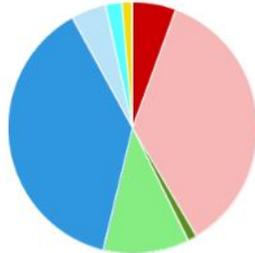


# The Art and Science of Teaching Online Statistics: a Case Study

Elena Chudaeva, George Brown College

|             |     |       |
|-------------|-----|-------|
| Statistics  | 75  | 5.6%  |
| Damned lies | 478 | 35.8% |
| Statistics  | 15  | 1.1%  |
| Statistics  | 148 | 11.1% |
| Lies        | 510 | 38.2% |
| Statistics  | 60  | 4.5%  |
| Statistics  | 28  | 2.1%  |
| Statistics  | 17  | 1.3%  |
| Statistics  | 5   | 0.4%  |



"There are three kinds of **lies**:  
**lies, damned lies, and**  
**statistics.**"

Benjamin Disraeli, the 19th century British  
Prime Minister

## Remote Learning Isn't Going Away

It is time to make it more effective.

“ Let's consider remote learning a great experiment and a challenge to our ingenuity and resourcefulness.

In short, let's apply the qualities that we associate with our scholarship - imagination, vision, inventiveness and creativity - to our teaching.”

Source:

<https://www.insidehighered.com/blogs/higher-ed-gamma/remote-learning-isn%E2%80%99t-going-away>

## Question

What tips do you have for creating successful online learning ?

# Agenda

1. E-learning in a digital age
2. STEAM initiative
3. Community of Inquiry
4. Samples of course design elements
5. UDL and online learning
6. Resources

# E-learning in the 21st century

What is it?

The world has changed dramatically.

What about Education?

The screenshot shows the Global News website interface. At the top, there is a dark blue navigation bar with the Global News logo on the left and buttons for 'WATCH', 'RADIO', and 'SUBSCRIBE' on the right. Below this is a horizontal menu with categories: World, Canada, Local (with a dropdown arrow), Politics, Money, Health, Entertainment, Lifestyle, Watch, Sports, Commentary, and Contests. A search icon is on the far right. A large banner advertisement for '#CANADA TOGETHER In Concert' is displayed, featuring logos for 'ET CANADA', 'Presented by ID', and 'CCMA', along with a 'WATCH NOW' button. The main article is titled 'What is e-learning and why does it have some Ontario teachers concerned?' under the 'EDUCATION' category. It is by Jamie Mauracher, Global News, and was posted on January 21, 2020, at 8:35 pm, with an update at 9:36 pm. A black redaction bar covers the bottom of the article content. On the right side, there is a 'MORE FROM GLOBAL NEWS' section with a 'COMMENTARY: How to teach your kids math at' article and a 'DISTANCE LEARNING' video player featuring Erika Mark, a 22-year-old teacher, with the subtitle 'The long distance learning challenge'.

# The Skills Needed in a Digital Age (Bates, 2019)

Communication Skills

Ability to Learn Independently

Ethics and Responsibility

Teamwork and Flexibility

Thinking Skills

Digital Skills

Knowledge Management

# 7 Principles to Design Innovative Learning Environments

(OECD, 2017)

- Make learning and engagement central
- Ensure that learning is understood as social
- Be highly attuned to learners' emotions
- Reflect individual differences
- Be demanding for all while avoiding overload
- Use broad assessment and feedback
- Promote horizontal connectedness

## “From STEM to STEAM” Benefits

- STEAM aligns with employer demand for well-rounded grads by creating opportunities to use interdisciplinary approach, which otherwise, will be absent in a curriculum with emphasis on vocational outcomes.
- Research supports cognitive effect of the arts and its connection to enhancement of skills necessary for students to succeed in any field.
- Combination of STEM and non-STEM skills provides a balanced approach to preparing students to uncertain future (CCA, 2015).

## Art develops abilities such as:

- Draw on curiosity
- Perceive an object in a different form
- Construct meaning
- Work effectively with others

Art and science do not compete, they are complementary.

