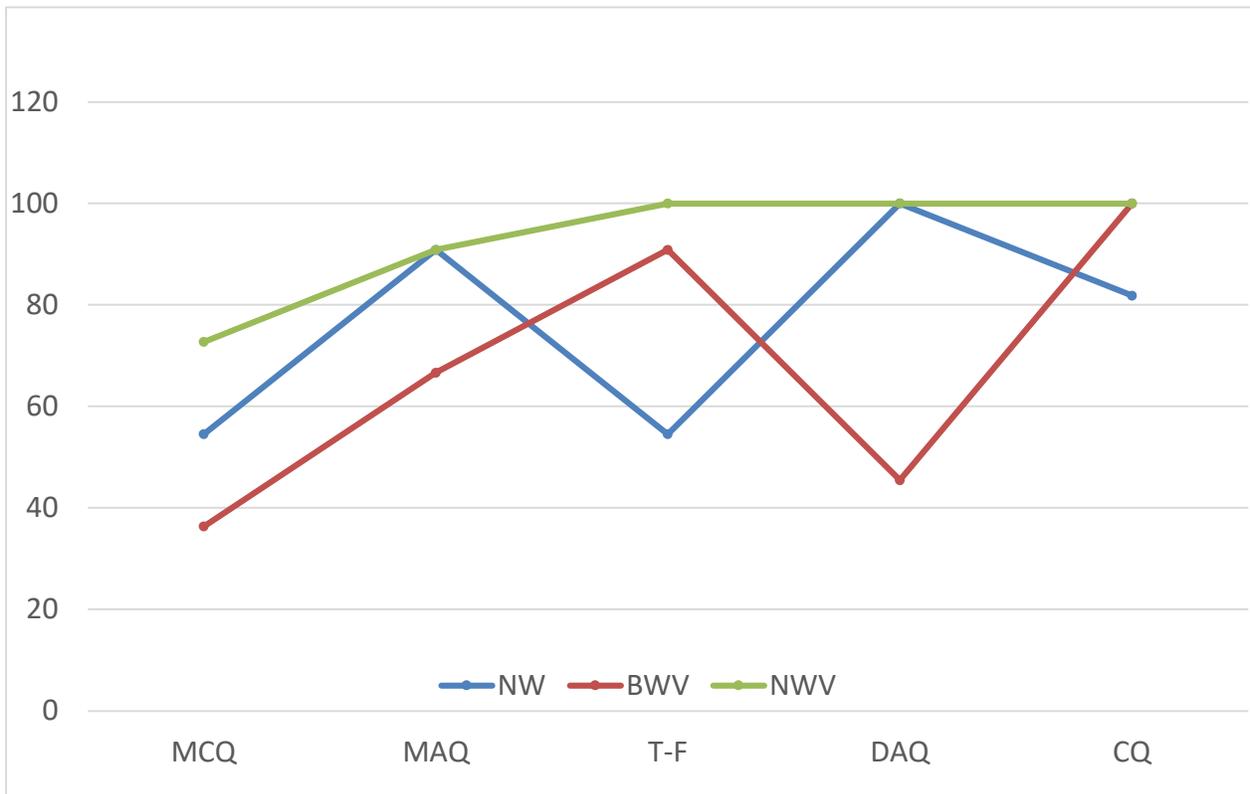


Figure 2: Question type comparison for 0-10 mins

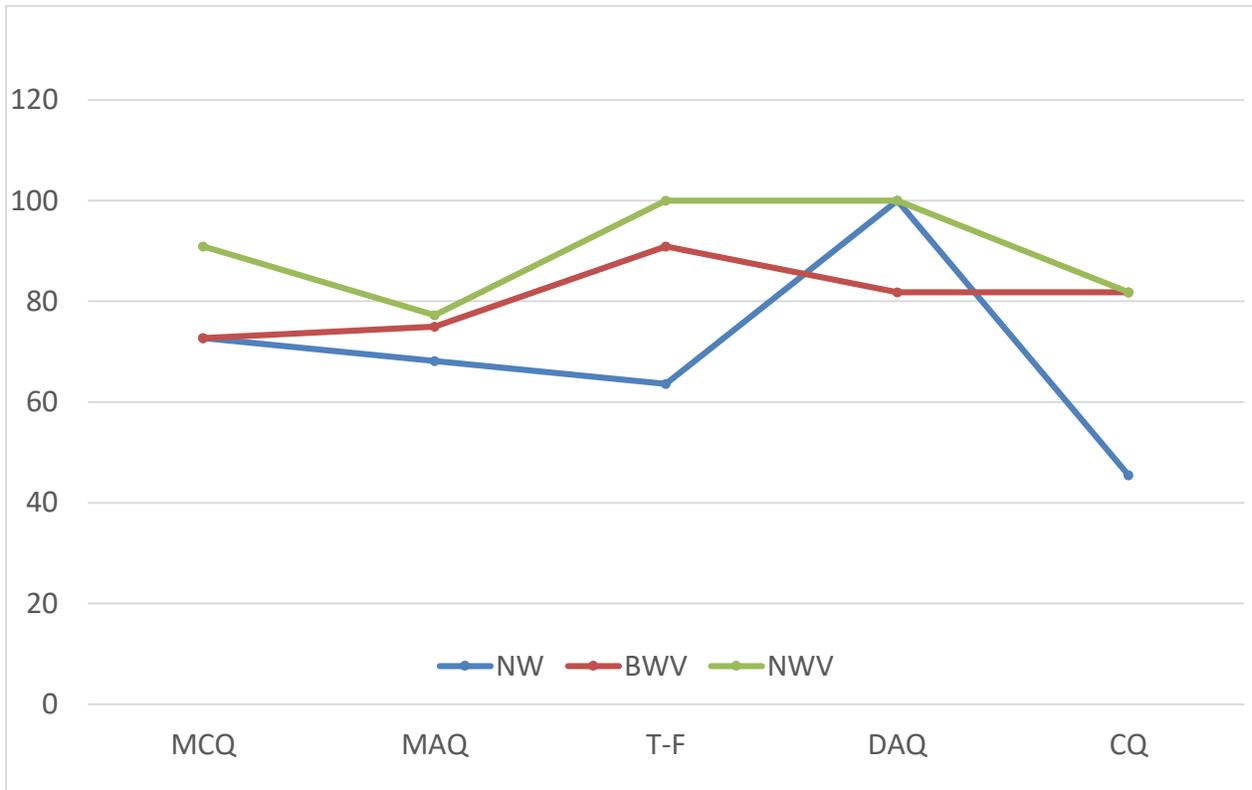


Figure 3: Question type comparison for 10-20 mins

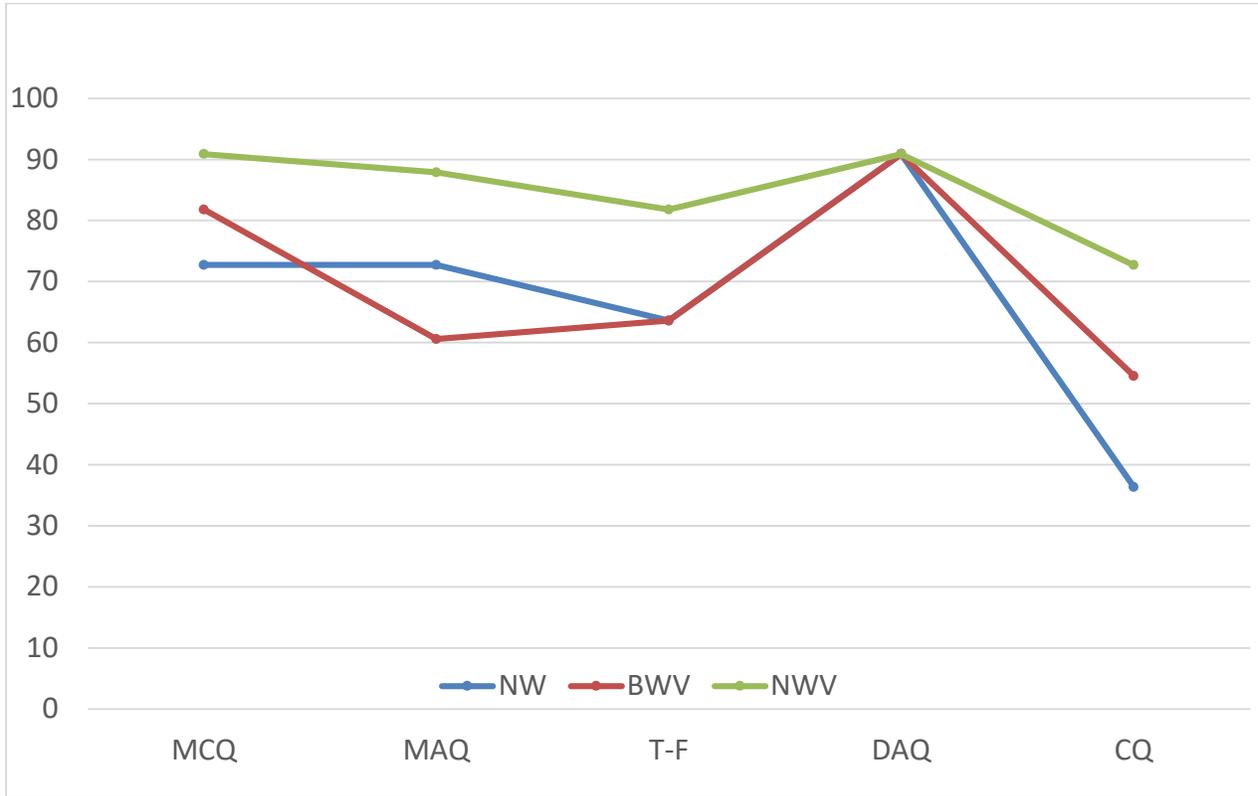


Figure 4: Question type comparison for 20-30 mins

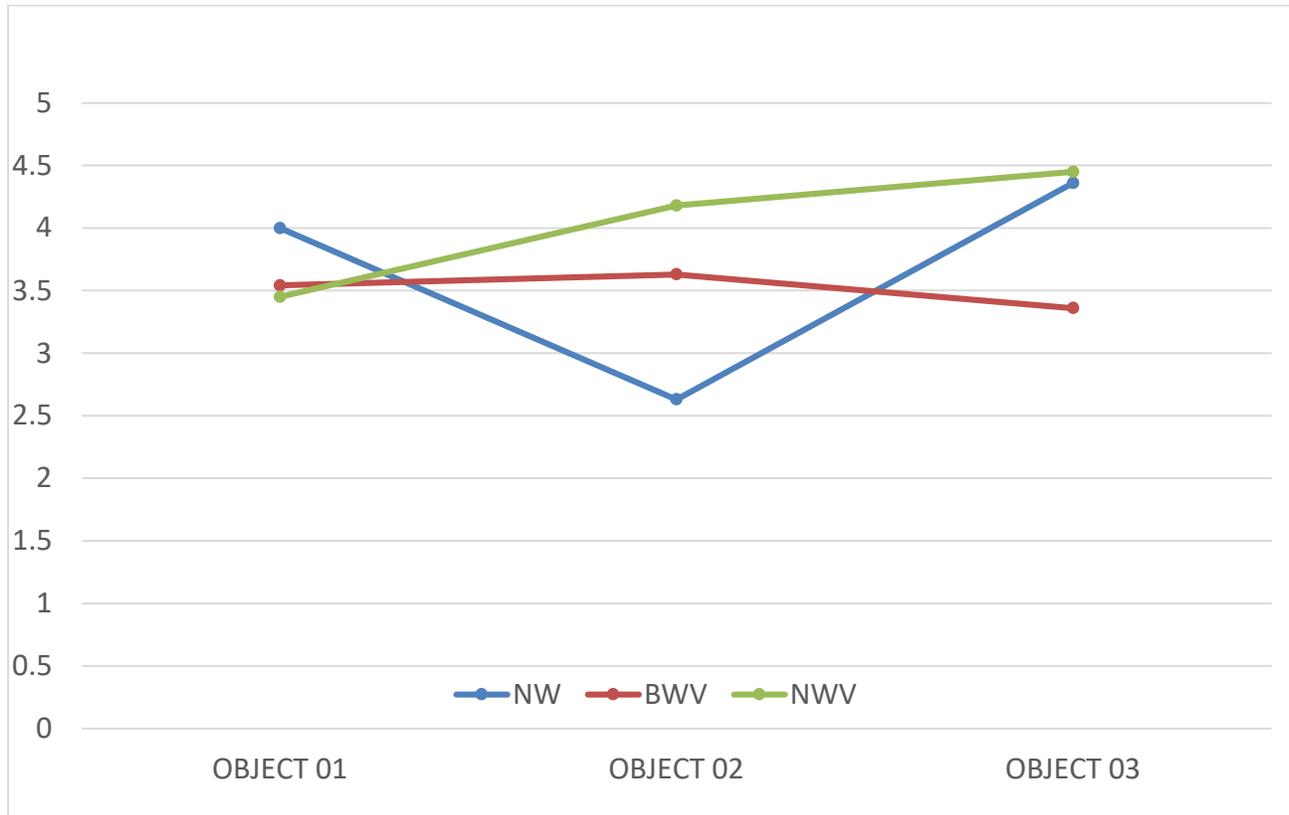


Figure 4: Question type comparison for 20-30 mins

a. No Window Classroom

It was observed that compared to the B.W.V., the students' performance was better in MCQ, M.A.Q., and D.Q. types of questions. However, compared to the performance from the N.W.V. classroom, the students performed much better in all questions. However, the same is not valid for creativity, as it varies.

b. Barren Window View of Classroom

