# **PAHS** CHAIR



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Virginia Tech Industrial Design Thesis Spring 2023 Professors Dr. Yoon Choi & Brook Kennedy

Special thanks to my mentors throughout the semester Caleb Rancourt & Trip Ivey



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# How can the design of a chair instill better sitting posture habits in elementary school children?





# Problem:

Neck and back pain effect the majority of factors lead to neck and back pain, one of the most common is poor posture.



# **Americans**. While many

# 80% of adults suffer at some point from back pain as a result from poor posture

70% of adults have had neck pain so severer they cannot complete their daily activities





# **Poor posture** can cause a slew of complications that can effect your body in the long-run:

Weakens muscles and ligaments - Throwing off the bodies natural "mid-line" adds significant strain on the bodies muscles and ligaments. Fibers meant for posture are not being used, where as fibers intended for movement have to pick up the slack. Extra stress on muscles weakens them and reduces stability long-term.

**Mentally taxing**- The mind and the body are connected in far deeper ways than we think. Chronic pain from soreness can cause headaches, digestion issues, loss in confidence, fatigue, and greatly decrease the ability to focus.

**Visible changes in body**- With continuous poor posture, the body can develop permanent dis-figuration; such as- loss of height (sitting/ standing), difficulty walking, hunchback, disk degeneration, "tech-neck", and stiffness in what used to be regular daily motion.

**Good posture** is the proper alignment of your body when standing or sitting. Correct positioning results in the least strain or tension on muscles and ligaments.

Prevents injury and chronic pain- Keeping your body in optimal shape allows you to perform at your fullest physical potential. Muscle fibers meant for posture remain strong, while muscle fibers intended for movement maintain their ability to smoothly and confidently function.

Promotes Mental well-being- Maintaining good posture can help you feel great, feel more active, and subconsciously be more confident. Proper posture can boost energy levels and promotes focusing abilities.

**Improves physical appearance** - Proper posture can add literal inches to ones height (sitting/standing), pushes your shoulders back and chest forward to appear more confident, and keeps your disks in line.

Fun fact: For every inch your head moves past your "mid-line", 10 lbs of pressure is added to your neck and shoulders. Poor posture can add an extra 20-60 lbs! That's as much as a child sitting on your shoulders; for who knows how long.

