Traditional face-to-face (F2F) undergraduate classroom
vs
fully online (FO) teaching

Can An Eye Tracking Analysis Help Us?

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F2F vs FO: negative aspects

"Our results strongly suggest that ==online instruction== in key introductory college level courses, at least as currently practiced, ==may not be as effective as face-to-face instruction== at 2-year community colleges."

The Effectiveness of Distance Education Across Virginia's Community Colleges: Evidence From Introductory College-Level Math and English Courses by Xu & Jaggars (2011)

F2F vs FO : negative aspects

"For increased online course offerings to translate to improved academic success and postsecondary progression, institutions may need to devote ==substantially more resources== to developing and evaluating programs and practices explicitly designed to ==improve such students' retention and learning in online courses==."

Xu & Jaggars (2011)

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F2F vs FO: negative aspects

"Clearly, from multiple perspectives, ==FO mathematics instruction has not been successful== in comparison with traditional F2F mathematics instruction."

A Review of Fully Online Undergraduate Mathematics Instruction through the Lens of Large-Scale Research (2000-2015) by Trenholm, Peschke & Chinnappan (2019)

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F2F vs FO: potential to explore

The use of technology-enabled <u>peer assessment processes</u> takes advantage of the predominantly asynchronous nature of current FO instruction can help students <mark>engage in higher-level mathematical activities</mark> and <mark>increase student interactivity</mark>.

Trenholm, Peschke & Chinnappan (2019)

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F2F vs FO: potential to explore

Potential for major pedagogical innovation in mathematics.

- **Relative ==*student anonymity*== as helping students feel less threatened as compared to live F2F settings (Smith, Ferguson, & Caris, 2003)**
- **An opportunity to ==*disrupt traditional teaching processes*== to the benefit of students and their learning (Borba et al., 2016; Trenholm, Alcock, & Robinson, 2016).**

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F2F vs FO : potential to explore

Potential for major pedagogical innovation in mathematics.

- **Enabling "*playful exploration*" (Rosa & Lerman, 2011).**

- **Relations are established between the construction of online identities and the teaching and learning of the definite integral concept in an online learning course.**

- **The role-playing game (RPG) is played through chat; characters (online identities) by each player.**

F2F vs FO: better learning from online videos

People <u>learn better</u> from an instructional video when

• the onscreen instructor draws graphics on the board while lecturing (*dynamic drawing principle*),

• the onscreen instructor shifts eye gaze between the audience and the board while lecturing (*gaze guidance principle*),

• the lesson contains prompts to engage in summarizing or explaining the material (*generative activity principle*),

Five ways to increase the effectiveness of instructional video by Mayer, Fiorella, & Stull (2020)