In the N.W. classroom, the student's performance was better in T-F and C.Q. questions. The performance in CQ-type questions significantly increased compared to the performance of students in the N.W. classroom. Furthermore, compared to the performance in N.W.V. classroom, the students did not perform as much for all questions.

c. Nature Window View Classroom

It was observed that compared to both N.W. and BWV-type classrooms, the students performed better in all types of questions. This tends to signify that the presence of windows affects students' performance compared to the classroom without any windows, especially in the case of the student's cognitive performance. Nevertheless, the same is not valid for creativity, as it varies.

4. CONCLUSION

The study was conducted at the National importance Architectural Institution in Vijayawada. The study examined the impact of natural window views on architectural students' academic and creative performance in the School of Planning and Architecture, Vijayawada (SPAV) institution. There is a positive correlation between the presence of windows, which affects the student's academic performance, especially their cognitive skills. It was found that the green window view significantly affected the students' performance for all the questions, which was not the case when comparing the no window and empty window view classrooms. However, there was a performance difference in the cognitive skill compared to the N.W. and B.W.V. classrooms. A more thorough investigation with advanced technologies and more time could reveal a clear link between the Green Window view and the student's academic success. In general, the findings correspond to previous research on the psychological benefits of nature. A classroom with a natural window view can help students cope with stress. Due to stress, there will be a variety of adverse outcomes, including physical illness, anxiety, depression, decreased academic performance, social withdrawal, etc. Simple measures such as the natural window view can significantly improve the students' stress recovery. Hence designers must work together to give students access to natural window views. By improving the campus landscape in this way, educational goals might be more easily reached.

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