A person's brain needs both views in order to make sustainable decisions (Sousa & Pilecki, 2013).

# Learning theories support art elements in course designs

(Schunk, 2012)

## **Imagery**

The human body is structured such that we take in more information visually than through all other senses. Visual displays help to foster attention, learning, and retention.

The collective findings from learning and brain research support the benefits of graphics.

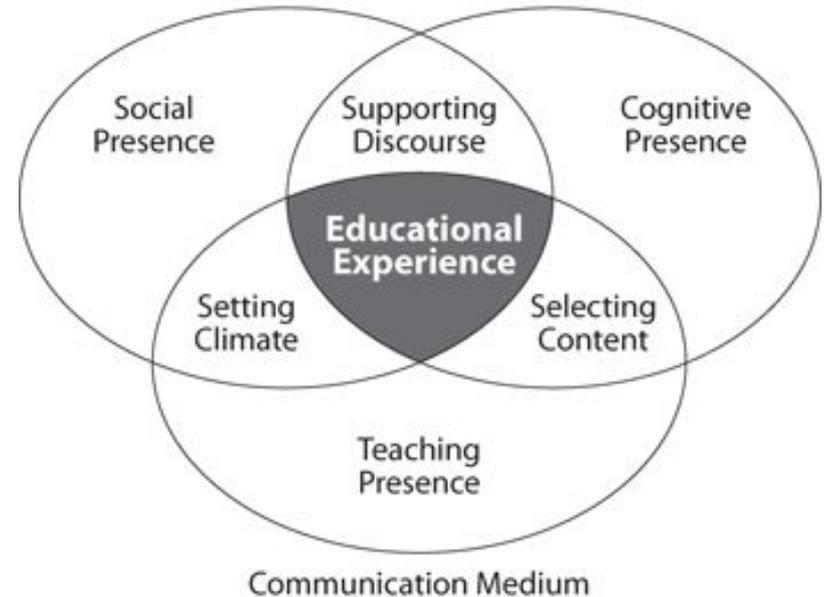
**Emotions** can facilitate learning because they direct attention and influence learning and memory.

Brain research substantiate the positive effect that emotional involvement can have on learning and the building of synaptic connections.

# Community of Inquiry

An educational community of inquiry is a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding.

Community of Inquiry Framework (CoI)  
a process of creating a deep and meaningful (collaborative-constructivist) learning experience through the development of three interdependent elements – social, cognitive and teaching presence.



<https://coi.athabascau.ca/coi-model/>

# Social Presence

is the ability of participants to identify with a group, communicate openly in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities. (Garrison, 2017)

- Affective expression
- Open communication
- Group cohesion

# Teaching Presence

is “the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes”. (Garrison, 2017)

- Design & Organization
- Facilitation
- Direct Instruction

# Cognitive Presence

is “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse”. (Garrison, 2017)

- Triggering event
- Exploration
- Integration
- Resolution

# Question

Teaching Presence

Social Presence

Cognitive Presence

Which of these presences would be the most challenging to create in online courses? Why?

Col framework is generic and coherent structure of a transactional educational experience whose core function is to manage and monitor the dynamic for thinking and learning collaboratively. (Garrison, 2017)

Suggestions to facilitate Social Presence:

- 1.Acknowledge participation
- 2.Be encouraging and supporting while directing discussions
- 3.Project your personality as a teacher
- 4.Suggest that students log-on at least three times per week
- 5.Encourage students to acknowledge contributions when responding
- 6.Be conversational and not too formal in communications
- 7.Encourage “lurkers” to participate

