

Effects of classroom lighting on filipino college students



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Several studies on the effects of lighting on students' academic performance had been done abroad on different social classes and ages of the subjects. These all had the objective of improving the learning process of students during their formative years at school. According to Bukky Akinsanmi, theories on how learning takes place include behaviorism, cognitivism, and constructivism. The behaviorism theory, which was popularized by B. F. Skinner, supports the idea that humans come into this world like a blank slate – tabular rasa. Humans learn based on reinforcements. Rewards are given to those whose action reaps positive results. Punishments are given otherwise. The effective transfer of knowledge is the teacher's responsibility leaving the student a passive participant. It is teacher-focused, structured, lecture-based, and uses reward and punishment to promote learning. The classrooms provided little room for flexibility. Lapses on behaviorism theory include the eventual possibility of extinction of positive results when rewards are removed and the attitude of just doing things for the sake of rewards. Since the behaviorism theory does not account for all learning, the cognitivism theory came into existence. It says that the mind is a "black box" that must be opened and understood. It focuses on the study of mental processes. Schools were built in single or two-story buildings connected by walkways housing students according to their grades. Meanwhile, Constructivism theory states that knowledge is constructed and not acquired. The learning process is now the responsibility of the student and not the teacher. It says that humans are like blank slates making meanings from experiences.

Unlike the behaviorism design of school environment, this theory supports student-centered, collaborative, cooperative, and experiential learning facilities with teachers serving as facilitators (Akinsanmi, 2008)

To enhance students' academic performance, the effective coordination of school environment must be studied. The physical characteristics of a school environment directly influences both the teacher's way of imparting knowledge on students and a student's performance at school. Such characteristics include sounds, temperature levels, and classroom lighting (Tope, 2013). Poor school facilities like inoperative heating system, inadequate ventilation, and poor lighting affect health, learning, and morale of students and staffs. Good overall building condition; including features such as large windows, natural lightings, and well-designed skylights on classroom settings; results to better students' academic achievement (Vandiver, 2011).

According to Robert Scott McGowen, the illumination of our surrounding environment impacts our reactions, motivations, moods, and sense of well-being. For centuries, this issue of illumination led to evident designs in architecture and natural lighting. Different degrees of illumination can be used to stimulate productive and creativity in offices and schools. Several studies had been done on providing windows or skylights in classrooms resulting to higher standardized tests. However, it does not clearly imply that the improvement in students' performance was due to increased light, quality of light, or physiological effect of natural lighting. Windowless spaces contribute to negative attitudes of students as well as their teachers especially when coupled with monotonous tasks. It was shown that natural
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lighting can improve the quality and quantity of lighting in instructional areas effectively. Daylight has been and is still the standard by which artificial light is measured. Research reports indicate a positive correlation between day lighting and academic performance. Good quality of lighting increases comfort and increased comfort contributes to higher scores and academic performance of both teacher and students. The developmental stages of students are also considered when designing lighting systems. It is a physical support on students to help them concentrate on their academic endeavors. Recently, the focus on effective learning environments has shone on healthy physical surroundings (McGowen, 2007). Changing the facilities creates a different learning environment. Creating change has a major impact on students, faculty, and administrators. This change creates the type of learning environment, which is more conducive to learning and performance. (Vandiver, 2011)

Two field studies and one experiment were done with Dutch elementary school children to examine the effects of dynamic lighting on concentration done by Slegers, Moolenaar, Galetzka, and Van Der Zanden. In the field studies, the pupils in the experimental conditions were subjected to different lighting settings and conditions during one day for a longer period of time (Study 1) or were constantly exposed to the focus setting for one month (Study 2), while the pupils in the controlled environment were subjected to the same lighting conditions during one morning (Study 3). They focused on pupils' concentration performance and evaluated the impact of different lighting conditions and settings on pupil's concentration. They also examined the differential effects of classroom lighting conditions on concentration for

gender. They evaluated the effects of lighting, conducting analyses of variance, using three samples of data from 181 elementary school children. The results of their field studies offer support for the positive influence of classroom lighting conditions on concentration. Although all pupils performed better at the concentration test at the consecutive measurement points, it appeared that the performance of the pupils in the experimental groups improved more than the performance of their peers in the control groups. Furthermore, the findings of the first field study show differences between grades: they found effects of lighting on concentration for pupils from grade 4, but not for pupils from grade 6. These findings suggest that older pupils' concentration might be less affected by the lighting conditions used than younger pupils. Hypothesis states that older pupils are more trained to concentrate while performing tests than younger pupils. On the other hand, the findings on the second field show that, on the average, older children perform better on concentration tests than their younger peers, no additional support was found for the role of age in the effect of lighting on concentration. Meanwhile, the results of the third study showed no statistically significant effect of lighting on concentration and so not substantiate the findings of the two field studies in a controlled environment. It might be because of the differences in the designs used. It suggests that the statistically significant differences found in the field of studies might be caused by uncontrolled extraneous influences that might limit or bias observation. It might also be that differences in the way children were exposed to the lighting conditions and settings in the different environments caused the differences between the findings. Although they did not evaluate the dynamic nature of the light system used, their findings seem to suggest <https://assignbuster.com/effects-of-classroom-lighting-on-filipino-college-students/>

