



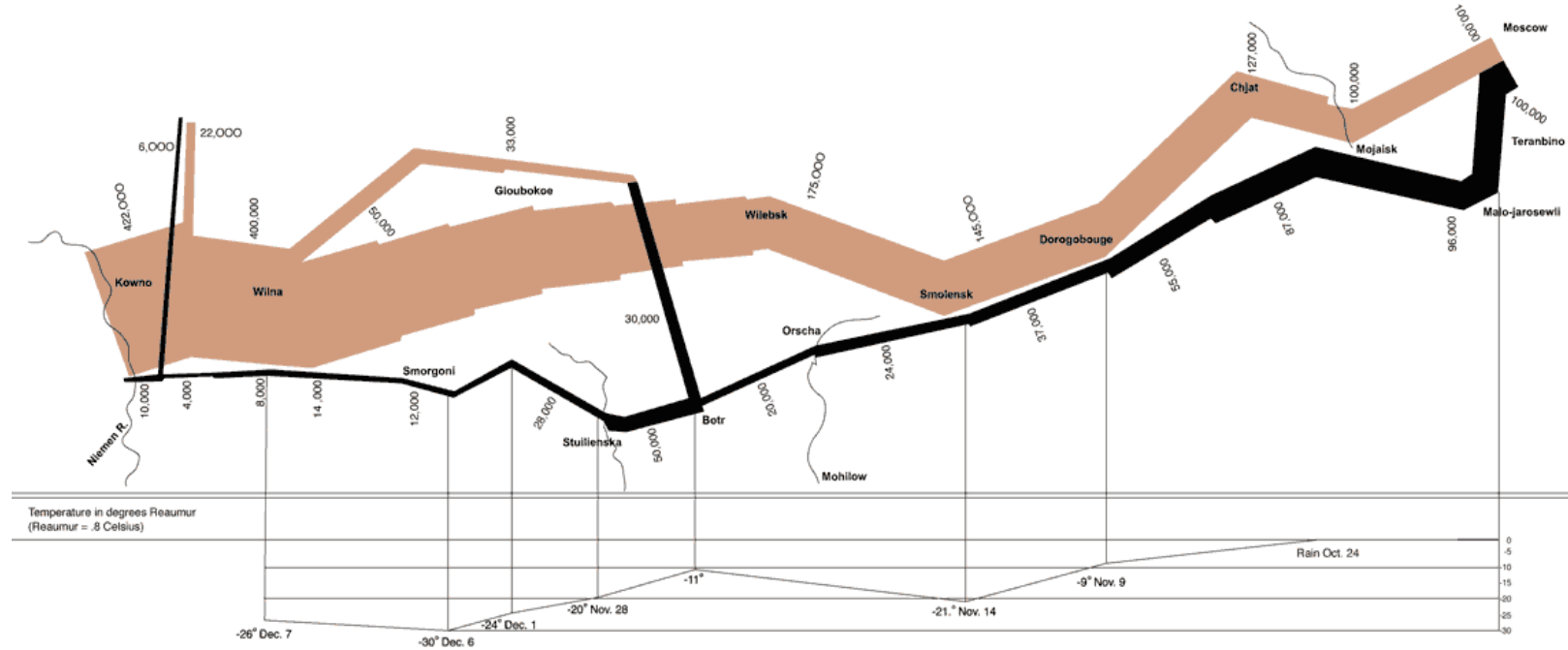
# Visual Communication Technologies and Their Application in Education

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OR

How to avoid all rules for good presentation to  
present the technologies for visual communication

