

# The Human Eye

A Modern Miracle Medical Machines Project

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# Overview

- Part of MMMM project
  - “conducting research on the reasoning and models that students use as they transfer basic physics knowledge to the application of physics in contemporary medicine”
  - “develop active engagement teaching-learning materials to help students learn about the applications of 20th and 21st Century physics to contemporary medical diagnosis and procedures”

As quoted from MMMM website

# Phase I – Models of Human Eye

- 13 interviews
- Graduate and REU students
- Wanted to learn how students perceive a series of models of the human eye
- Simultaneously gain info about what they know about the eye

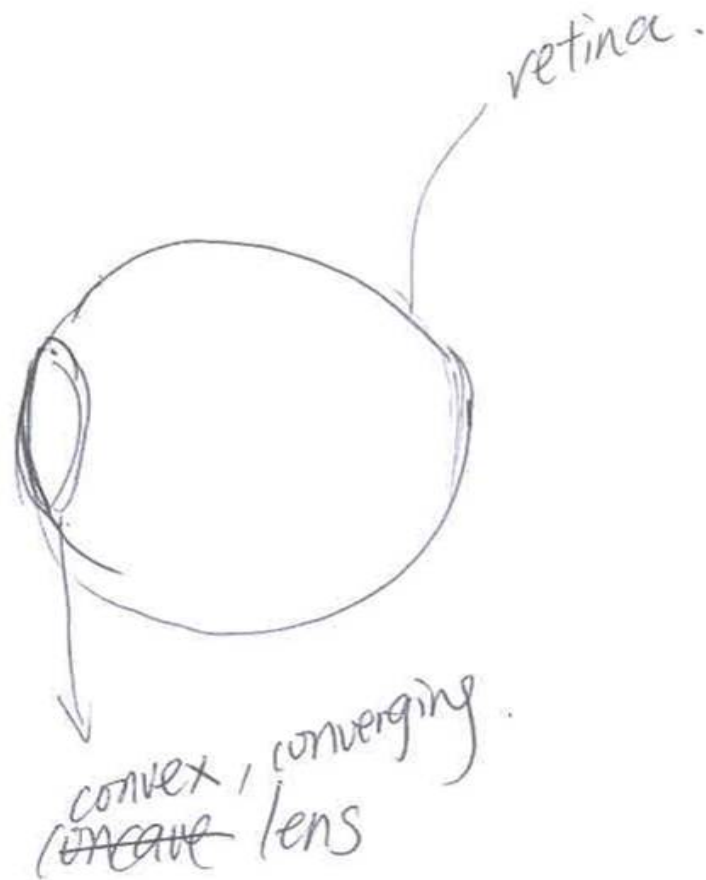
# The Models

- Anatomically Correct
- New PASCAL black plastic
- Black stainless steel
- White plastic
- Accomodation applet

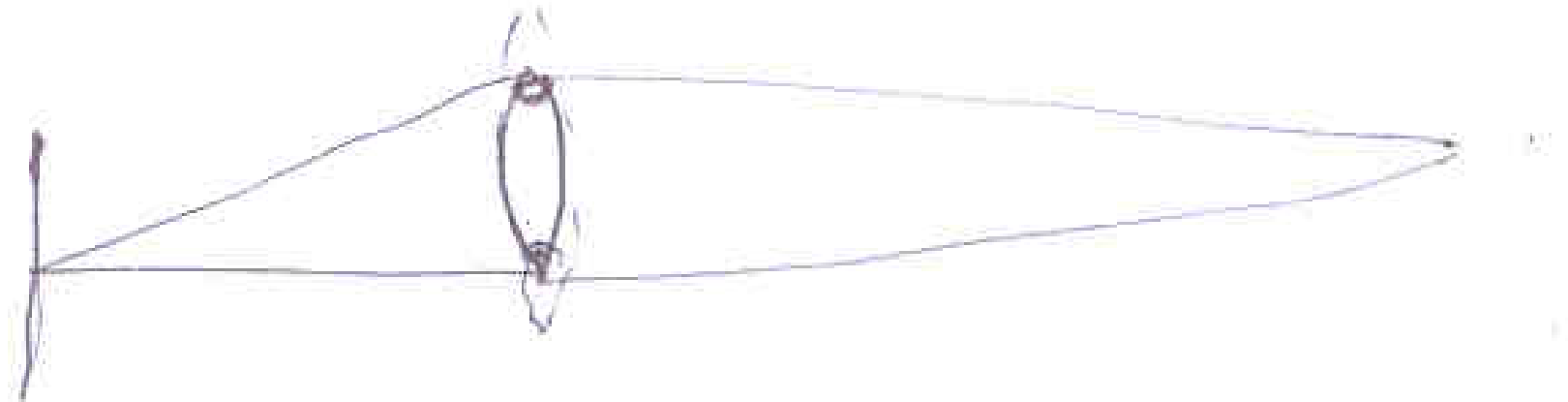
## Emerging trends ...

- The eye is made of two parts – a lens and a screen (retina)
- Very few students include other parts such as iris, cornea, etc

# Sample Drawings



# Sample Drawings



# When asked about defects ...

- Less than half of the interviewees could explain near and far sightedness.
  - Most of those interviewees had the defect
- Most students feel that near/far sightedness is a problem with the LENS, and very few mentioned the shape of the eye.

# Anatomical Model

- Most interviewees recognized its lack of displaying physical features
- Surprising number liked it

# Black steel model

- Comments on “out-of-date” appearance.
- Concern about the fact that it did not look like an eye.
- Adding water didn't always make sense

# White plastic model

- “the cool one”
- Intrigued by syringes – though many commented on only half-filled bladder.
- Only some recognized that their eye lens really moved like that.
- Questioned need for adjustability of out-of-round, because “your eye doesn’t do that, so it doesn’t help in understanding”

# Applet

- Liked because of many things moving automatically at once
- Caused some students to overlook things that were happening

# The results are in ...

- Before knowing features:

- Applet
- White plastic
- Anatomical
- Black steel

- After knowing features:

- White plastic
- Black steel
- Applet
- Anatomical

MOST, not all,  
students  
ranked this  
way

# When asked to design their own model ...

- Combination of the anatomical with the white plastic model
- Very few actually “designed” their own
- Liquid was less important – defects were listed as more important

# Other Issues?

- Inducing misconception about water filling the lens?
- [variability in the shape of the eye] “has been in 2 models, so it has to have a purpose ...”
- Lack of information if students had little prior knowledge of how the eye works

Input, please?

# Next steps ...

- Analyze data
  - Going to be difficult to start without Dr. Zollman, but it'll get done!
- Work on a model that will be the best for students understanding.
  - Take cues from the Germans?

# So where does the “MACHINE” come in?

- Not for a *Long* time
  - Auto-refractor
    - Snell’s Law
  - Lasik surgery
    - Lots of physics!

But I’ll get there!

# Thank you!

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<http://web.phys.ksu.edu/MMMM>