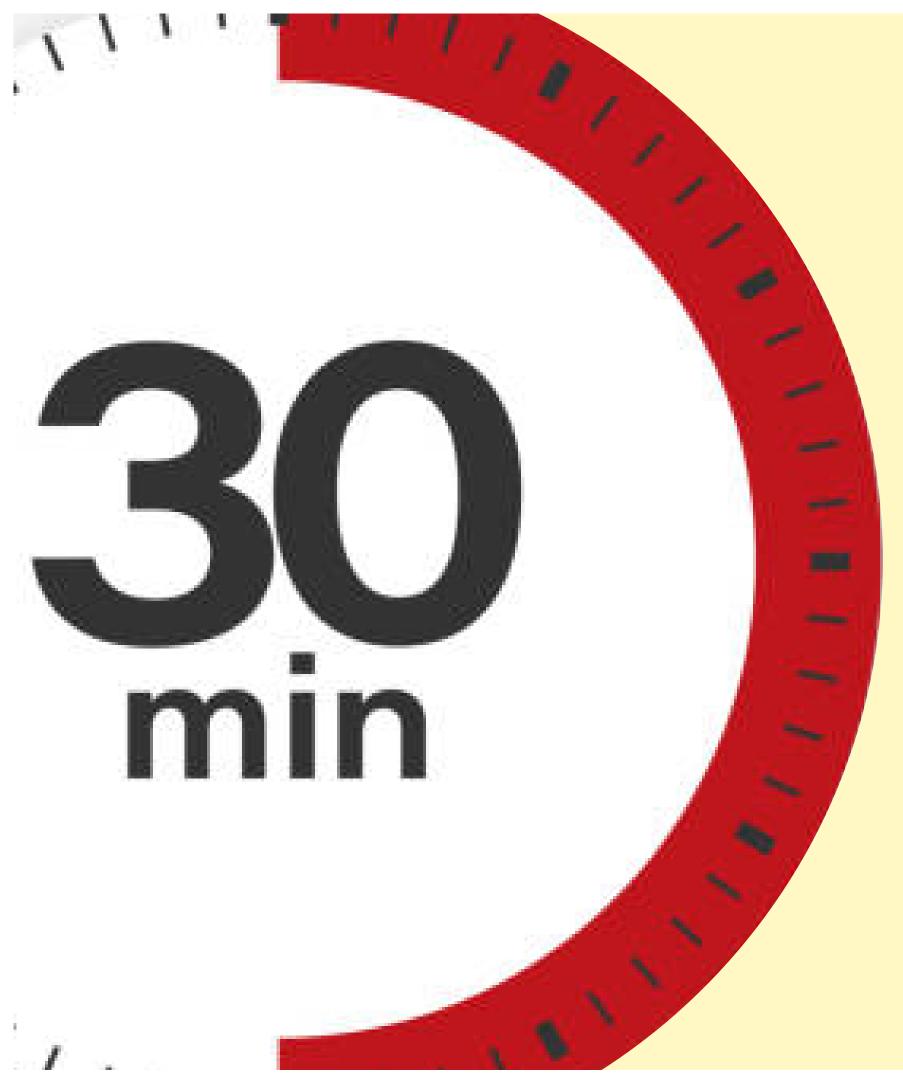
# Habits

While performing daily activities, our body utilizes previously learned motor patterns. If your body was taught to slouch- that is what it will perform.

Evidence has shown that bad posture as an adult was formed during childhood where we have developed habits by age 9.

Often, forming a habit easier than breaking one. It is proven that breaking a habit can take up to 254 days to break a habit.