# One picture worth of thousands words.....

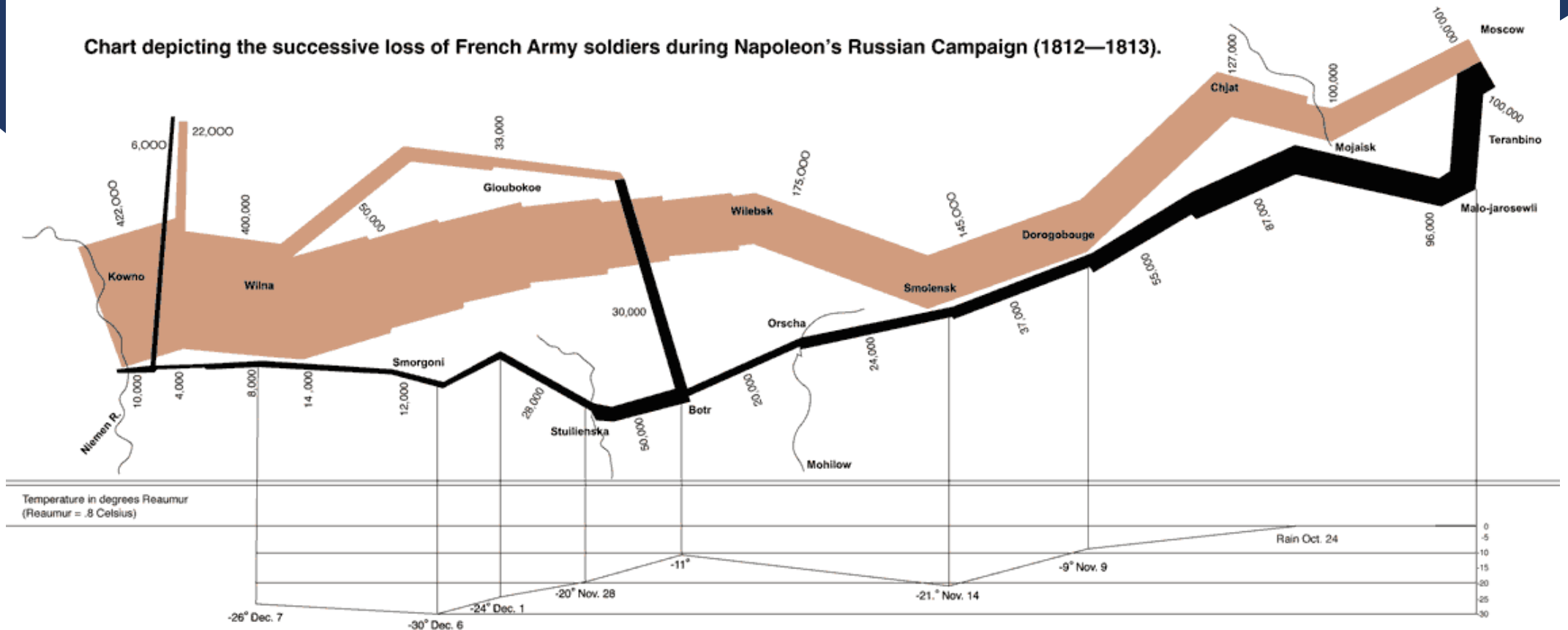


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# To understand do you need to be visual literate?

Chart depicting the successive loss of French Army soldiers during Napoleon's Russian Campaign (1812—1813).