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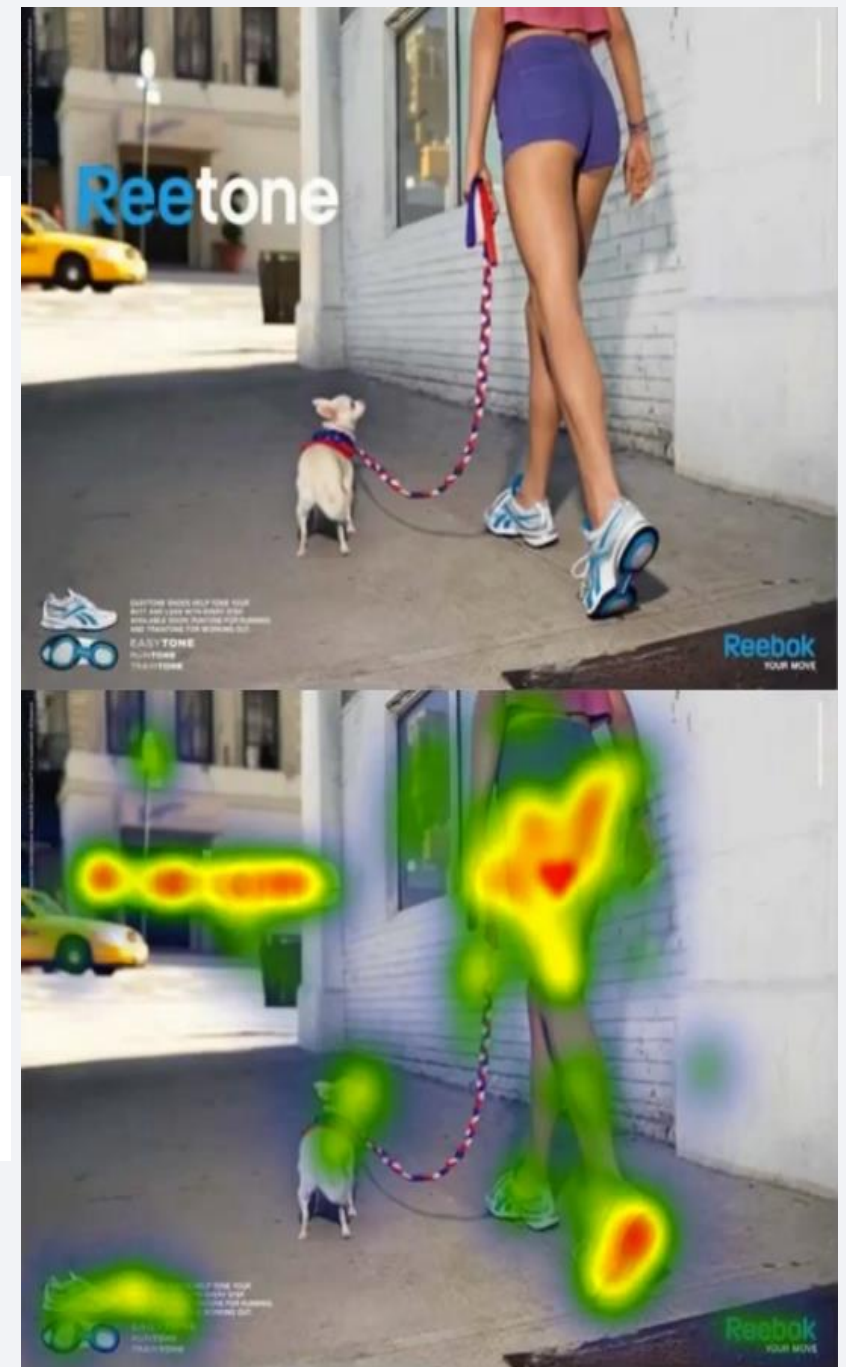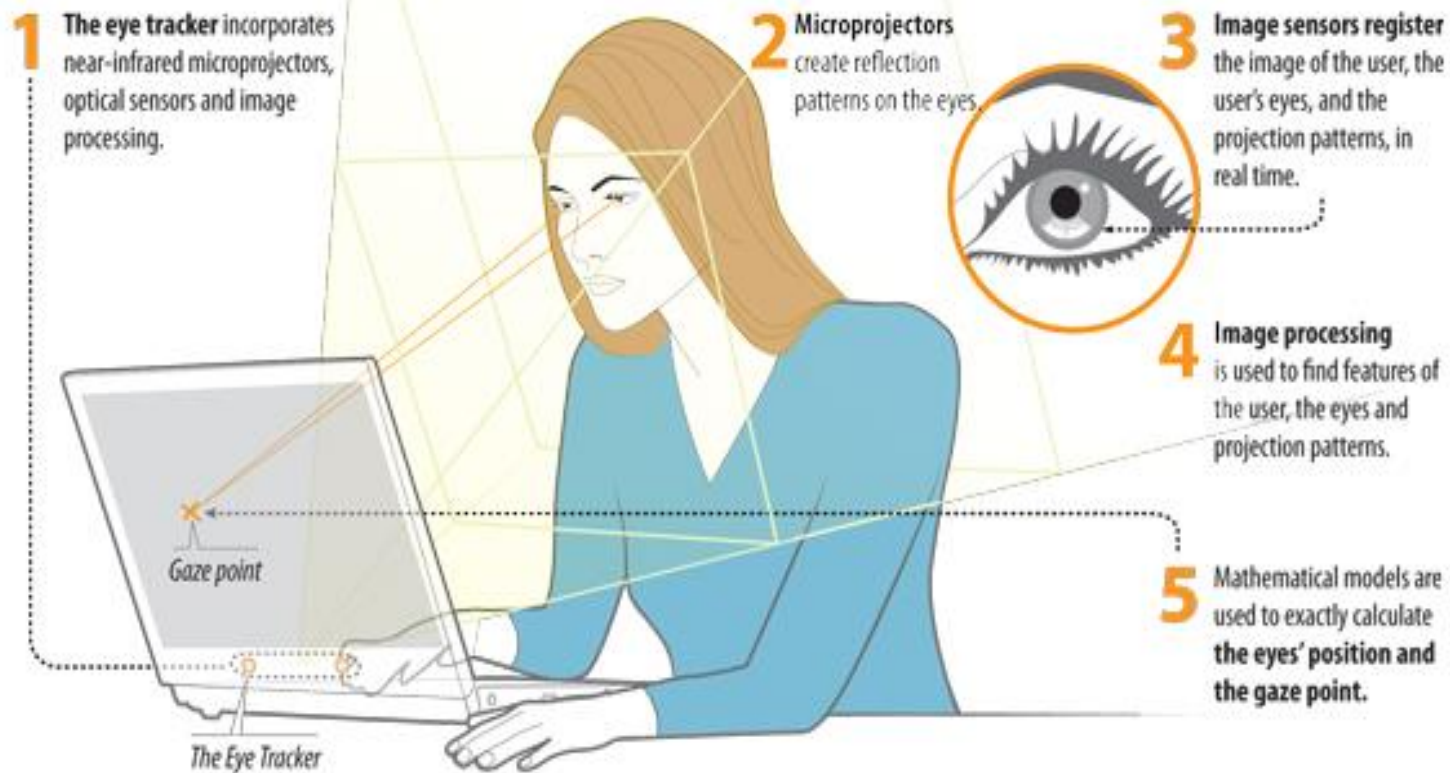# F2F vs FO: better learning from online videos