## Think about it: The average US children are sitting for on average **8.5 hours a day**

school year sitting

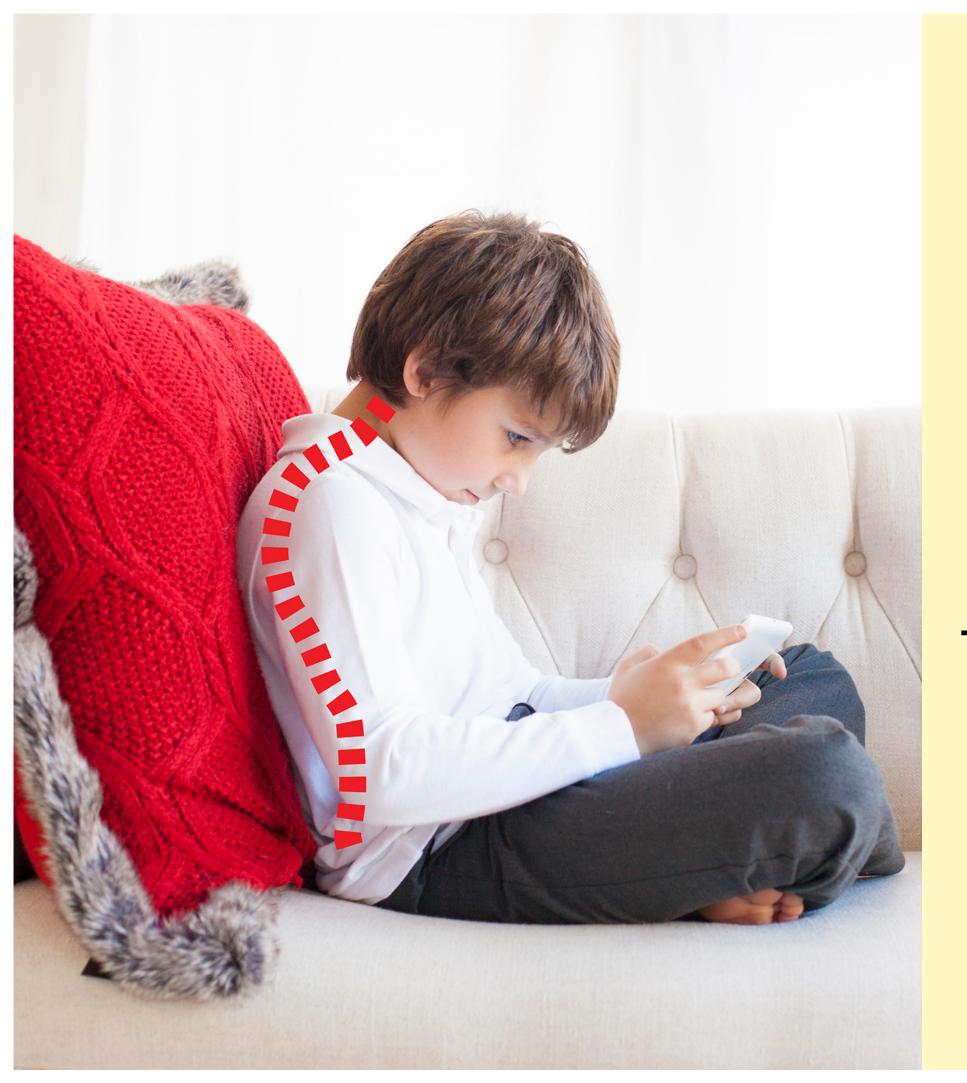
just 30 minutes a day

### Standard school year is 180 days with 990 instructional hours

# That equates to about **23% of**

# Forming a **habit in a child** takes

If we utilized just **30 minutes** of the **330 instructional minutes** in school, **better posture habits** will be instilled in 2nd grade children.



# We must alter the **habitual curve** for future generations.



# Market Research

Often, design for children comes from making adult products smaller without designing FOR children. Children are not capable of performing actions that are considered simple for an adult; like turning a knob to adjust height on a chair. Children are also far smaller than adults and are sized using a different set of poly-metrics to fit their bodies better.