Charles Minard (1781-1870), 1869

The best statistical graph that has been ever made

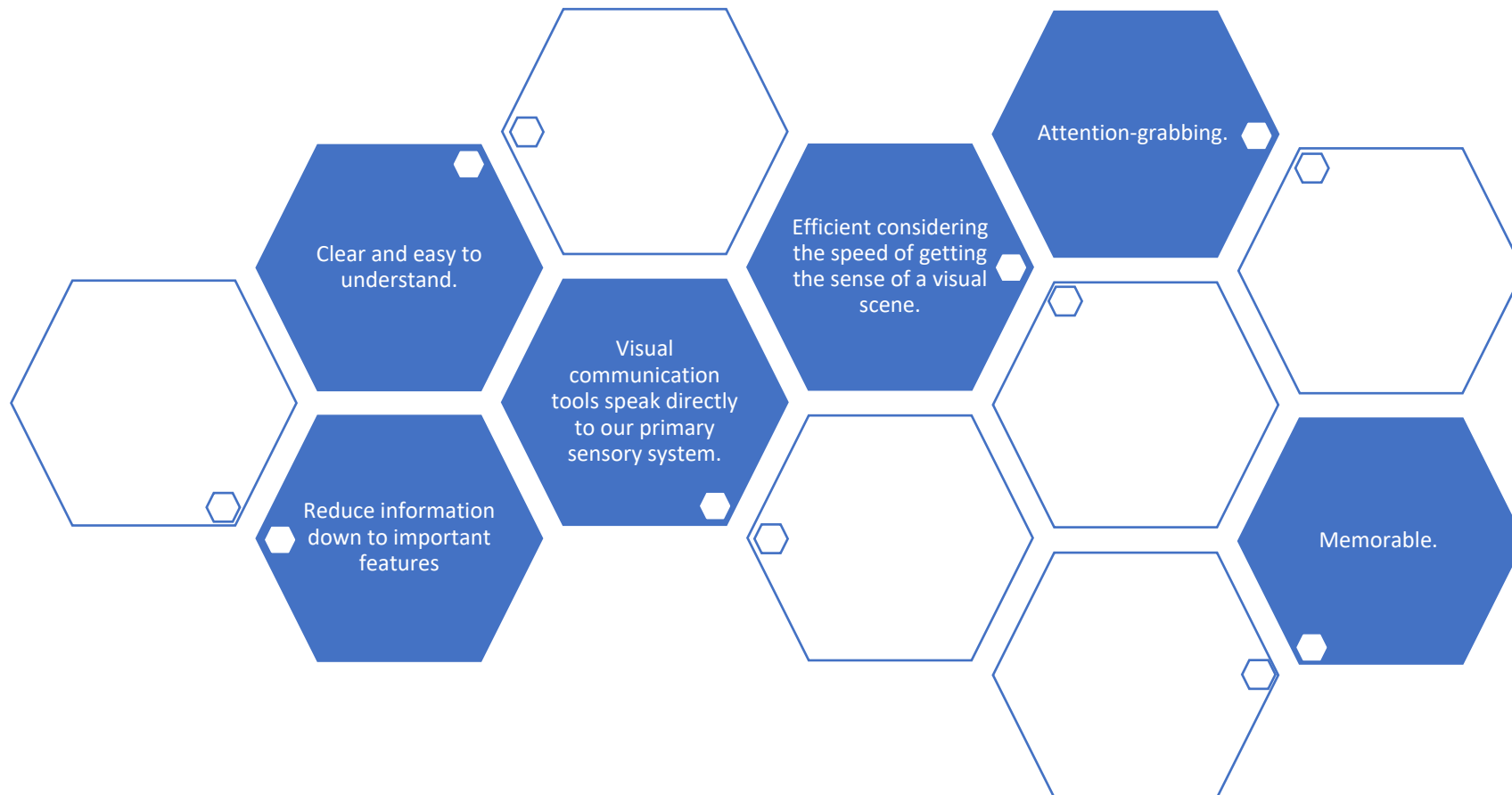
# Definition of Visual Communication

Visual communication includes the utilization of visual components to pass on messages among people.

Primarily associated with two-dimensional images, their creation application and publishing.

Now we consider web design, graphic interfaces, visualization, video games, YouTube, social networks, visual blogs, etc.

# Why Visual Communication?

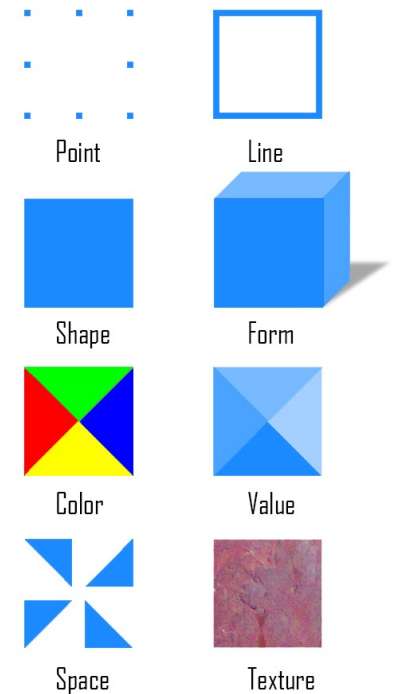


# Classification Schemas for Visual Communication

- According to the application field – education, marketing, ...
  - According to the user – teacher, students, administrator, ....
  - According to the aim and objectives – to inform, teach, create, assess, ....
  - According to the narrative – linear or non-linear (the last one include **interactivity**)
  - **According to the technology – hardware, software, ...**
- 
- **Where do the visual communication tools belong in this context?**
  - **What about the visual elements?**

# Elements of Visual Communication

- Graphic elements are the units of information that enable making complex visual objects.
  - These include dots, lines, photos, icons, paragraphs of text,...
- **Position, color, size, shape, and orientation** are variables applied to individual graphic elements which can change their meaning and interpretation.
- The graphic elements can be combined into compositions by using principles like **contrast, repetition, proximity, alignment, hierarchy, grouping, and sequence** among elements or compositions.

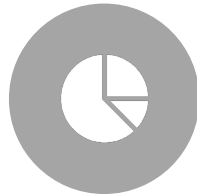


**I am not going to talk about the semiotics, neither about typography....**

# Visual Communication Tools



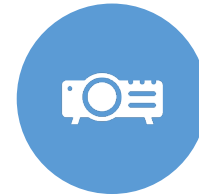
PHYSICAL OBJECTS



STATISTICAL/DATA  
VISUALIZATION



GRAPHIC DESIGN /  
PRESENTATIONS



VIDEO / ANIMATION /  
WHITEBOARD  
ANIMATION / SCREEN  
RECORDING / FACE-TO-  
CAMERA VIDEO



IMAGES / PHOTOGRAPHS



CHARTS AND GRAPHS /  
PROCESS DIAGRAMS /  
CONCEPT MAPS



# Application of Visual Tools in Education

*(Heinze-Fry and Novak, 1990)*

- For evaluation of benefits, learning, cost
- To generate ideas, insights, knowledge
  - Develops basic descriptions of the characteristics or components of a concept.
  - Identifies all characteristics of the concept, process or phenomena under discussion.
- For the creation of diagrams (representation), maps, diagrams, charts
- For systematization – organize, structure, sequence
  - involves some order being introduced to the visual tool.
  - The diagram represents groups and subgroups, providing structure and hierarchy.
  - Links between (sub)groups represent the relationships between the concept and their component parts.
  - Tools – classification trees, flow diagram, Gant diagram, timelines, storyboards (visualizations).