that an environment in which different lighting settings and conditions are used to support specific activities and tasks at hand during a longer period of time may be more effective for pupils' learning than an environment in which pupils are exposed to the same lighting condition for a relatively short period of time. The effect of lighting might be situation, task, and time dependent as previous studies also have indicated. The differences between the findings of the field studies and the third study for the relationship between lighting and concentration may also have to do with seasonal effects. Seasonal effects were also found in a more recent study into the effects of dynamic lighting on student alertness in a lecture room environment. The results of that study showed that in spring no change in alertness could be detected, while in the autumn study the decrease of alertness during lectures was significant. These findings shed light on the effects of exposure to lighting conditions during different seasons and the effect of the dynamic nature of light. As such, attention should be paid to the added value of artificial lighting in combination with exposure to daylight for the improvement of the performance of students in educational settings. Third, the results of their field studies showed no evidence of differential effects of gender in the relationship between lighting and concentration. Although earlier studies did find effects of lighting on performance and mood differ between men and women, their findings do not indicate gender related effects of lighting on pupils in elementary education. This may be related to the difference between children and adults in effects of lighting, for instance in regard to the development of psychological and affective preferences for the environment in general, and lighting specifically. (Slegers et. al., 2012)

According to Warren Hathaway, a search for ways to improve education is sustained by the general view that the learning environment is an important aspect in the educational process and the specific findings of research into the effects of types of lighting on people. Among the most surprising findings from the research in this field were that those elementary students who received trace amounts of ultraviolet light in their classrooms developed fewer dental carries and had better attendance than students in a comparison group. Sunlight is still the most important source of light and energy for living organisms and it may be experienced as direct light or as skylight. Most people do their works each day under the influence of sunlight. However, as society becomes more urbanized, people spend much less time under sunlight and much more time under artificial lamps. We are surrounded by walls, floors and ceilings covered with colors seldom repeated on the same scale in nature and these colors are usually perceived under lighting systems designed more for efficiency than for their possible physiological or psychological effects on people. Indeed, our artificial lighting systems can only simulate twilight levels of illumination-light levels of 200 to 1500 lux in comparison to light in the natural environment at twilight of 2, 800 to 8, 200 lux and at noon up to 100, 000 lux. There is significance of wide differences in light levels between natural settings and built environments. Corth contended that the natural environment of our earliest ancestors was not the open plains but the forest floor. As a consequence, the habitat noon-time light levels would have been much lower than the 8, 200 to 100, 000 lux found in open areas. Moreover, he further contended that the spectral quality of the light at the forest floor was greenish-yellow and represented the combined result of the solar radiation spectrum and the <https://assignbuster.com/effects-of-classroom-lighting-on-filipino-college-students/>

filtering effect of the forest canopy. He also progressed the view that our ancestors only later they occupied the forest floor near the equator did they move onto the open plains either north or south of the equator. Thus he concluded that heavy skin pigmentation was a matter of camouflage for survival more than it was a filter against UV light. As humans left the forest cover and moved into the more open country to the end of the equator and away from zones of intense UV light, the pigmentation was reduced as a response to the need for increased vitamin D which is formed by the action of ultraviolet light on the skin. Following Corth's logic, one might expect two effects. First, in as much as the light spectrum of cool-white fluorescent lamps approximates that of the greenish-yellow light reaching the forest floor, people may find these lights to be very satisfactory. Second, if skin pigmentation decreases as a response to an increased need for ultraviolet light, highly pigmented people living in northern climates may have greater needs for ultraviolet stimulation than do lightly pigmented people. Sunlight contains all colors in relatively uniform amounts and all colors are equally visible when illuminated by sunlight. For this reason, natural light serves as the reference for comparing the color rendition characteristics of artificial lights, with natural light having the maximum or reference Color Rendition Index (CRI) of 100. The color rendition index is a measure of the way colors look under specific light sources. It is important to note that equivalent CRI indices mean the same thing only when the light sources to which they relate have equivalent color temperatures. As a consequence, colored objects may appear different when viewed under lights with different color temperatures but equivalent CRI indices. Not all artificial light sources accurately reproduce the full spectrum of sunlight. Incandescent lights are <https://assignbuster.com/effects-of-classroom-lighting-on-filipino-college-students/>