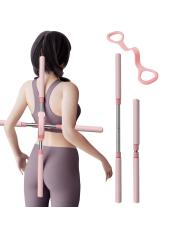




### For Adults







# Hard to use





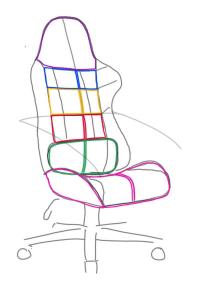


### For Children



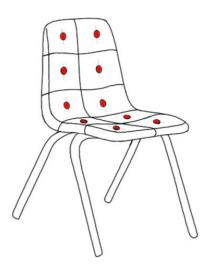


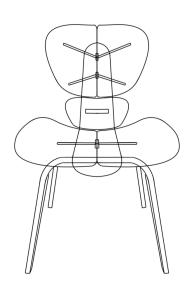


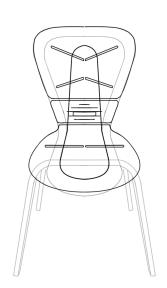


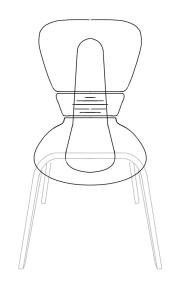


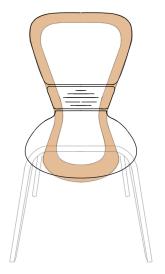


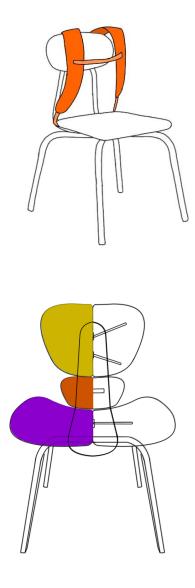


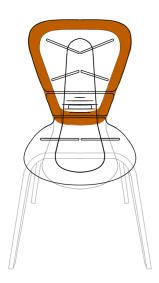




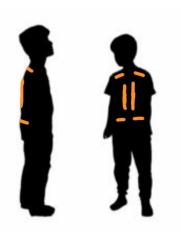








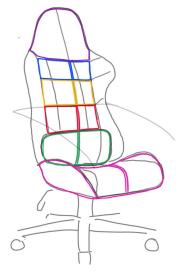
### Sketching/ Ideation



Gaming chair turns off without posture

Puffer inflates to support posture

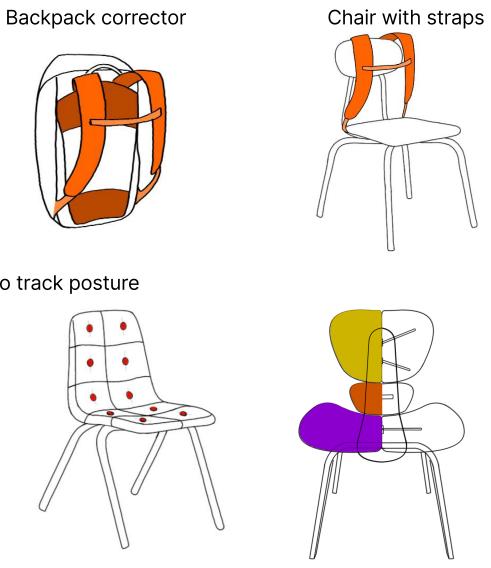
Spikes remind about posture



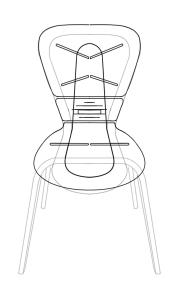


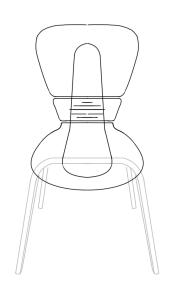
Seat with sensors to track posture



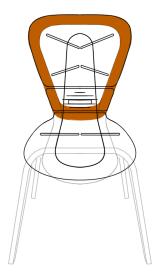


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Final form bent from one sheet of ply

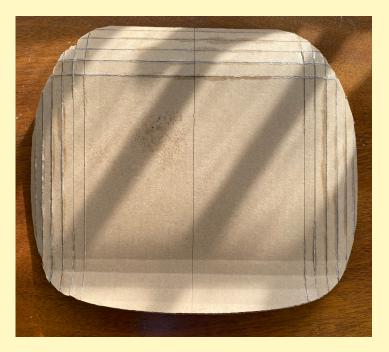




Cardboard form study was conducted to visualize the size of chair needed to accommodate a 2nd grade student. Resonating with the curves made from one sheet, I decided to mold my seat with layered and formed veneer.









Making the mold- I spent some time shaving away at foam to form nice curvature to mold the veneer. I cut the foam into strips to form shave and then put back together.

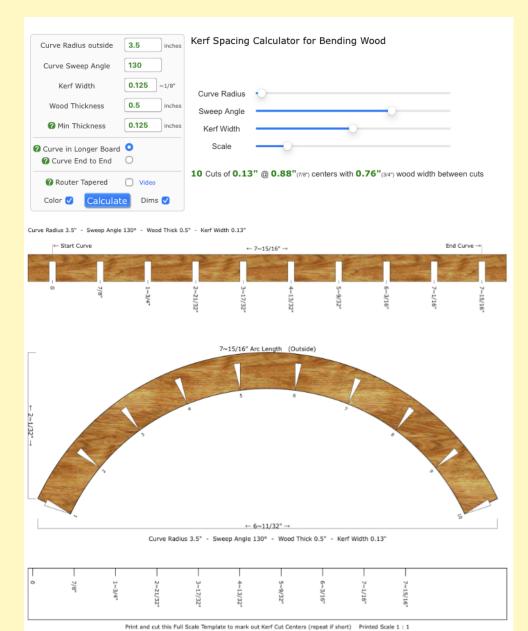
I made a critical mistake when I assumed veneer was supplied anywhere that carried wood... It was not. I had to think of a different way to form the seat.