# Visual Communication Technologies

- Visual communication technologies are devices and software tools that enable the creation, adaptation, storage and transmission of visual (multimedia) content.
- Requirements for the technologies
  - Depending on the tool, aims, users, phase of the lifecycle of the tool...
- Classification of software technology during the lifecycle of a tool type
  - Creating materials and resources
    - Text/Audio/Video processing
    - Programming
  - Storing resources
    - Repositories
    - Content Management Systems
  - Delivery, exchange of information, data, resources
  - Management of the learning process

# Some Random Technology Examples.....

- **Hardware**

- Input devices
- Output devices
- Storage systems
- Networks

- **Software (processing tools)**

- Text
- Graphic
- Audio
- Video
- Animation

- **Types of devices**

- Microphones
- Speakers
- Digital Cameras
- Headphones
- Computers
- DVD Players
- LCD Projector
- Video Games
- Home theaters
- TV

# Another random List of Authoring Tools Features

- **Content authoring**
  - The core feature of any authoring tool is the ability to create lessons.
  - This includes adding and editing slides, images, text, video, audio or any other on-screen element.
  - These features enable to bring course to life and represent what the learner will be seeing, hearing, and doing.
  - The kind of e-learning course that you create depends on these core content authoring features:
- **Images**
  - Add or import images
  - Edit images
- **Video**
  - Webcam recording
  - Screen recording
  - Import and export videos
  - Insert videos to interactions
  - Link to external video sources
  - Edit videos
- **Animations**
  - Animate on-screen images or text
  - Ability to import animations
  - Ability to import HTML5 animations
  - Ability to insert text animations
- **Formatting**
  - Text & style editing
  - Object alignment & editing
  - Background themes
  - Create master slides
  - Navigation player skin options
  - Page transitions
  - Responsive design
  - Importing a PowerPoint lesson

An abstract background on the left side of the slide. It features a central square with a blue-to-orange gradient, surrounded by several overlapping, semi-transparent, colorful bands (red, orange, yellow, green, blue, purple) that radiate outwards, creating a lens flare or prism effect. The overall color palette is vibrant and multi-colored.

# Images / Photographs

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- Created by measuring lights (colours) and reflects reality
- Enhance textual messages or replace verbal messages and convey complex information
- Today rarely used alone
  - Interpretation is dependent on the context – magazines, books, newspapers, albums, web-sites
  - Overusing is a problem because pictures are not always self-explanatory
- An image can be created by using a paint program or by scanning a photograph
- Issue for technology – storing format

# Image-viewing and editing tools

- Image viewing and organizing
  - There are a good range of tools around designed to help organize and view images
  - Some of these have some basic editing functions
  - Example - Google Photo <https://photos.google.com/sharing>.
- Editing tools
  - GIMP (GNU image manipulation program) is a free tool (<https://www.gimp.org/>)
  - Free open source Inkscape (<https://inkscape.org/>).
  - Pinta ([http:// pinta-project.com](http://pinta-project.com)) is free and open-source, and available for Windows, Mac and Linux.
- Jarvis, Matt. Brilliant Ideas for Using ICT in the Classroom (p. 59). Taylor and Francis. Kindle Edition.



# Print media

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- The first mass media
- Combination of text and images
- Standardized format and print
- Used by organizations, events, and businesses.
- Include brochures, flyers, and posters, books, photography, posters, paper handouts





# Storyboards

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- is a visual organizer - a series of illustrations displayed in sequence for the purpose of previsualizing a video, web-based training, or interactive media sequence.
- they are also used to previsualize a web site or application during development phase.



# Power BI Edu

1



## Description

Драган е практикант во компанија која се занимава со анализа на текот на податоците и нивна визуелизација. Добива task за креирање на dashboard и негов publish на Power Bi Service.

2



## Description

На Драган му се прикажани сите активни модули со кратки информации за истите како темите кои се обработуваат, оцена, опис, потребно време и слично.

3



## Description

Бидејќи драган има солидно претходно познавање од областа на Power BI, нема потреба од препорачан Learning Path за почетници, односно Драган ја пребарува само темата од интерес, во овој случај Power BI Service. Го внесува клучниот збор во полето за пребарување.

4



## Description

Откако ќе го селектира модулот "Power Bi Service", на Драган му се прикажани сите податоци за соодветниот модул заедно со копче за почеток на изучување на материјалот.

5



## Description

Драга го изучува материјалот со поминување на сите предвидени секции од таа област.

6



## Description

Откако Драган ја заврши последната секција од модулот, му се прикажува кратка сумаризација од материјалот и можност за Драган веднаш да го полага испитот или да остави време за повторување.

7



## Description

Драган одлучува веднаш да го полага испитот, со тоа му се отвора сетот на прашања од соодветниот изучен модул.

8



## Description

Со успешното завршување на испитот, на Драган му е презентираан заслужениот сертификат.

