

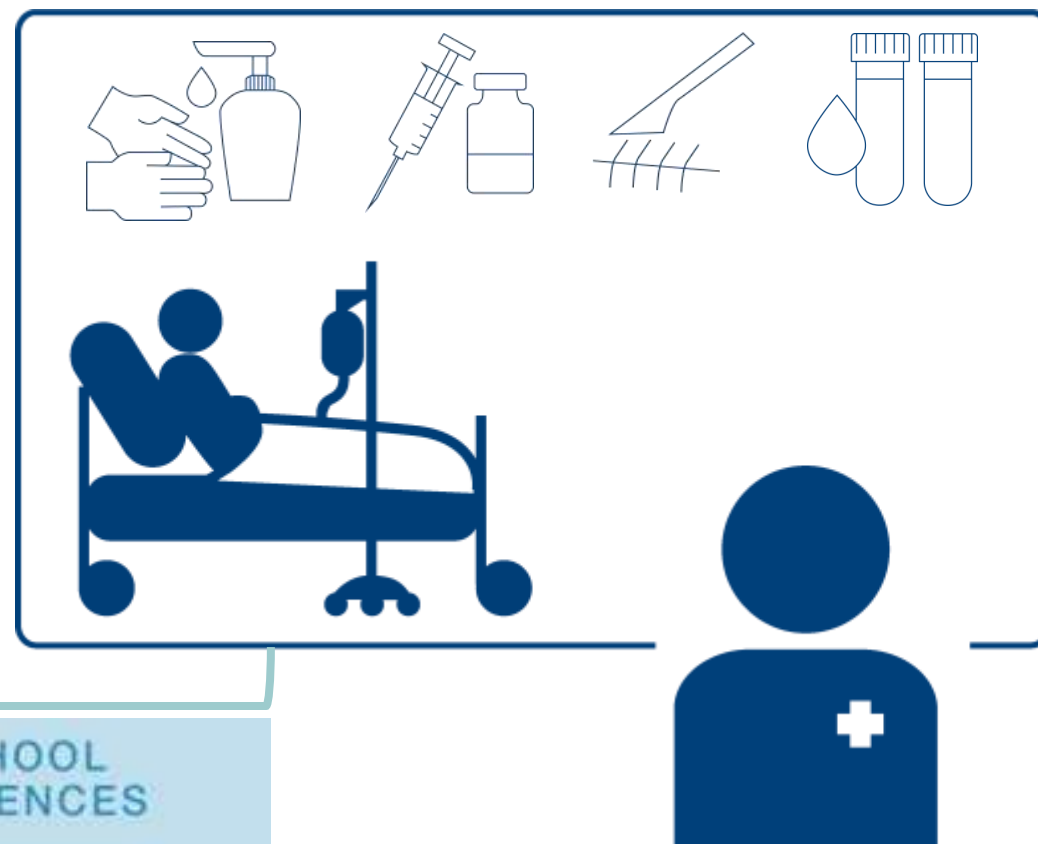
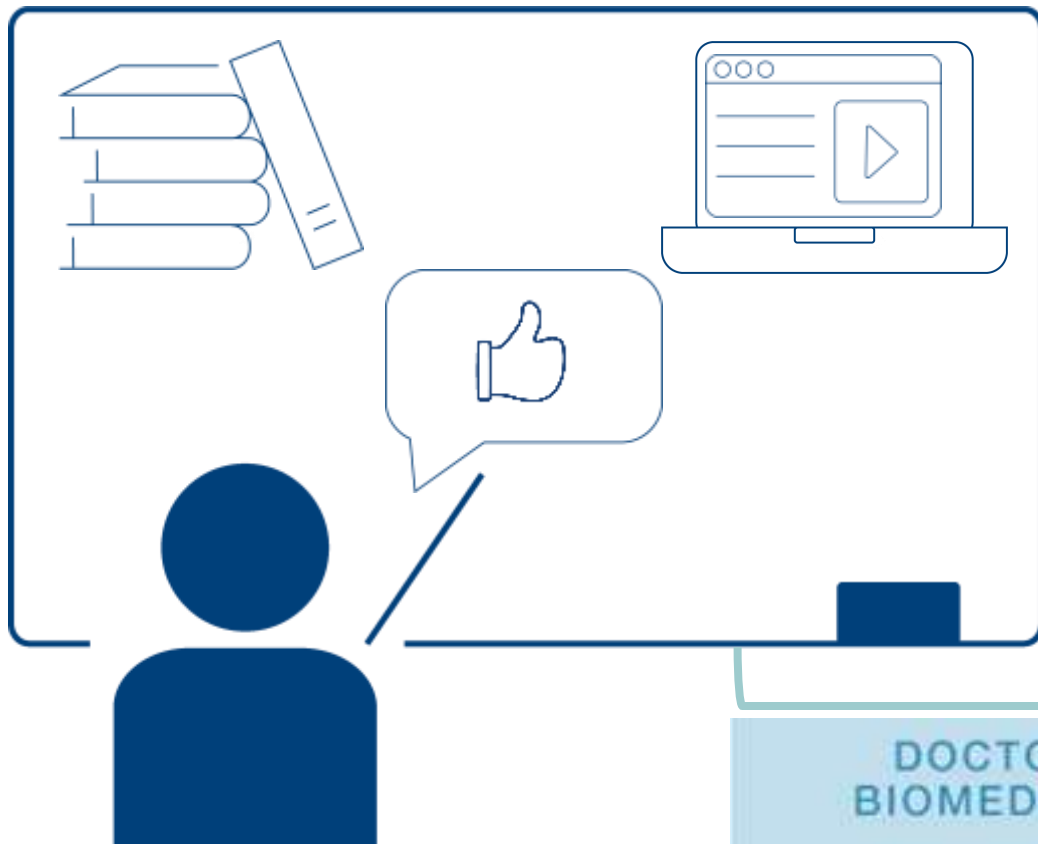
# Navigating through Multimedia Principles