Bend study- without access to veneer, a different approach had to be made. I researched wood bending and fell upon kerf spacing to cut ply wood down to the last veneer face to allow for bends. I still wanted to make the chair out of one piece of wood as if it was molded.











# Model Making-

Kerf cuts were made all down the board at their respective measurements to encourage the ply to bend. The ply was then soaked and steam pressed with an iron to make the fibers of the last face flexible to bend. Glue and clamps were applied to force form the shape of the seat.









# PAHSECHAIR



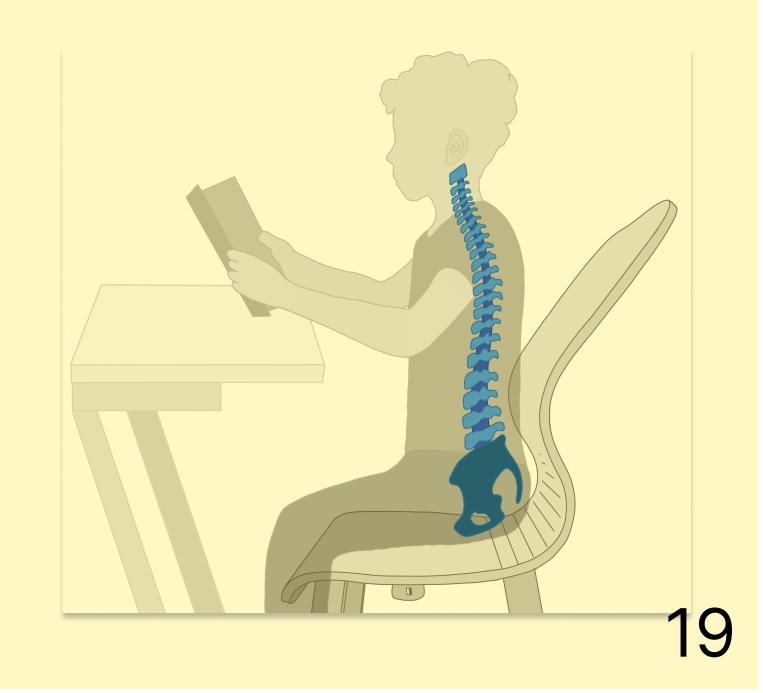
Story-

The body of the chair is molded from one piece of wood to form proper alignment for 2nd grade students. The chair is lined with 8 tactile sensors that activate with contact. Data is tracked by the chair to monitor seated posture while in class. It only takes 30 minutes a day!