rich in red and yellow light, but radiate relatively little energy in the blue and green region of the spectrum. Cool-white fluorescent lights emit most of their radiant energy in the green and yellow bands of the spectrum, the range to which eyes are most sensitive. Thorington asserted that it is at the 555 nm that the lumen or the standard unit of light is defined. Full spectrum lights emit a significant portion of their radiant energy in the blue area of the spectrum. A further small percentage of the radiant energy from fluorescent lamps may fall into the ultraviolet range. Rooms lit with full spectrum fluorescent lights may be seen as being somewhat dimly lit since the eye is less sensitive to blue light than to green and yellow light,. Full spectrum lights do, however, have a relatively high Color Rendition Index and this may be very important to vision processes. In this regard, Aston and Bellchainbers compared high efficiency with lamps that provided a spectrum more closely balanced to natural light. In their report they said, The results clearly show that the Kolorite lamps, lamps simulating natural light in spectral distribution, not only provide better color qualities but give a higher degree of visual clarity than do the high efficacy lamps at an equivalent illuminations. Ozaki and Wurmm drew attention to the fact that light from high pressure sodium vapor lamps produced anomalies in the growth and development of animals. They presented evidence to the effect that the exposure of developing rats to high pressure sodium vapor (HPSV) lights caused characteristic changes in growth and development. Downing concluded: There is no area of our mental and bodily functioning that the sun does not influence. Our bodies were designed to receive and use it in a wide range of ways. We were not designed to hide from it in houses, offices, factories and schools. Sunshine, reaching us through our eyes and our skin,

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exercises a subtle control over us from birth to death, from head to tail.

Zamkova and Krivitskaya augmented regular fluorescent light with ultraviolet suntan lamps in a controlled experiment involving school children and they reported that when compared to the control group, students who received exposure to ultraviolet light showed increased levels of working ability and resistance to fatigue, improved academic performance, improved stability of clear vision, and increased weight and growth. Volkova studied the effects of ultraviolet supplements to general lighting in a factory and found that when compared to a control group, an experimental group of adults demonstrated decreased permeability of skin capillaries, increased white cell activity, and reduced catarrhal infections and colds. Richard Wurtman concluded that light has biological effects that are important to health and that some of these effects may be easily reproduced and measured in the experimental laboratory. These effects were of two kinds: those which modify the individual's endocrine, hormone and metabolic state by means of light reaching the retina and those which result from light on the skin. He also linked light entering the eye with responses of the pineal gland and secretion of the hormone melatonin. This hormone in turn influences the functions of other glands, possibly as a result of direct action on specific areas of the brain. Wurtman and Weisel studied the effects of light from cool white lamps and full-spectrum Vita-Lite lamps on a group of rats. Their findings support the argument that environmental lighting has an effect on at least some neuroendocrine functions. Himmelfarb, Scott, and Thayer reported that light from Vita-Lite (full-spectrum) lamps was significantly more effective in killing bacteria than light from standard cool-white lamps. Downing offered evidence that small amounts of ultraviolet

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radiation destroy bacteria and moulds. Relatively small amounts of ultraviolet light can stimulate calcium absorption among elderly men who have no exposure to sunlight and who eat a diet containing little vitamin D. Mass, Jayson, and Kleiber reported that students studying under full-spectrum lights had the smallest decrease over time in critical flicker fusion and an increase in visual acuity. Students studying under cool-white illumination demonstrated greater lethargy than those studying under full-spectrum lights (Hathaway, 1994).

Sleegers suggested that future research should, therefore, focus on the interaction between light conditions and settings, specific activities and tasks and duration. This may increase our understanding of the variability of the effect of lighting among classroom environments, school activities, tasks and student performance and the potential effects of dynamic lighting in school settings. More research is needed to test the effects of different lighting conditions and settings on the school performance of different age groups. Future studies should use reliable and repeated measurements of concentration in order to reduce bias, increase the validity of the design used and evaluate the possible long term effects of lighting on school performance of young children in natural school environments. More systematic research is needed on the relation of daytime and artificial light, concentration, and seasonal effects, using objective measures to analyze performance in real life settings and with prolonged exposure. By doing this, the findings of these studies may help to increase our understanding of person/environment interaction and its impact on the performance and learning of elementary school children (Sleegers et al, 2012). At the same

time, the literature on the non-visual effects of types of lighting on people is constantly expanding and from this there emerges a need to examine a variety of types of lighting for non-visual effects on people (Hathaway, 1994).