

An Ergonomically Designed Whiteboard with a Safety Locker

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Abstract

Whiteboards are the most common medium between a teacher and students to communicate in classrooms. In the mid-1990s, the popularity of whiteboards enhanced quickly and they have become a fixture in offices, meeting halls, classrooms, and additional work environments. However, the people who are using the product will suffer from MSD's (musculoskeletal disorders) of shoulders pain, leg cramps and back pains due to prolonged standing and reaching heights to write on the board. In addition to that in many colleges or schools, the teacher alone should carry the markers, dusters, heavy books and exam sheets. Often people may forget those things when they are in a hurry. That will increase more effort on the person either physically or mentally. To reduce MSD's to some extent, few modifications in the design of a whiteboard have been done to make it ergonomically friendly and also acts as a locker exclusively for rightful authorities or teachers.

Introduction

A blackboard is an eco-friendly writing surface on which text or drawings are made with chalks, made of calcium sulphate or calcium carbonate. But there are many advantages as chalk requires no special care, it is cheaper. Chalk has a mild smell, but, whiteboard markers have a pungent stench. Coming to disadvantages, chalk produces dust depending on the quantity of chalk used. Few people find this uncomfortable or allergic to it, and according to the American Academy of Allergy, Asthma and Immunology (AAAAI), there are links between chalk dust and allergy and asthma problems. The dust prohibits the use of chalk in dust-sensitive equipment such as computers. Later the Ceramic green boards came into existence which also uses chalk as a medium for writing on it. They are scratch-proof, fireproof, and waterproof, rustproof also a maintenance-free. But, they easily break. Later, Whiteboards came into existence. Whiteboards became commercially available in the early 1960s. They became commonly used by businesses firms & even more common in classrooms during the 1990s due to concerns over health problems in children with dust allergies and the potential for chalk dust to damage computers. Around 1990, about 21% of American classrooms had converted from chalkboards to whiteboards. But, still, there are few disadvantages in every type of boards such as musculoskeletal disorders. For reducing

them I redesigned a board which minimises the MSD's. By using the servomotors and biometrics housed into the board, it will make it safer and friendly to use as there won't be any need to lift the board manually by the subject and an unauthorised person cannot misuse it due to biometric. But for making it cheaper, I used adjustable knobs with a spring mechanism and a master lock and key for authorised people to carry. This product is budget-friendly, reliable and long-lasting due to its rigidity and view factor of a whiteboard is better in darker lighting conditions from chalkboards to whiteboards. But, still, there are few disadvantages in every type of boards such as musculoskeletal disorders. For reducing them I redesigned a board which minimises the MSD's. By using the servomotors and biometrics housed into the board, it will make it safer and friendly to use as there won't be any need to lift the board manually by the subject and an unauthorised person cannot misuse it due to biometric. But for making it cheaper, I used adjustable knobs with a spring mechanism and a master lock and key for authorised people to carry. This product is budget-friendly, reliable and long-lasting due to its rigidity and view factor of a whiteboard is better in darker lighting conditions. Whiteboards are the most common medium between a teacher and students to communicate in classrooms. In the mid-1990s, the popularity of whiteboards enhanced quickly and they have become a fixture in offices, meeting halls, classrooms, and additional work environments [1]. However, the people who are using the product will suffer from MSD's (musculoskeletal disorders) of shoulders pain, leg cramps and back pains due to prolonged standing and reaching heights to write on the board. In addition to that in many colleges or schools, the teacher alone should carry the markers, dusters, heavy books and exam sheets. Often people may forget those things when they are in a hurry. That will increase more effort on the person either physically or mentally. This proposed industrial design is mainly focused on methodology and guidelines for the design of an ergonomic-oriented whiteboard that helps a person to concentrate and work more efficiently. OSHA (Occupational Safety and Health Administration) has laws for classroom and teachers which should be followed by every workplace or workstation to reduce the risk factors in the long-run. Parents put their trust in schools [2]. They expect their child is being taught in a safe environment. The teachers deserve and are protected from workstation safety hazards in the classroom by a federal agency, OSHA. These regulations and standards are intended to protect the employee from injuries and death in the workplace. The locker provided will act as safe for daily needed things in the classroom.