# “Collage” Design of Activity-Based Statistics Course

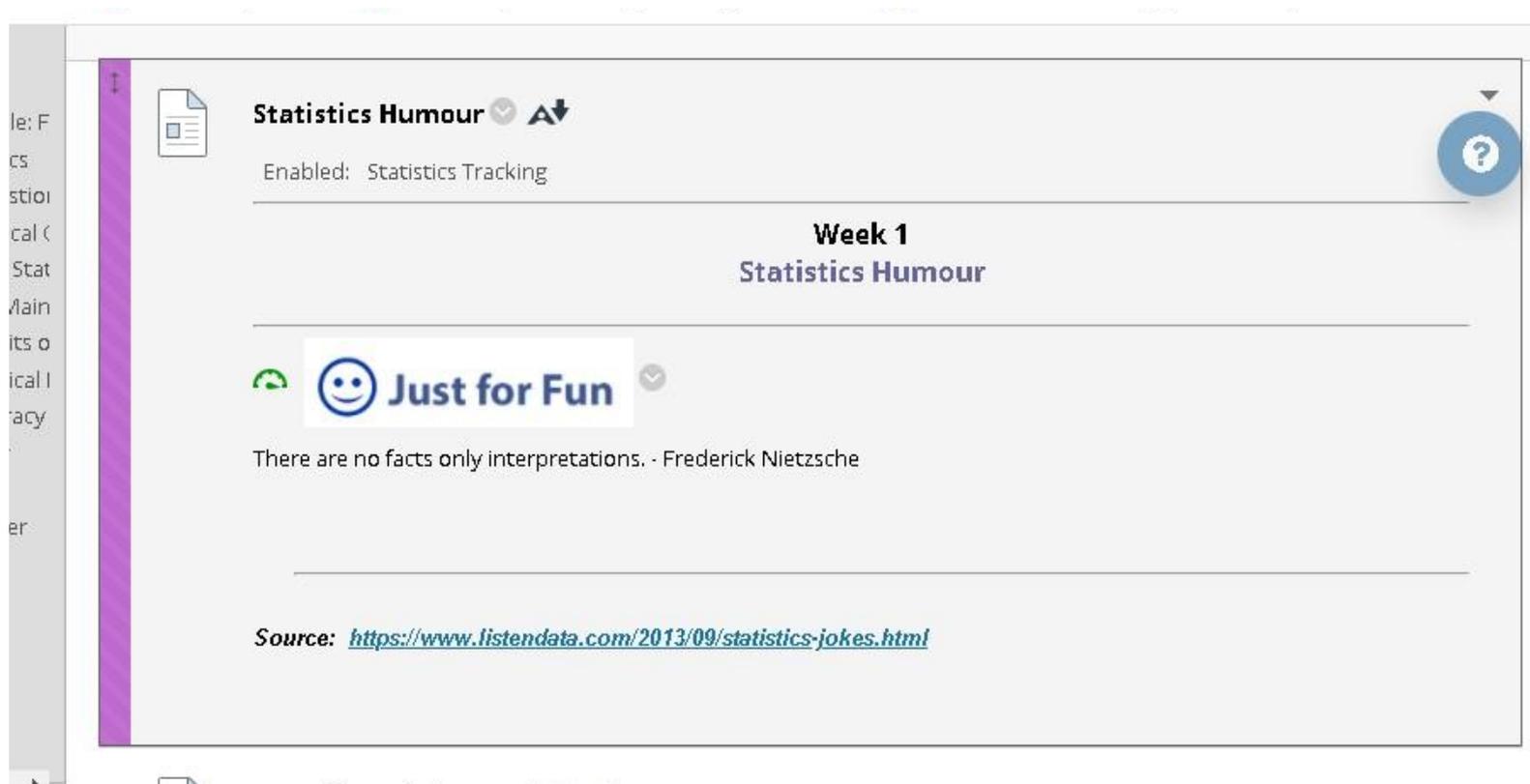
## **Goal**

Mix activities for individual and collaborative learning with art-inspired elements to create multiple opportunities for engagement with and integration of the course content.

## **Course elements**

Imagery, songs, humor, art-inspired activities, simulations, reflective activities, group project, discussion forums, videos, etc.