to design demonstration videos  
of psychomotor skills in  
health professional education

Greet Leysens

Department of Pharmaceutical and Pharmacological Sciences







## Multimedia learning with video

Didactic succes factors to master psychomotor skills  
in health professional education



**Health Professional  
Education**

**Frameworks**

**Multimedia  
principles**

**Checklist**

**Videos**

**Lessons learned  
&  
future directions**

# Health Professional Education



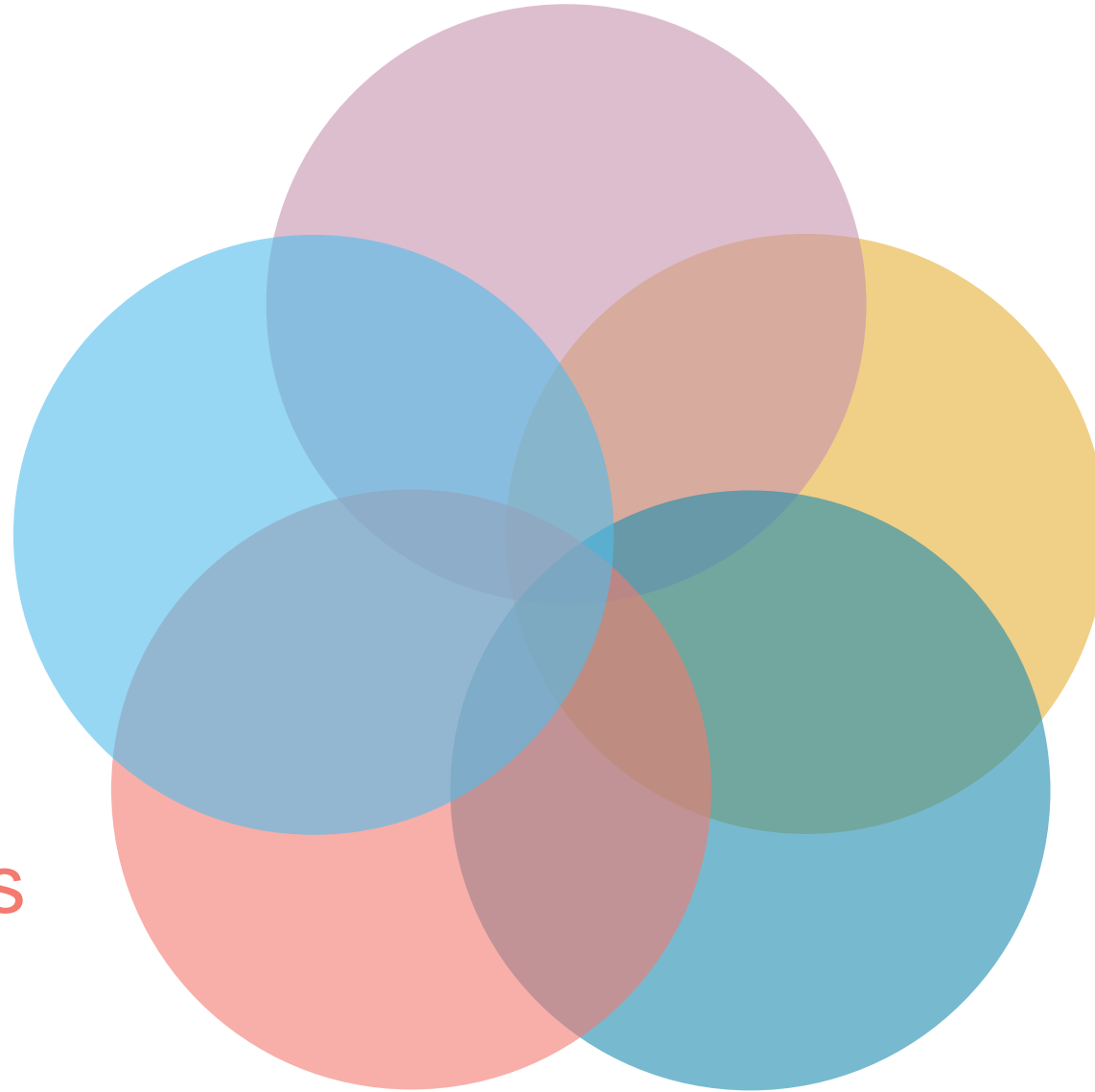
clinical judgment

clinical reasoning

psychomotor skills

critical thinking

problem solving





## psychomotor skills

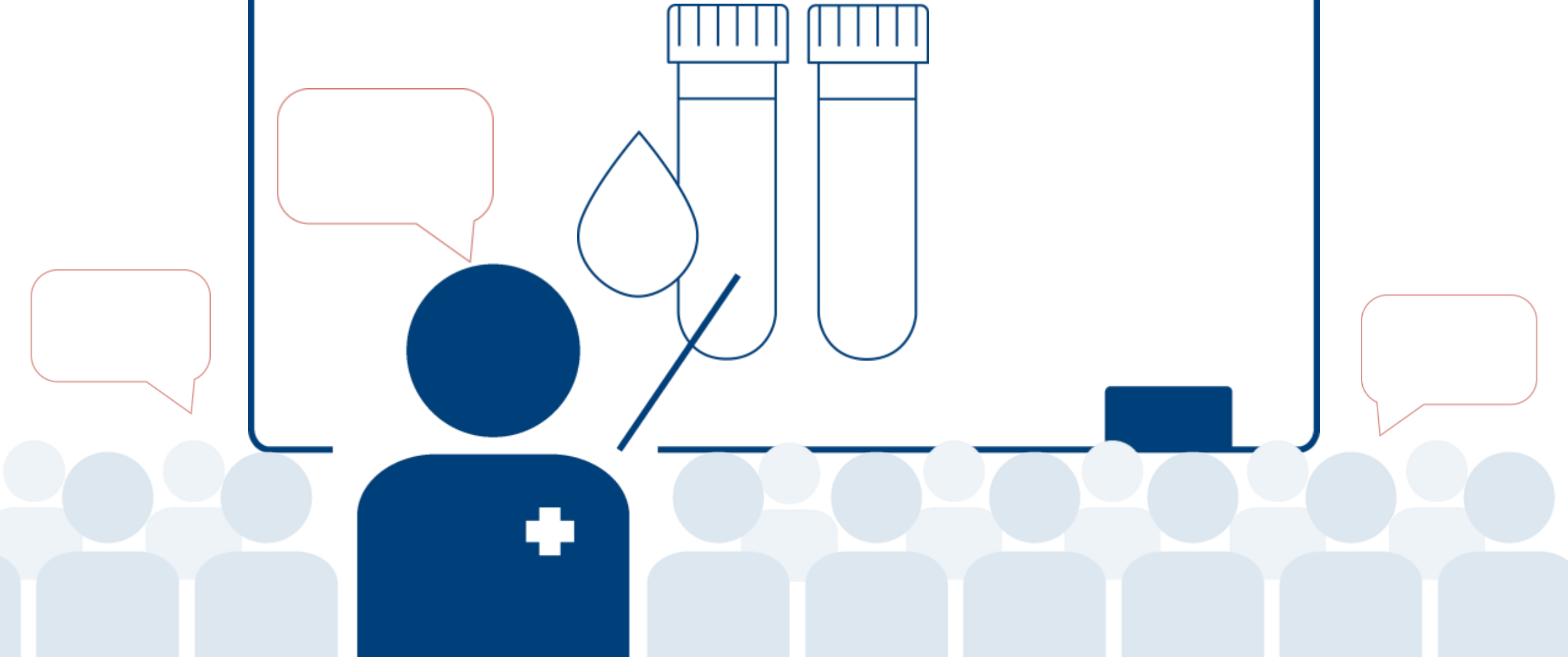


## physical movements

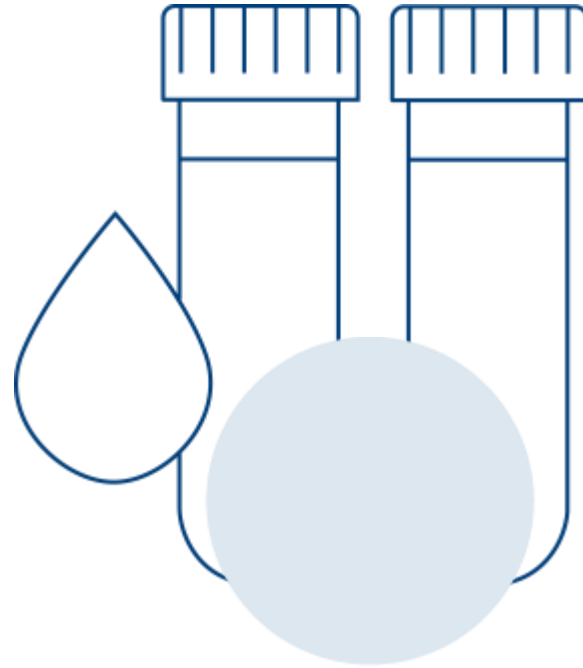
- ✓ proficiently
- ✓ under varying conditions
- ✓ within time limits

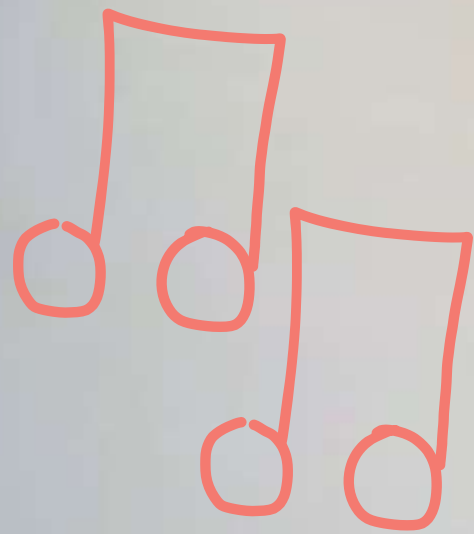


