How do we know what we don't know we don't know?

Can we predict how technology will change the way we teach?

Dirk Colbry

What are our goals?

- Improved teaching though technology

Levels of Learning

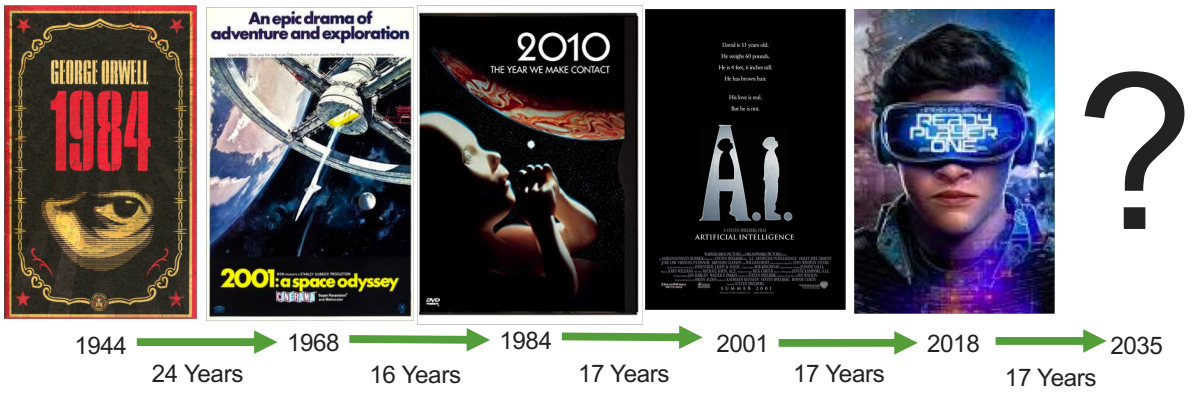
- **Ignorance** - Don't know what you don't know
- **Wisdom** - Know what you don't know
- **Knowledge** - Know what you know
- **Instinct** - Don't know what you know