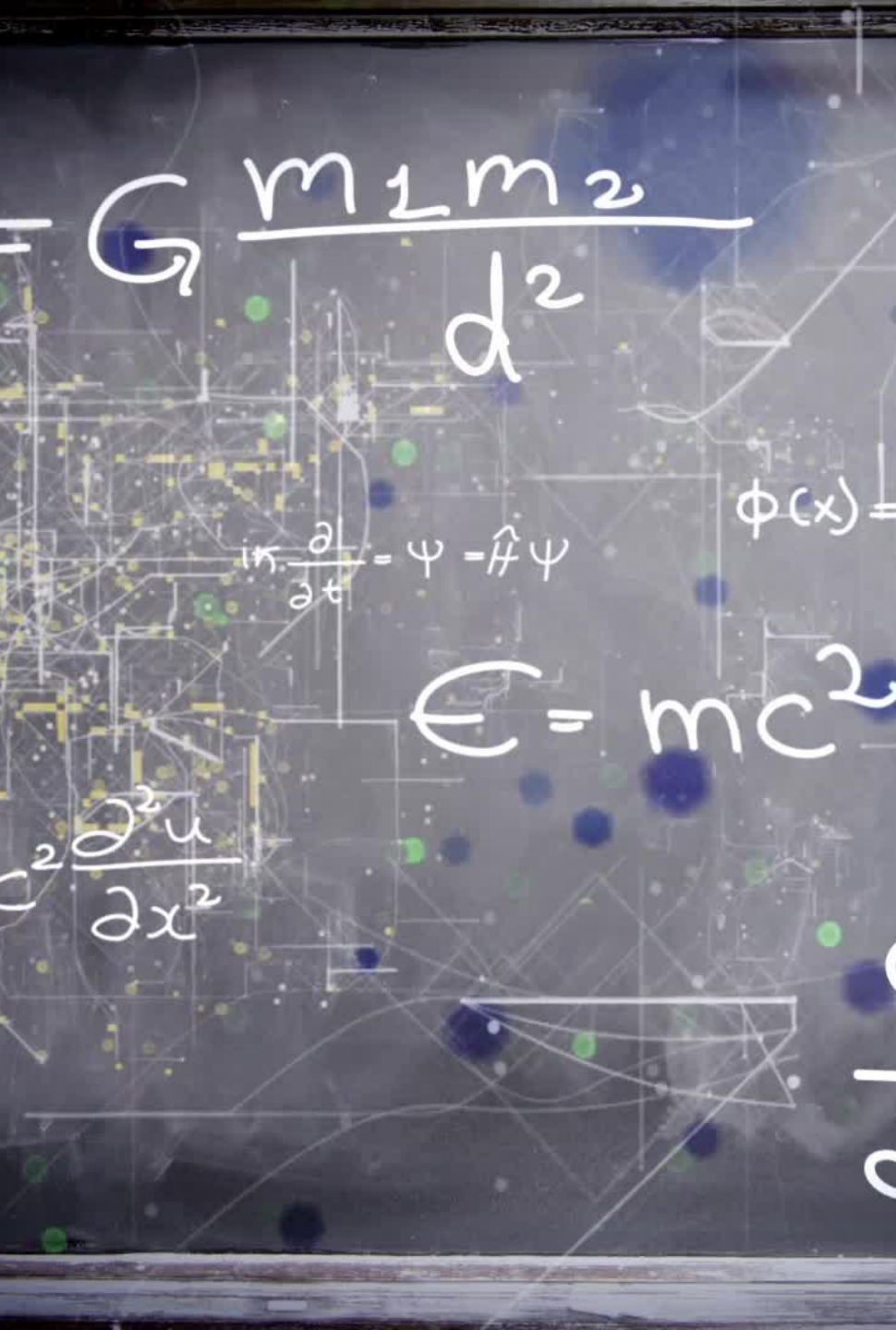


# presentations

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- Extremely powerful tool
- **Classification**
  - **Slide Presentations**
    - add a visual element which helps to understand the subject matter in a much easier and better way
  - **Overhead Transparencies/Projector Slides**
    - are displayed by the OHP (overhead projector) which can enlarge your slides onto any wall or screen
    - Can be produced in three ways – spontaneously produced slides that are written while you speak, pre-prepared slides, and a combination of these two.
  - **Blackboard or whiteboard**
    - You can use them to record or key point or clarify your title when you are introducing your presentation.





# Drawing

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- Active description of the subject of interest
- Can be used for analysis
- Classification:
  - Descriptive show what an object looks like
  - Expressive to make an impact beyond description
  - Constructional – sketches of something that should be produces – designers drawings, project drawings, presentation and maintenance, technical illustrations
  - Functional drawings enable learner to visually follow the process (any type of process)

# Graphs/ Diagrams



Depend on precision



Different graphs can represent the same thing



Types – logico-mathematical (presenting mathematical concepts in visual form), algorithmic (operational research flow charts), data display (numeric information into graphics form)