# synchronous instructor led learning

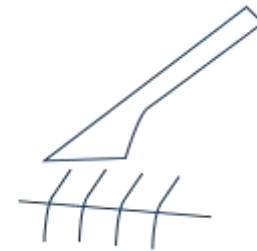
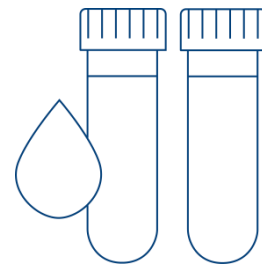


# asynchronous self-paced learning





the **IDEAL**  
demonstration **video**  
to maximise  
**learning** efficiency



# Frameworks

skill acquisition

reflective practice

novice

advanced  
beginner

competent

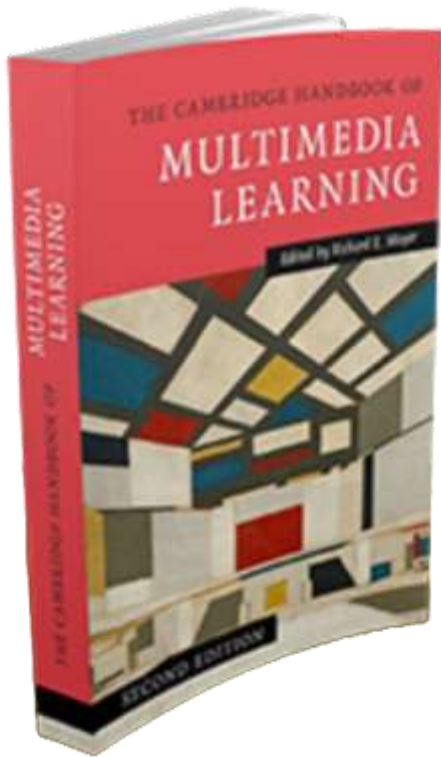
proficient

expert



Teachers must initially use **context-free** rules  
to instruct task performances