Methods and Materials

Ergonomics in terms of safety for the teachers at workstation are least focused. There are some products which are so called interactive boards, electronic boards and smart boards. But they don't suffice the actual area of problem of workstation ergonomics. Before finalizing the concept, generative survey of questionnaires are conducted where 35 subjects, lecturers were participated. Lecturer's different backgrounds i.e. people from Designing, Engineering, Arts, Physiotherapy, Pharmacy etc. because, there will be different teaching methods used in different backgrounds. As, some of the backgrounds like arts or designing, they rarely use the board to communicate with students, but in other backgrounds like Engineering or in elementary or high schools, there will be maximum use of the white boards due to their method of teaching. The target population as some may need a locker instead of an ergonomically friendly white board. Our main target population is women teachers. As height variation is very high compared to males all over the world. Mainly the female will be beneficial as their average height is 5ft 4in. and minimum average height is 5ft 1in. The mechanism which could be used such as servo motors and biometric scanner are found to increase the cost in cost analysis of the material to be and found alternative by using value engineering. The adjustable mounting can be controlled by slides screw which is can be both manual and electronically controlled [3]. A manual locker with master key. If it is electronic, then there would be lesser human interaction for the adjustment. As the main goal of this ergonomics involved whiteboard is to reduce the MSD's facing by the people using it.

Results

By the survey conducted amongst 35 participants, both males and females, 69% of them felt the stress actively and passively during their teaching hours. Only 38% of the population is willing to some extent by carrying the classroom belongings such as books, cables, answer sheets, duster & marker. Remaining 62% are not willing to carry because, carrying extra weight during the working hours to every class is creating mental and physical stress on them. For the addition of locker into the white board, 85% of them agreed to it and remaining 15% agreed to some extent.

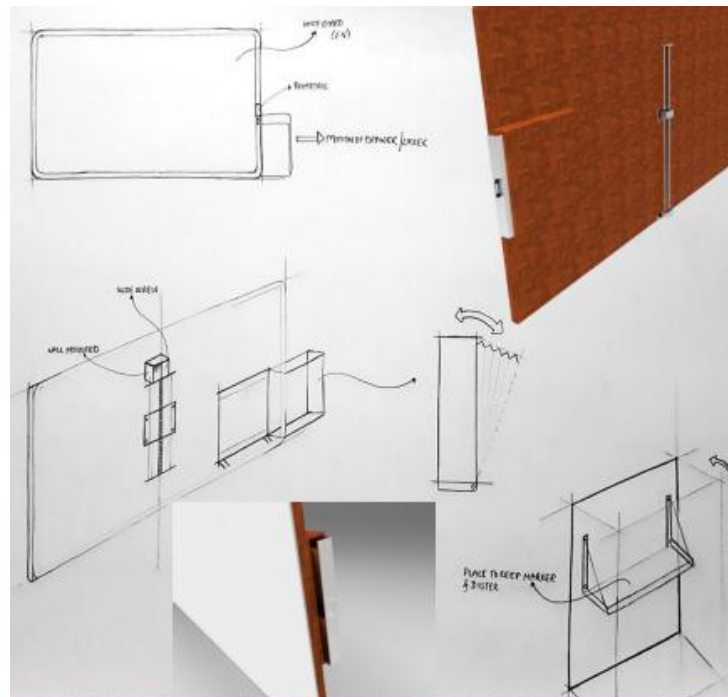


Figure 1 .Concept sketches and 3d Renders of ergonomically Designed White Board With locker.

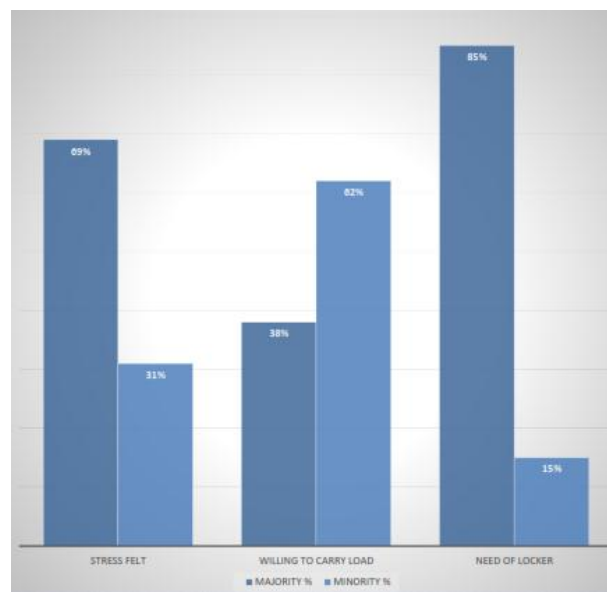


Figure 2 Illustration survey results.

Discussion

By this feedback survey along with research conducted amongst the people who are prone to musculoskeletal disorders in long run, it is showing that even there is improvement of the material of writing boards used in workplaces, the long term problem of musculoskeletal disorders faced by its users are considered only till some extent. So, by making changes to the design and adding mechanical advantages to it will solve the problems

facing by teachers in classroom workstation [4]. By this solution we can reduce the long-term disorders occurring to humans who has to stand at their work station and the locker provides safety to the belongings which reduces passive stress on the person.

References

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