# Course Elements: Jokes



The screenshot shows a course interface with a sidebar on the left containing a list of items: 'le: F', 'cs', 'stioi', 'cal (', 'Stat', 'Main', 'its o', 'ical l', 'acy', and 'er'. The main content area is titled 'Statistics Humour' and includes a document icon, a dropdown arrow, and a share icon. Below the title, it says 'Enabled: Statistics Tracking'. A blue circular help icon with a question mark is in the top right corner. The section is titled 'Week 1 Statistics Humour'. Below this, there is a 'Just for Fun' logo with a smiley face and a dropdown arrow. The text reads: 'There are no facts only interpretations. - Frederick Nietzsche'. At the bottom, the source is cited as: 'Source: <https://www.listendata.com/2013/09/statistics-jokes.html>'.

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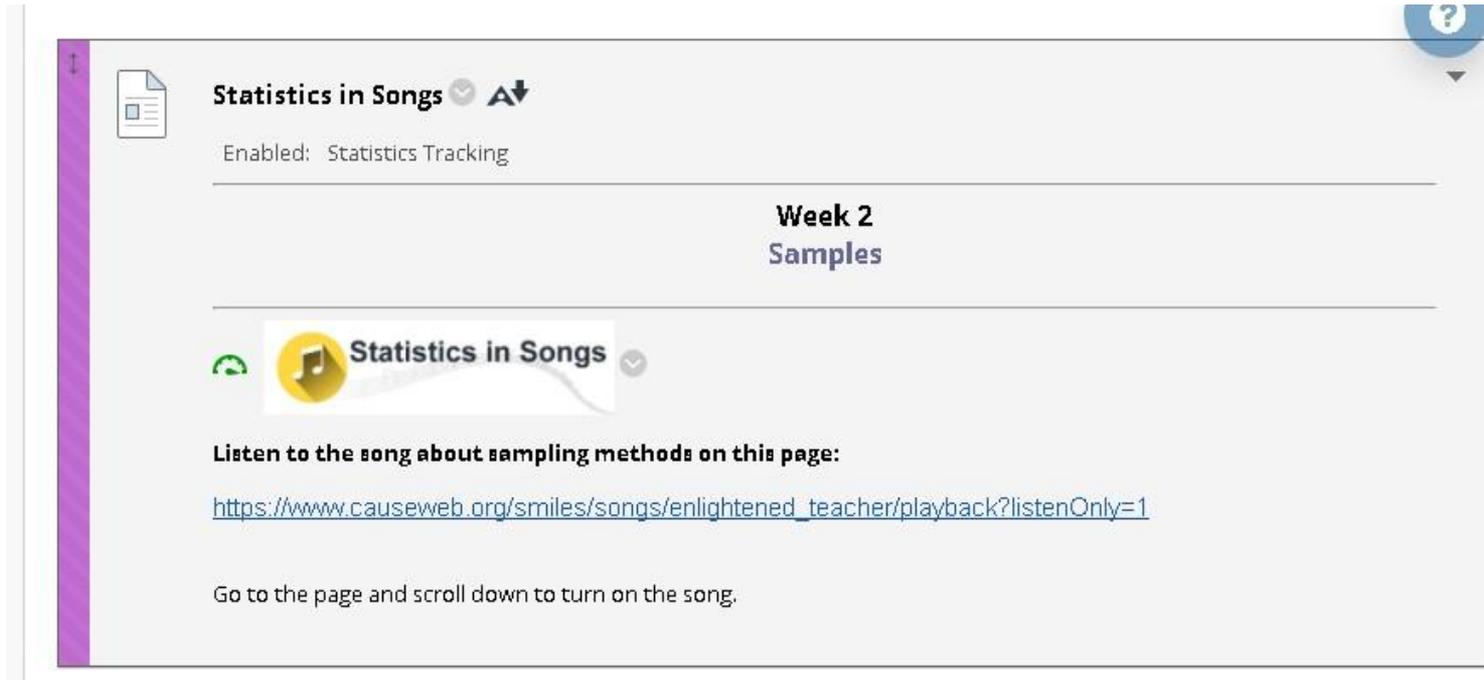
**Week 1**  
**Statistics Humour**