1. Students misuse current chairs and are sitting more often than not with poor posture throughout class.

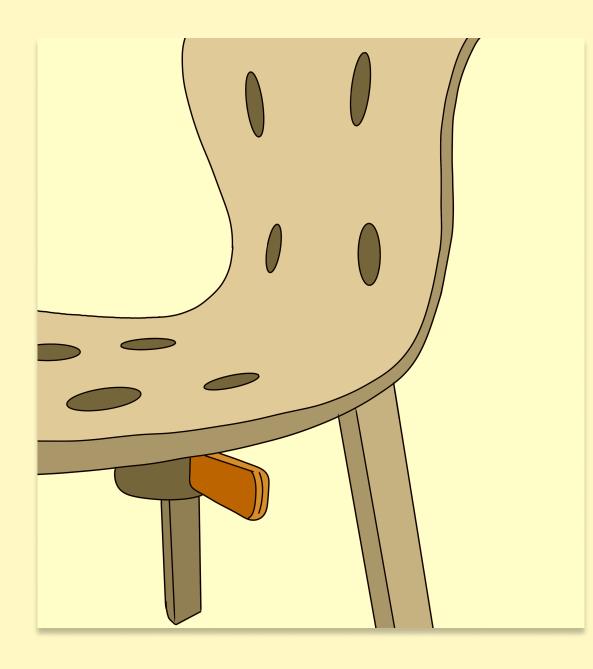
2. Schools furnish with



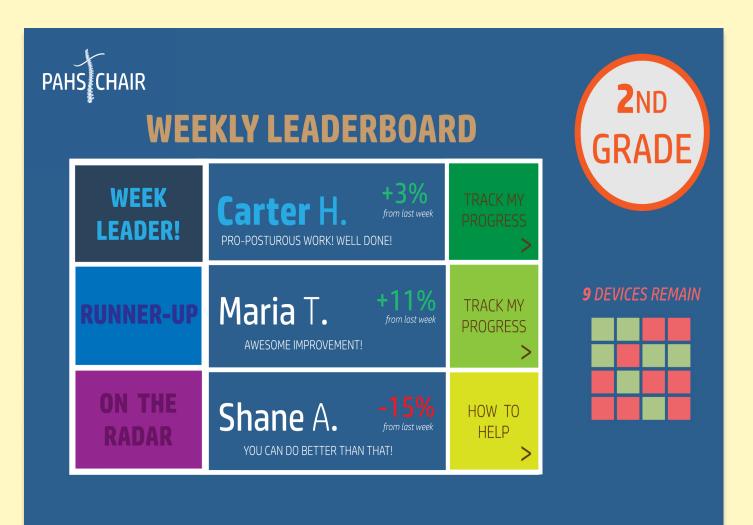


## Pahstchair to improve students seating postures.

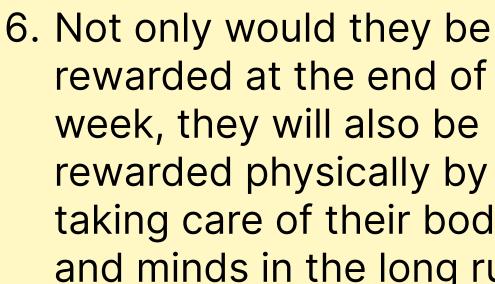
3. Data collecting device integrated under the seat records data on the students sitting habits while in school.



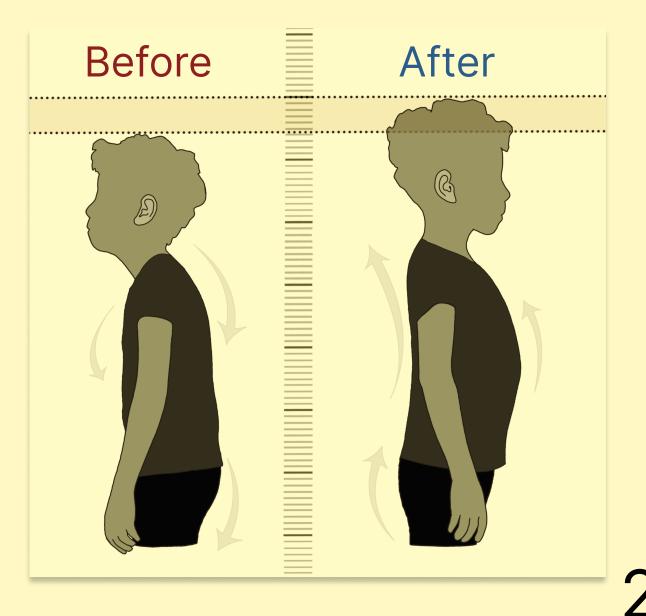
4. Students would bring their data collecting drive to the teachers' charging station. The dock transfers the data to the teachers server where they can track each student.



