

STEM PATHWAYS

A Boost Against Arthritis **STEM** Challenge!

The Problem

Brian and his dad Bob suffer from arthritis. They spend hours daily behind the wheel of a tractor and truck. Their doctor suggested they purchase a new tractor seat to improve posture and comfort.

The Challenge

Design a freestanding seat that Brian and Bob can test for improved support, comfort and maneuverability.

Find a Solution

ASK: What are some possible ideas?

PLAN: Test out your ideas

CREATE: Put your ideas to the test

TEST: How well did your ideas work?

IMPROVE: Review results & make changes

Things to Consider

1. What seating dimensions are important?
2. What driver and/or environmental conditions do you need to consider?
3. How will design materials chosen impact vibration-absorbing suspension, pivoting and comfort?

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View This Video About The Design of A Chair
<http://www.engineerguy.com/videos/video-chair.htm>



Choose Your Design Materials

- Balloons (mixed sizes)
- Brown parcel tape
- Newspaper



SAFETY ALERT: Scissors are sharp! Please be careful when cutting. Alert the leader to any latex allergy!



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Note: Challenge can look a tractors, lawn mowers, cars, trucks, airplanes, amusement ride, stadium, office or home furniture chairs and seats.

TIME: 30 - 45 MINUTES

Materials & Supplies

- Balloons (mixed sizes)
- Brown parcel tape
- Newspaper

Design & Test Space

- Indoor or outdoor area sufficient for each team.
- When testing prototypes, make sure that the test area is free of sharp objects, corner, etc.
- Have someone from each group test their model.



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Engage the Learner

- How will age, size and mobility of the driver impact design features? *Lumbar support lower back and maintains the slight curve in your spine. Head and arm supports and rests. Distribution of weight is there a one size fits all seat.*
- What environmental conditions need to be factored into your design? *Driving machinery on rough terrain requires more shock absorbing.*
- How would you approach the design for someone with a disability?

Observations & Conclusions

- What worked? What didn't? Knowing what you know, what changes will you make?
- If you could choose another material, what would it be?
- What might you do differently to improve the comfort or the support of your seat design?

Post photos of the seat that ...

- Held the most weight
- Was the most comfortable
- Provided the most support

STEM Career Path...

Occupational Therapist

- Who else might be involved? *Safety specialists, industrial designer, engineer, rheumatologists, physical therapist, agriculture systems technologist, economist*
- Who benefits? *Health benefits, reduced work-related injuries, improved efficiency, manufactures competitive edge*
- What other industries might benefit from this work? *Auto, truck, airplane, bus, stadium, amusement ride, office, school and home furnishing seating.*

Refer to Career Focus Card for more details.



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STEM PATHWAYS

career

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Did You Know? Arthritis is the most common cause of disability in the United States. This disease effects 1 in 5 adults, 50 million, and 300,000 youth. In the agricultural community, arthritis effects 1 in 3 adults and is a leading cause of disability.

SCIENCE

Occupational
Therapist

What seat features would you need to change to factor in a driver's disability?

- Assess driver's limitations, equipment, handles, automation to aid the person getting into or out of the seat, adjustments and supports to improve posture, mobility, comfort, etc.

TECHNOLOGY

Safety Specialist &
Technician

What impact will autonomous cars have on future seat designs?

- You know those self-driving cars that seem so futuristic really aren't. Technology is progressing faster than rules and policies related to road use. GPS (global positioning systems) technology is already enabling farm machinery to drive unaided by a person. Safety technicians are actively involved in testing and recording results to assess reliability before a product goes into production and afterwards to ensure consumer safety.

ENGINEERING

Industrial Designer

View:

<http://www.youtube.com/watch?v=CCmkKMBRZKI>

How will changes in the workplace affect the future of the seat design for all types of uses?

- Ergonomic principals are used to improve the productivity, health, safety and comfort of people trying to complete a particular function. Industrial designers work with health and safety specialists to factor in improvements to reduce stress and strain. As consumers transition to a more mobile office, seat designs for home, office and commute will change to meet those preferences and needs.

MATH

Market Research
Analyst

What determines if a new seat design goes into production or not?

- Increase use of data and market research to determine customer's behavior is used to make decisions on product development. A Market Research Analyst will account for the fastest growing occupation of all occupations at 32% from 2012-2022.



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Occupational Therapist

Finding Solutions For...

- Evaluate a person's home or workplace and offer advice for equipment, changes to improve health related limitations.
- Demonstrate exercises for stretching joints to provide arthritis relief.

Job Forecast Looks Like...

- **Median Income:** \$75,400 per year
- **Job Outlook:** 29% growth from 2012-2022
- **Job Environment:** Work with patients in medical facilities, hospitals, physician's offices, home health services, nursing homes, often on their feet for long periods of time
- **Expected Growth Areas:** aging population, persons involved in accidents, lose of limbs, chronic or disabling illnesses to improve daily living skills

Skill Set Needed...

- **High School Courses:**
 - Math: algebra, geometry and calculus
 - Science: biology, chemistry, and physics
 - Specialized: anatomy, health
- **Communication:** listen attentively and be able to give good directions.
- **Compassion:** strong desire to help people.
- **Flexibility:** must be creative in their treatment approaches and motivating their patients.
- **Interpersonal:** ability to earn respect and trust of others.
- **Patience:** people's limitations, injuries, illnesses and disabilities can become frustrating for them and you.

Education and Training Required...

- **Entry Level Jobs:** Master's Degree in Occupational Therapy after obtaining a bachelor's degree including coursework in biology and physiology.
- **Additional Training and Certifications:** Must pass the National Board for Certification of Occupational Therapists and must take classes to maintain that certification.