  **Just for Fun** 

There are no facts only interpretations. - Frederick Nietzsche

Source: <https://www.listendata.com/2013/09/statistics-jokes.html>

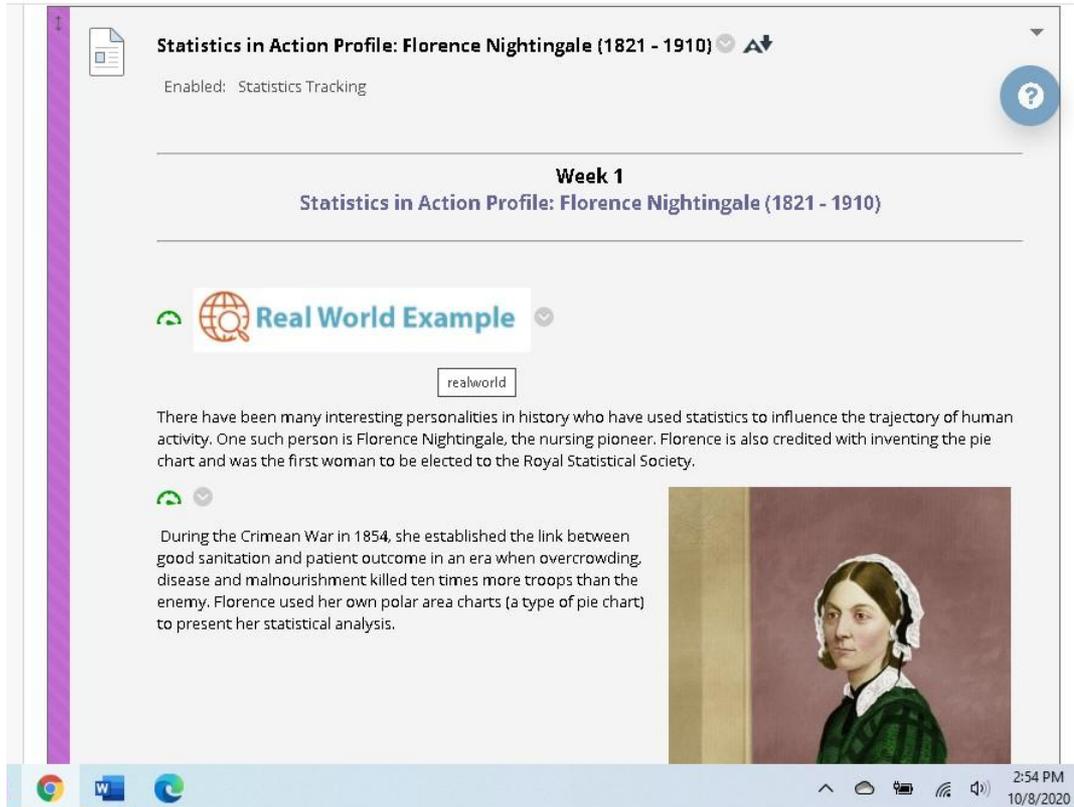
# Course Elements: Songs



The screenshot shows a course interface with a purple vertical bar on the left. At the top right, there is a blue circular help icon with a white question mark. Below it, the title 'Statistics in Songs' is displayed with a document icon, a checkmark, and a speaker icon. Underneath, it says 'Enabled: Statistics Tracking'. A horizontal line separates this from the next section, which is titled 'Week 2 Samples'. Below that, there is a yellow circular icon with a music note and the text 'Statistics in Songs' with a checkmark. The main text reads: 'Listen to the song about sampling methods on this page:' followed by the URL [https://www.causeweb.org/smiles/songs/enlightened\\_teacher/playback?listenOnly=1](https://www.causeweb.org/smiles/songs/enlightened_teacher/playback?listenOnly=1). At the bottom, it says 'Go to the page and scroll down to turn on the song.'