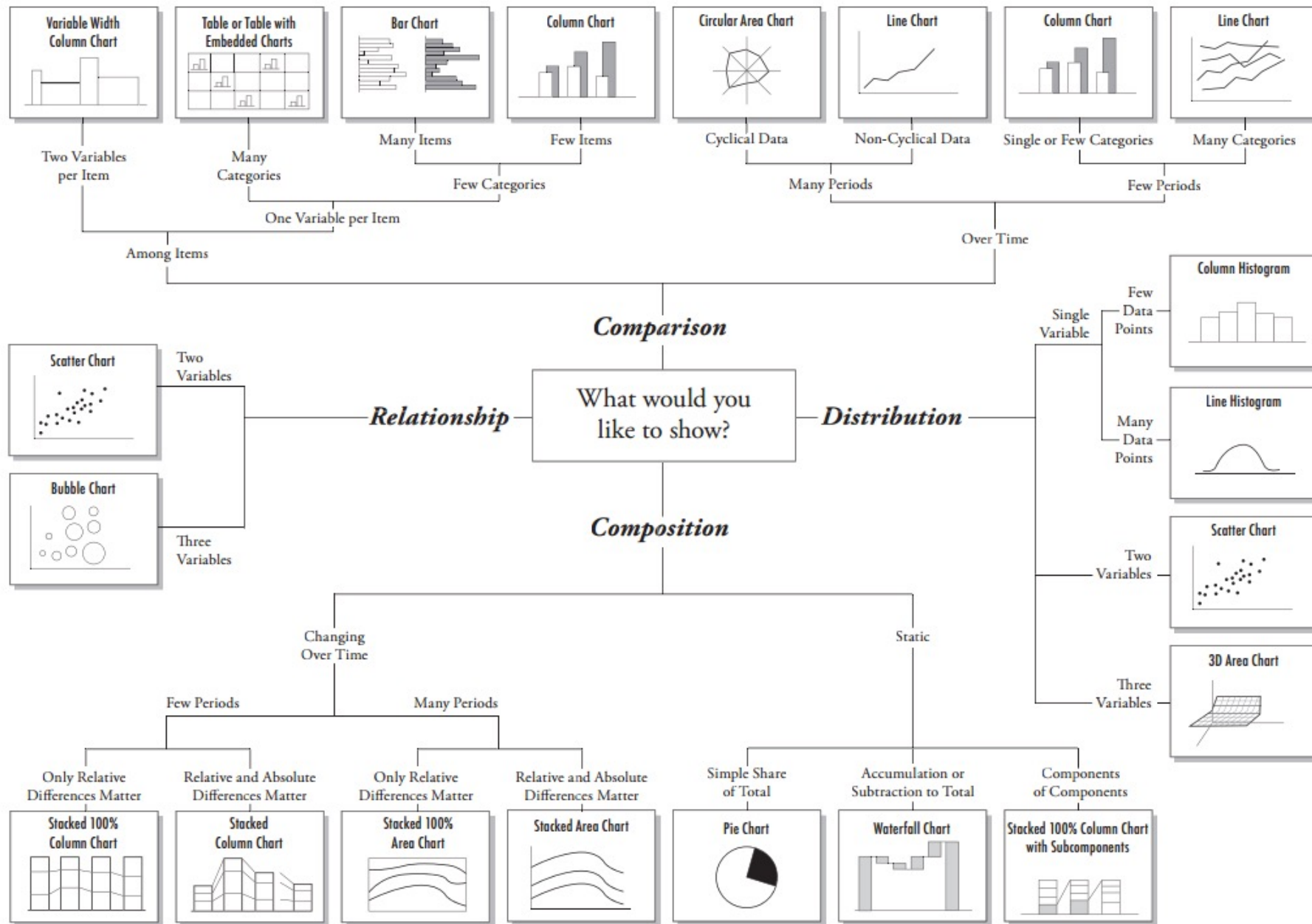


Rules for representation – Familiar by author and audience



I personally use Tableau as a visualization tool (free licensing for education)

# Chart Suggestions—A Thought-Starter



# Moving visual content....



## Video

photographic images that are played back at speeds of at least 30 frames per second and provide the appearance of full motion.

technology of electronically capturing, recording, processing, storing, transmitting, and reconstructing a sequence of images representing scenes in motion.

Video takes a lot of storage space.



## Animation

The illusion of motion created by the consecutive display of images of static elements.

Animation is used to enhance / enrich the experience of the user to further understand the information conveyed to them.

Many applications for both Macintosh and Windows provide animation tools.

# Videos

- can serve as training aids and the medium to introduce concepts.
- The process of creating videos includes preproduction, the shoot and postproduction



## instructional video?

An instructional video is any video that demonstrates a process, transfers knowledge, explains a concept, or shows someone how to do something.