– Benner (1884)



People can learn more deeply from words & pictures than from words alone

– Mayer (2014)

# Multimedia principles





# Journal of Applied Research in Memory and Cognition



COVID-19 Special Forum Article

## Evidence-Based Principles for How to Design Effective Instructional Videos

Richard E. Mayer\*  
University of California, Santa Barbara, USA

▶ 14 multimedia principles

*Australasian Journal of Educational Technology, 2022, 38(3).*



## **Improving instructional video design: A systematic review**

**Matthew Fyfield, Michael Henderson, Michael Phillips**  
Monash University, Australia

 **31 multimedia principles**

reduce  
extraneous  
processing

- 1) coherence
- 2) signalling
- 3) redundancy
- 4) spatial contiguity
- 5) temporal contiguity
- 6) segmenting
- 7) background music
- 8) audio quality
- 9) video length reduction
- 10) perspective (1st)
- 11) presenter's face
- 12) sound effects

manage  
essential  
processing

- 13) pre-training
- 14) modality
- 15) multimedia
- 16) speech rate (fast)
- 17) transience
- 18) worked example
- 19) learner control
- 20) reviews

foster  
generative  
processing

- 21) personalisation
- 22) voice principle
- 23) embodiment principle
- 24) guided discovery
- 25) self-explanation
- 26) drawing
- 27) dialogue
- 28) emotional design
- 29) misconceptions
- 30) integrated learning activities
- 31) interactivity

# most supported principles

- 1) coherence
- 2) signalling
- 3) redundancy
- 4) spatial contiguity
- 5) temporal contiguity
- 6) segmenting
- 7) background music
- 8) audio quality
- 9) video length reduction
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- 25) self-explanation
- 26) drawing
- 27) dialogue
- 28) emotional design
- 29) misconceptions
- 30) integrated learning activities
- 31) interactivity

# highly confounded principles when applied to video design

- 1) coherence
- 2) signalling
- 3) redundancy**
- 4) spatial contiguity
- 5) temporal contiguity
- 6) segmenting
- 7) background music
- 8) audio quality
- 9) video length reduction
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- 26) drawing
- 27) dialogue
- 28) emotional design
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- 31) interactivity

# relatively under-studied principles

- 1) coherence
- 2) signalling
- 3) redundancy
- 4) spatial contiguity
- 5) temporal contiguity
- 6) segmenting
- 7) background music
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COVID-19 Special Forum Article

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## Improving instructional video design: A systematic review

**Matthew Fyfield, Michael Henderson, Michael Phillips**  
Monash University, Australia

# Video in the Age of Digital Learning

## Chapter 3 Instructional Videos for Teaching and Learning

**Table 3.1** Primary types of instructional videos

Video category	Production style (level of production quality—PQ)
1. Lecture videos (pre-produced)	Featuring instructor
	• Lecture/classroom captures (low to medium PQ)
	• Screencasts (low to high PQ)
	• Professionally produced videos (high PQ)
	• “Office hour” videos (low PQ)
	Without instructor (low to high PQ)
	Tutorials (low to high PQ)
2. Explainer videos	Graphics (motion/still) (low to high PQ)
	Animations (low to high PQ)
	Demonstrations (low to high PQ)
3. Live content	Live classroom, interactive (low PQ)
	Screencast webinars (medium PQ)
	Produced webinars (high PQ)
	One-on-one (low PQ)
4. Documentary/narrative	Interview (low to high PQ)
	Documentary film (low to high PQ)
	Narrative film, reenactment (low to high PQ)
	Case study (low to high PQ)
5. Videos integrating other media	Transcripts
	Interactive (linked) graphics
	Simulations
	Discussions
	Assessments
6. User-generated content	Video messages (generally low PQ)
	Presentations, projects, reports (generally low PQ)
	Assignment responses (generally low PQ)



	Tutorials (low to high PQ)
▶ Explainer videos	Graphics (motion/still) (low to high PQ)
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	Discussions

## **Improving instructional video design: A systematic review**

**Matthew Fyfield, Michael Henderson, Michael Phillips**  
Monash University, Australia

### *Implications for practice or policy:*

- Instructional videos that are shorter, segmented, coherent and paired with learning activities are more likely to lead to improved learning gains in students.
- Researchers reporting on the use of videos should provide comprehensive descriptions of media, including links to the media where possible.
- Designers of instructional videos should critically evaluate design principles established for non-video media.