People <u>learn better</u> from an instructional video when

- a demonstration is filmed from a first-person perspective (*perspective principle*), or

- subtitles are added to a narrated video that contains speech in the learner's second language (*subtitle principle*).

People <u>do not learn better</u> when interesting but extraneous video is added (*seductive details principle*).

Mayer, Fiorella, & Stull (2020)

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Eye tracking

1. **The eye tracker** incorporates near-infrared microprojectors, optical sensors and image processing.

2. **Microprojectors** create reflection patterns on the eyes.

3. **Image sensors register** the image of the user, the user's eyes, and the projection patterns, in real time.

4. **Image processing** is used to find features of the user, the eyes and projection patterns.

5. Mathematical models are used to exactly calculate **the eyes' position and the gaze point.**

Gaze point

The Eye Tracker

Skimming vs reading

Eye tracking: action plan

"Many types of eye-trackers can be operated without any skills in experimental design or data analysis, thereby lowering the barriers to conducting eye-tracking research. … Motivated by this concern, we have proposed a list of threats to the validity of eye-movement research … which will allow researchers to identify problems before conducting their studies."

Threats to the validity of eye-movement research in psychology

By Orquin & Holmqvist (2018)

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Eye tracking: action plan

1. Literature analysis
2. Design of valid experiments
3. Creation of sample video materials by lecturers and students
4. Testing sample videos on lecturers and students
5. Simple post-video quizzes or interviews to assess learning and knowledge retention
6. Analysis of eye-tracking data and quizzes
7. Recommendations to lecturers

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Eye tracking: your help will be needed for

Creation of sample video materials by lecturers and students
- with/without lecturer/combination of these;
- dynamic writing/prepared slides/combination of these;
- writing on a board/tablet/pc/ combination of these.

1. Testing sample videos on lecturers and students
2. Simple post-video quizzes or interviews to assess learning and knowledge retention
3. Analysis of own experience and recommendations to lecturers

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Thank you for attention!

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