[https://www.causeweb.org/smiles/songs/enlightened\\_teacher/playback?listenOnly=1](https://www.causeweb.org/smiles/songs/enlightened_teacher/playback?listenOnly=1)

# Course Elements: Statistics in Action Profile



The screenshot shows a web interface for a course profile. At the top, the title is "Statistics in Action Profile: Florence Nightingale (1821 - 1910)" with a dropdown arrow and a share icon. Below the title, it says "Enabled: Statistics Tracking" and a help icon (question mark in a blue circle). A horizontal line separates the header from the main content. The main content is titled "Week 1" and "Statistics in Action Profile: Florence Nightingale (1821 - 1910)". Below this is a "Real World Example" section, indicated by a globe icon and a dropdown arrow. A small box labeled "realworld" is positioned above the text. The text reads: "There have been many interesting personalities in history who have used statistics to influence the trajectory of human activity. One such person is Florence Nightingale, the nursing pioneer. Florence is also credited with inventing the pie chart and was the first woman to be elected to the Royal Statistical Society." Below the text is a portrait of Florence Nightingale. The bottom of the screenshot shows a Windows taskbar with icons for Chrome, Word, and Edge, and a system tray with a clock showing 2:54 PM on 10/8/2020.

**Statistics in Action Profile: Florence Nightingale (1821 - 1910)** ▼ ↕

Enabled: Statistics Tracking ?

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**Week 1**

**Statistics in Action Profile: Florence Nightingale (1821 - 1910)**

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 **Real World Example** ▼

realworld

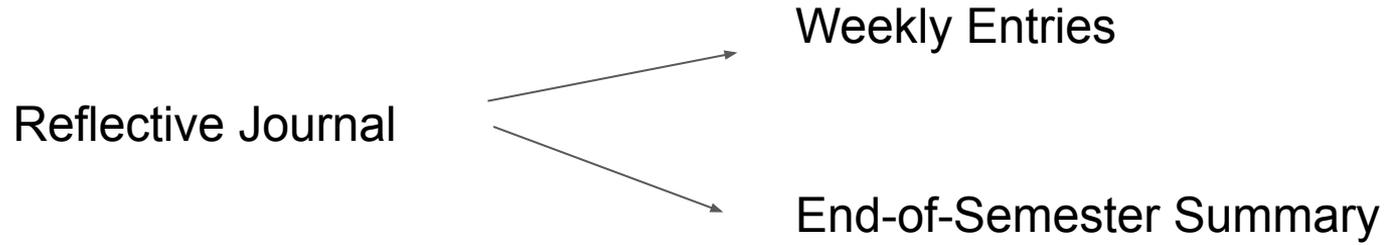
There have been many interesting personalities in history who have used statistics to influence the trajectory of human activity. One such person is Florence Nightingale, the nursing pioneer. Florence is also credited with inventing the pie chart and was the first woman to be elected to the Royal Statistical Society.

 ▼

During the Crimean War in 1854, she established the link between good sanitation and patient outcome in an era when overcrowding, disease and malnourishment killed ten times more troops than the enemy. Florence used her own polar area charts (a type of pie chart) to present her statistical analysis.



# Course Elements: Journal



Video description of the assignment [https://www.youtube.com/watch?v=t\\_lisbW6wsQ&t=1s](https://www.youtube.com/watch?v=t_lisbW6wsQ&t=1s)

# Students' Feedback

I personally enjoyed the songs about statistics, it helped me see the fun side of statistics and made it less intimidating.

I really do appreciate of the breakdown of the materials in the modules. It is very organized and helped me quickly go back on topics that took me longer to understand.

I also use the practice exercises to test my knowledge and see where I'm at. It helps me identify where I'm lacking and where I'm doing well.

## Question

How familiar are you with Universal Design for Learning (UDL)?

Do you use UDL principles and guidelines in your teaching practices?

# Universal Design for Learning

UDL is a framework to improve and optimize teaching and learning for all people based on scientific insights into how humans learn (CAST, 2020).

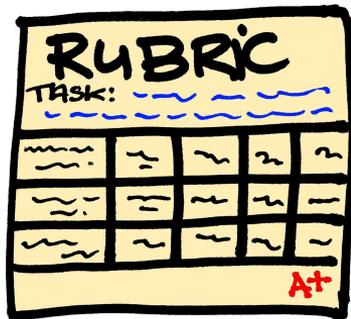
UDL Guidelines:

Provide **multiple means** of

Engagement

Representation

Action & Expression



Industry is the best at the intersection of  
science and art.