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- **Designers of instructional videos should critically evaluate design principles established for non-video media.**

# Checklist

# Development checklist

- design asynchronous demonstration videos -

✓ List & formulate  
31 propositions  
(Mayer, 2014; Fyfield, 2022)

✓ Ensure wording  
consistency

✓ Feedback experts  
KU Leuven  
LIMEL  
(n=8)

✓ Reformulate or  
omit propositions

✓ Final checklist 24  
propositions

reduce  
extraneous  
processing

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- 2) signalling
- 3) redundancy
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- ~~31) interactivity~~



# Checklist

## - design asynchronous demonstration videos -

Extraneous processing principles <sup>1-3</sup>		applied? (yes, not always, no)
1	Coherence*	Irrelevant spoken or written words and images are excluded.
2	Signalling*	Cues are added to highlight or spotlight key information.
3	Redundancy*	The same information is not presented in written sentences and spoken narration simultaneously.
4	Spatial contiguity*	Related written words and images are presented in close physical proximity.
5	Temporal contiguity*	Related spoken words and images are presented simultaneously.
6	Segmenting*	The message is presented in learner-paced meaningful segments.
7	Background music	Irrelevant background music is excluded.
8	Audio quality	Audio is clear, with no hissing or interference.
9	Video length reduction	The video is as concise as possible while maintaining clarity.
10	Perspective (1st superior)	The video is shot from the learner's point of view.
11	Presenter's face	When alternative complex visuals are displayed, the presenter's face is excluded.
12	Sound effects	Irrelevant sound effects are excluded.
Essential processing principles <sup>1-3</sup>		
13	Pre-training*	Key vocabulary is presented at the beginning of the video.
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23	Self-explanation *	The video prompts the learner to explain the learning goal.
24	Integrated learning activities	Practice activities are integrated either during pauses in the presentation or following the video.

\*Mayer (Mayer, 2014)



## Extraneous processing principles <sup>1-3</sup>

applied?  
(yes, not  
always, no)