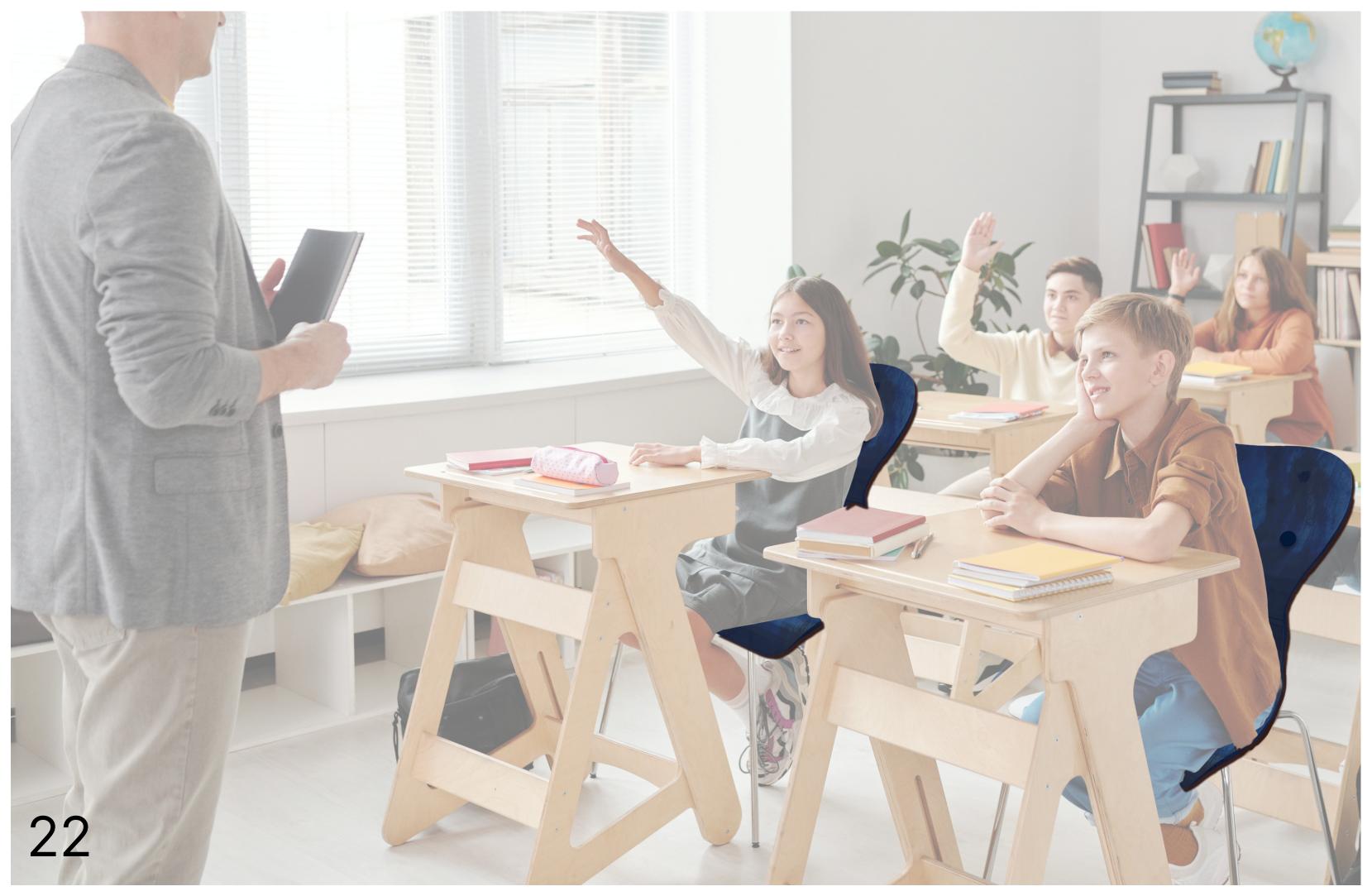
5. Based on the data of the students, the top performer with best posture for the week would be rewarded for their progress. This would incentivize them to continue practicing their posture.







rewarded at the end of the week, they will also be rewarded physically by taking care of their bodies and minds in the long run.





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## THANK YOU

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# CITATION

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