Edwin H. Land (an American scientist and inventor, co-founder of the Polaroid Corporation)

Source: <https://www.azquotes.com/quotes/topics/art-and-science.html>

Thank you!

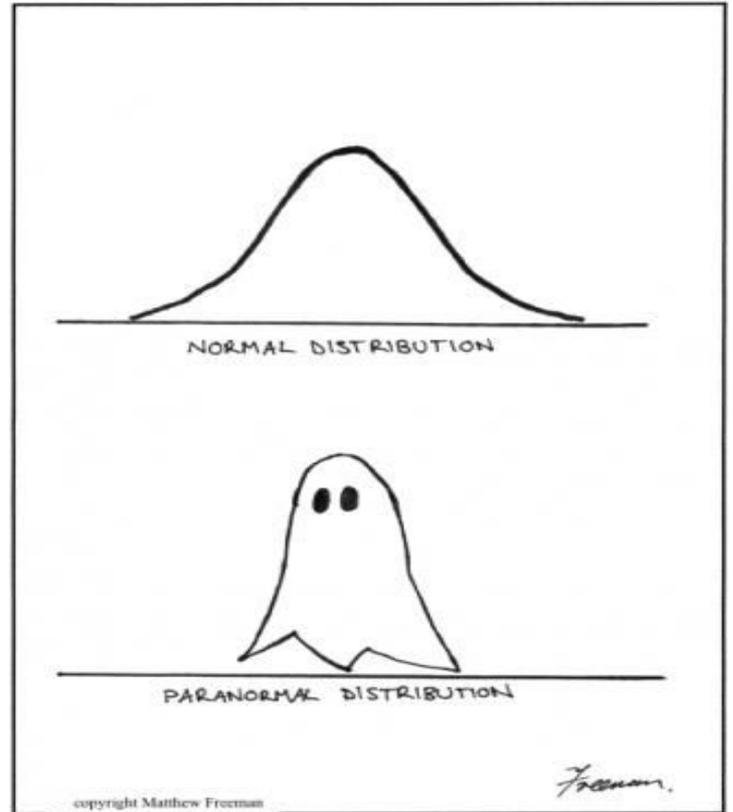


Image credit:

[https://www.causeweb.org/cause/resources/fun/all?type\\_1=cartoon&combine=&field\\_tags\\_tid=All&items\\_per\\_page=10&page=10](https://www.causeweb.org/cause/resources/fun/all?type_1=cartoon&combine=&field_tags_tid=All&items_per_page=10&page=10)

# Resources

Songs in teaching

<https://onlinelibrary.wiley.com/doi/pdf/10.1111/1467-9639.00062>

<https://stemforall2018.videohall.com/presentations/1242>

Smiles project

<https://www.causeweb.org/smiles/>

<https://www.causeweb.org/smiles/about>

Samples

[https://www.causeweb.org/smiles/songs/enlightened\\_teacher/playback?listenOnly=1](https://www.causeweb.org/smiles/songs/enlightened_teacher/playback?listenOnly=1)

Other resources on fun activities

<https://www.causeweb.org/cause/resources/fun/references>

<https://www.causeweb.org/cause/resources/fun/cartoons/beanstalks?id=258>

# References

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- CCA. (2015, April 30). *Some assembly Required: STEM Skills and Canada Economic Productivity*. <https://cca-reports.ca/reports/some-assembly-required-stem-skills-and-canadas-economic-productivity/>
- OECD. (2017). *The OECD Handbook for Innovative Learning Environments*, OECD, Publishing, Paris. [https://read.oecd-ilibrary.org/education/the-oecd-handbook-for-innovative-learning-environments\\_9789264277274-en#page1](https://read.oecd-ilibrary.org/education/the-oecd-handbook-for-innovative-learning-environments_9789264277274-en#page1)
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Schunk, D.H. (2012). *Learning Theories: An educational Perspective*. (6<sup>th</sup> ed.). Upper Saddle Hill, NJ: Pearson Education Inc.