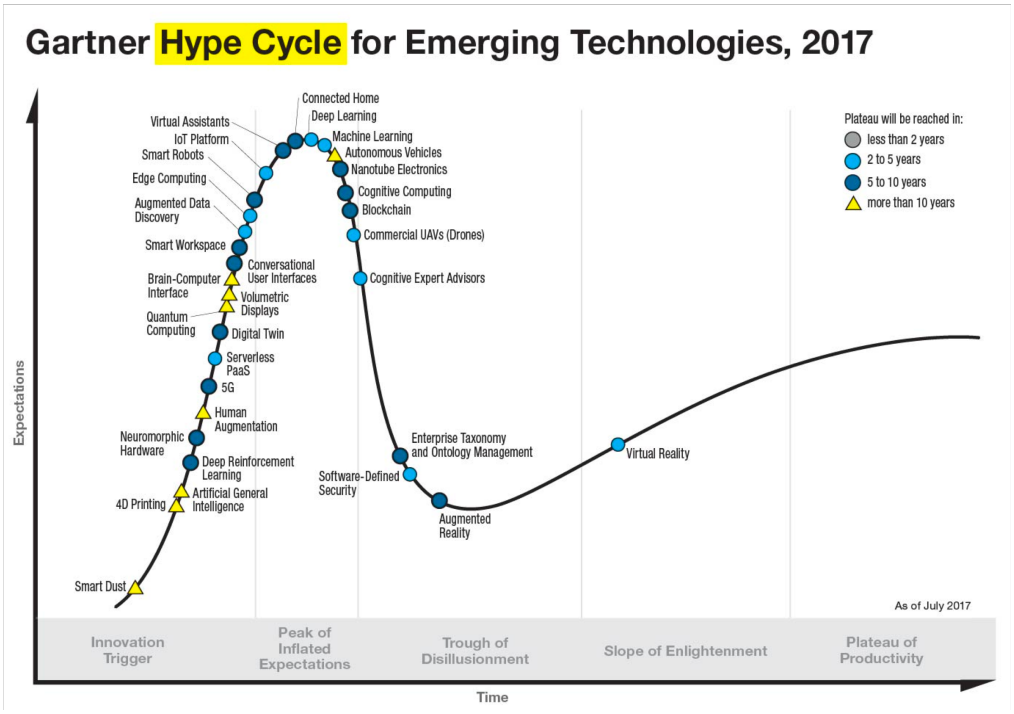
Example Learning Theory

- Behaviorism
- Cognitivism
- Constructivism
- Humanism
- Connectivism

From: https://www1.educationdegree.com/articles/educational-learning-theories

Are we bad (or good) at predicting the future…





What do students need to learn?

- Information
- Skills
- Self Learning
- Creative Problem Solving

Technology for learning

Access to information

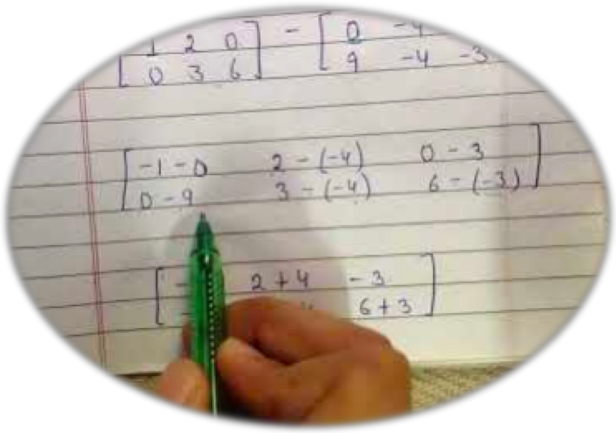
- Spoken word
- Books
- Internet

Skills

- Pen and paper
- Calculators
- Spell checking
- Programing

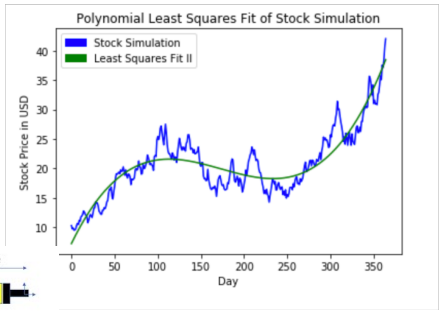
Example –Linear Algebra MTH314 (old way)

- Targeting Engineering and Natural Science students intended to focus on applied uses of linear algebra
- Assignments assess the students ability to know facts and skills related to matrix based calculations (dot products, matrix multiply, etc.)
- Students are rarely exposed to matrices bigger than 4x4 and only problems “neat” solutions (i.e. problems that can be solved with pencil and paper)

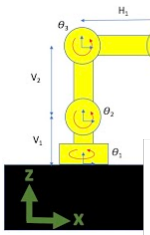


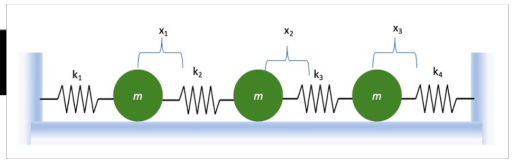
CMSE/MTH 314 – Numerical Linear Algebra

- **Idea - Use programming to teach Math**
- Flipped classroom, Active Learning model
- Assignments focus on real world examples on the computer. **The technology helps motivate and improves understanding**
- Exams are open internet




```
J2 = np.matrix([[np.cos(theta2),0,np.sin(theta2), 0 ],
                [0, 1, 0, 0 ],
                [-np.sin(theta2),0,np.cos(theta2), V1],
                [0, 0, 0, 1]])
```





Predicting the future

- It is best to focus the goal of improving teaching rather than solely focusing on the solutions.

- With this goal in mind, I think it would be interesting to see find ways to use AI to support self learning and creative problem solving.