Types: microvideos, tutorial videos, training videos, explainer videos, recording a lecture or presentation, screencasts



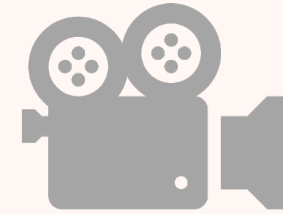
software tool:  
Camtasia

# More about videos



## Distribution

Broadcasting via any audiovisual medium.  
Streaming video (webcasting when conducted  
over the Internet)  
Lecture capture systems



## There are three primary ways to deliver video in education.

On-demand video.  
One-way video.  
Two-way interactive video.



# Making videos

- **How to produce**
  - Students can make movies using software such as Windows Movie Maker or iMovie to create digital movie projects and/or slideshows
  - Students can make movies by using their smartphone
  - Can be as simple as putting in pictures with captions in a slide show, or as difficult as full movies using video cameras, editing, etc.
- **Authoring tools**
  - Viddler (<http://www.viddler.com/>)
  - Vimeo (<http://vimeo.com/>)
  - GoAnimate (<http://www.miniclip.com/sketch-star/en/>) (free animations and instructions on how to create simple animations)

# Web sites



The most common way to convey info at present



A combination of hypertext, graphics, audio, video, (linked elements) and interactivity culminating in a complete, non-linear computer-based experience.



Rules are defined for layout, navigation

# Authoring Tools



Use to merge multimedia elements (text, audio, graphic, animation, video) into a project.



Designed to manage individual multimedia elements and provide user interaction (if required).



Examples:

Macromedia Authorware

Macromedia Director

Macromedia Flash

# Processing Video Tools

- Development: requires beginner multimedia developmental skills
- Hardware/software requirements; mobile phone, basic camcorder, microphone and tripod;
- Examples
  - Microsoft® Producer (free at <http://www.microsoft.com/windows/windowsmedia/technologies/producer.msp>);
  - commercial software Elluminate® at <http://www.illuminate.com/>
  - video editing software such as:
    - iMovie (<http://www.apple.com/ilife/imovie/>)
    - Viddler at <http://www.viddler.com>; Vimeo at <http://vimeo.com>.
    - Adobe Premiere (<http://www.adobe.com/products/premiere/index.html>)

# Animations, interactive courseware, tutorials, simulations

- Development: requires intermediate/advanced technology developer skills
- Usually developed in applications such as:
  - Macromedia Director and Authorware as alternative development environments.
  - Java (<http://java.sun.com/>) for **mathematical and scientific animations**
  - Mathsonline Puzzlemaker makes creating simple games and puzzles easy  
<http://www.univie.ac.at/future.media/moe/testpuzzle/testpuzzle.html>
  - Hot Potatoes at <http://hotpot.uvic.ca/> for creating a wide range interactive exercises (free of charge for educational purposes).
  - The commercial software Sitepal (<http://www.sitepal.com/>) allows the creation of speaking avatars using your voice and photographic or cartoon facial features. Free 15-day trial available

# VR and AR Definitions

Replace with your own text



## Virtual reality (VR)

- virtual reality is a **medium** composed of **interactive computer simulations** that sense the **participant's position and actions** and **replace or augment the feedback to one or more senses**, giving the feeling of being mentally immersed or **present in the simulation** (a virtual world). (Sherman&Graig, 2004)



## Augmented reality (AR)



- Augmented reality is an **enhanced version of reality** created by the use of technology to **overlay digital information** on an image of something being viewed through a device
- **AR (Azuma, 1997)**
  - Combines real world and virtual objects
  - Interactive in real time
  - Registered in 3D

Virtual world

Reality-Virtuality continuum

Real world

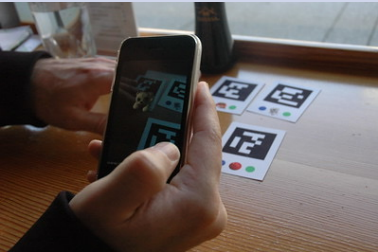

# VR hardware technology

Type VR	Input	Output
<p><b>Non Immersive</b></p>  <p>Image source: <a href="https://www.extremetech.com/gaming/">https://www.extremetech.com/gaming/</a></p>	<p>Tracking devices position, head (and hand)</p> <p>User actions input devices audio devices haptic equipment</p>	<p>Visual devices Computer monitor &amp; glasses Autostereoscopic devices</p> <p>Audio</p> <p>Haptic equipment</p>
<p><b>Semi Immersive</b></p>	<p>Tracking devices position &amp; orientation, head (&amp; other body parts)</p> <p>User actions input devices audio devices haptic equipment</p>	<p>Visual devices projectors or stacked TV &amp; glasses</p> <p>Audio stationary, dynamic</p> <p>Haptic equipment data gloves, end effectors, ....</p> <p>Other senses (olfactory, taste, vestibular)</p>
 <p>CC-BY-SA-4.0, Manus VR</p> <p><b>(low cost) Mobile VR - minimal</b></p>	<p>Tracking devices (position &amp;) orientation head (&amp; other body parts)</p> <p>User actions input devices audio devices haptic equipment</p>	<p>Visual devices HMD</p> <p>Audio stationary, dynamic</p> <p>Haptic equipment data gloves, end effectors, ....</p> <p>Other senses (olfactory, taste, vestibular)</p>

input - tracking – **internal smartphones sensors**, head (and hand)

output – smartphone display with **optic system (Cardboard)**

# AR hardware technology (USE)

Input devices	Computer system	Output
<b>Tracking sensors</b>	<b>Application</b>	<b>Visual displays</b>
optical (with or without markers), GPS, gyroscopes, accelerometers, audio tracking devices	AR viewer AR browser AR standalone apps AR cloud client apps	Computer displays HMD Glasses Stereoscopic displays
<b>Environmental sensors</b>	<b>Hardware</b>	<b>Other devices</b>
environmental conditions sensors, like pH, voltage, radio frequency information, and other specific aspects of the physical world	<ul style="list-style-type: none"> <li>•handheld system</li> <li>•desktop/laptop computer</li> <li>•VR based hardware combination with/without connection to the server</li> </ul>	Audio displays Haptic displays Other sensory displays
<b>User input devices</b>		
buttons, touchscreens, keyboards, and other typical UI devices.		
<b>Examples</b>	<b>Examples</b>	
 	Applications - Augmented Reality Browsers - Augment, Wikitude, Junaio (free), Layar - 3D viewers - Ngrain, Sun Seeker, Google Sky Map, GeoGoogle Games - Pokemon Go, Temple Treasure Hunt Game, Landlord Real Estate Tycoon, Ingress,	



## content development tools

- Representation of objects - senses, fidelity, 2D & 3D objects, animations
- programming tools, editing tools, scan real world objects and convert information to digital representation, we can use already developed objects
- OpenGL, WebGL, Maya from Autodesk, 3ds Max, etc..

## AR/VR development tools

- programming libraries, development tools
- enable combining the following functions: 3D recognition and tracking, image recognition and tracking, facial tracking, motion tracking, placement of virtual objects as 3D models in a real-world environment, virtual buttons, localized occlusion detection using virtual buttons, video overlay, integration with external plugins, .....

## AR/VR application

- Environmental acquisition
- Sensor integration
- Application engine
- Rendering software


# VR Development Tools

**Supported equipment?  
Platform?  
Price?  
Programming?  
Developer?** ↓

Tool	Devices/platforms
Unity 3D	HMD - Oculus Rift, Steam VR/Vive, Play station VR, Gear VR, Microsoft HoloLens, and Google's Daydream View Mobile platforms - Mac OS X, Android, iOS, Window The paid version supports Nintendo Wii, Xbox 360, and PlayStation.
Unreal Engine 4	HMDs - Oculus Rift, HTC Vive, Samsung Gear VR, Google VR, and Leap Motion, etc. Windows PC, PlayStation 4, Xbox One, Mac OS X, iOS, Android, AR, VR, Linux, HTML5 etc.
Blender	Based on Python, Blender is a modern and opensource 3D graphics software CAVE/VideoWall, Head-Mounted Displays (HMD) Blender is supported on Windows, Mac OS, and Linux platforms.
Amazon Lumberyard	Major HMDs PC, Xbox One, PlayStation 4, iOS, Android (Nexus 5 and equivalents with support for OpenGL 3.0+). Windows and Linux
CryEngine	Windows, Linux, PlayStation 4, Xbox One, Oculus Rift, OSVR, PSVR, and HTC Vive.
AppGameKit	Windows, Mac, Linux, iOS, Android including inc Google, Amazon & Ouya, HTML5, Raspberry Pi (free from TGC website).
Google SketchUp	Windows 7 and newer and OS X 10.9 and newer
Vizor.io	Visual programming editor to create WebVR and WebGL experiences
JanusVR	Janus is more like a web browser than a development tool used to create VR applications The supported platform is Windows 7 or a newer version.
React 360	a framework used to create 3D, 2D and VR interfaces for building photo and video viewers, 360 tours, adventure games, 3D board games, etc
A-Frame	a web framework that is used to build immersive virtual reality experiences

# AR Development Tools

Supported equipment?  
Platform?  
Price?  
Programming?  
Developer?



Tool	Operating Systems / Devices
Apple ARKit	iOS
Vuforia	iOS, Android
Google ARCore	Android, iOS, cross-platform AR applications
ARToolKit	iOS, Android, Windows, Mac OS, and Linux platforms
MixedReality Toolkit (HoloLens)	Microsoft Windows Microsoft HoloLens, Microsoft Immersive Headsets (IHMD) Steam VR (HTC Vive / Oculus Rift), OpenXR platforms
DroidAR	Android
AR.js	Android, iOS 11 and Windows mobile. Runs on a user web browser
HP Reveal Studio	Android and iOS
Amazon Sumerian	Android and iOS Oculus Go, Oculus Rift, HTC Vive, HTC Vive Pro, Google Daydream, and Lenovo Mirage

# Instead of conclusion...

- *Thank you all....*