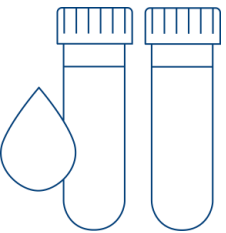
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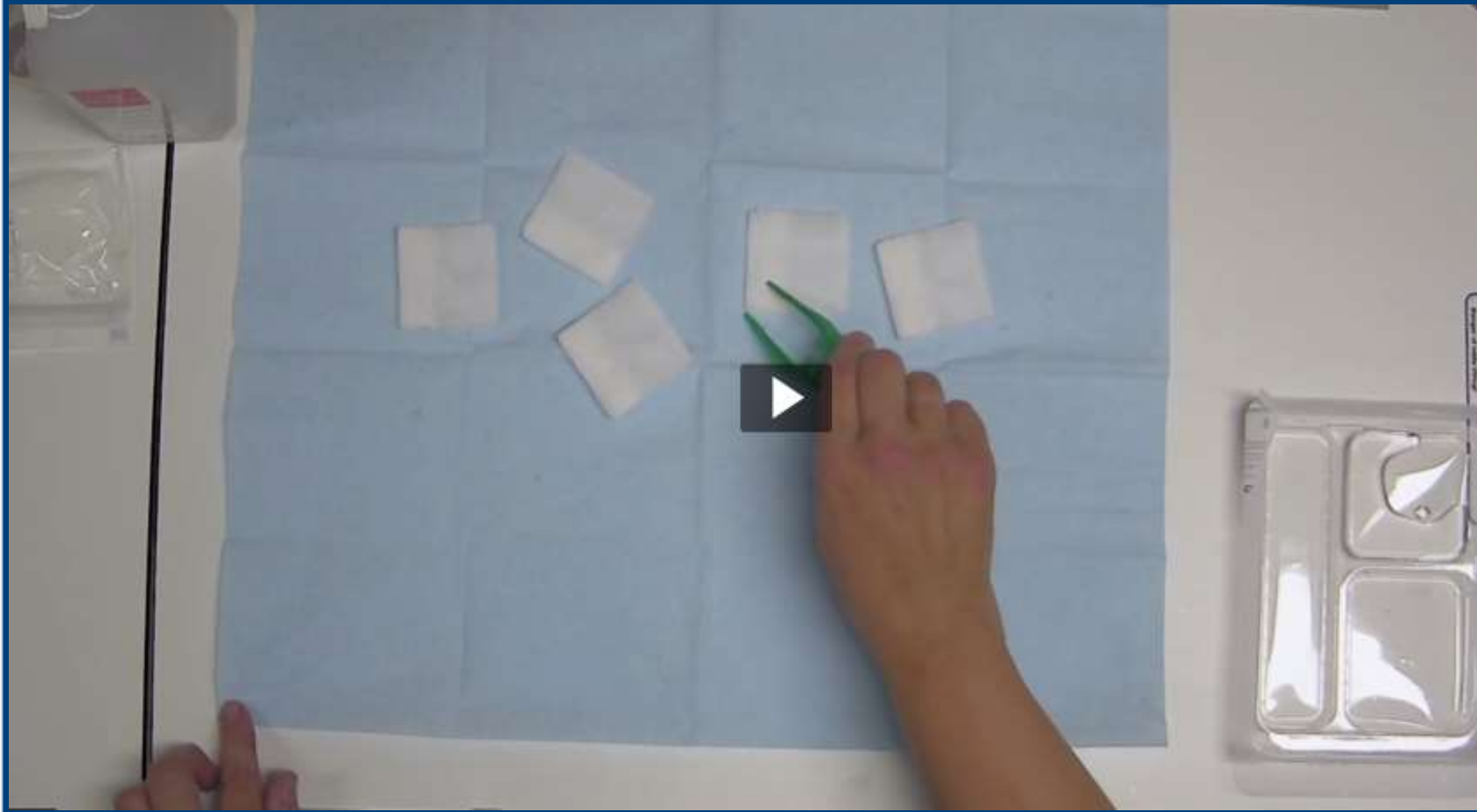
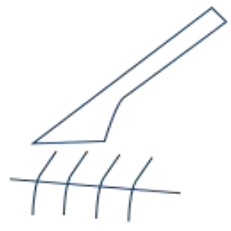
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# Videos







**segmenting principle**





**pre-training principle**



**signalling principle**




**spatial contiguity principle**



- bedbeschutting - nierbekken



- veld leggen
- reinigingsmiddel in blister
- handschoenen aan 
- verband losmaken



- wondbed, dichte & verwijderde omgeving reinigen
- verwijderde omgeving droogdeppen
- verband aanbrengen



May clip

**reviews principle**



**Heb je oefenmateriaal,  
oefen de stappen  
terwijl je  
de video herbekijkt**

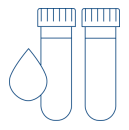
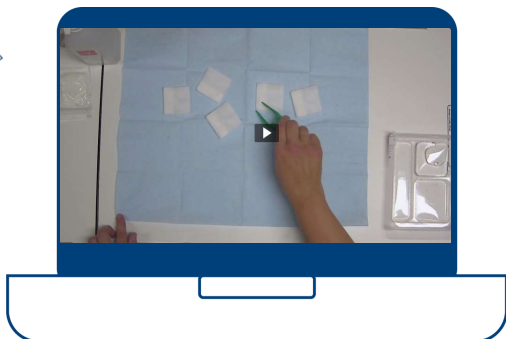
**integrated learning activities principle**

# feedback

KU LEUVEN

THOMAS  
**MORE**

UNIVERSITY OF  
APPLIED SCIENCES



KU LEUVEN

GREET LEYSSENS  
PhD project  
greet.leysens@kuleuven.be



## Checklist

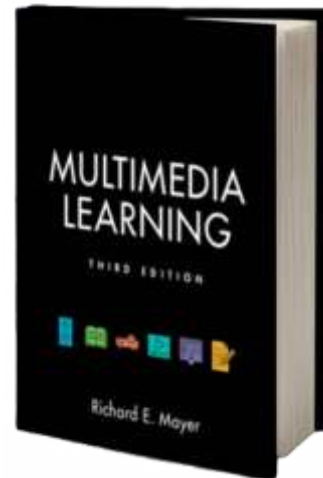
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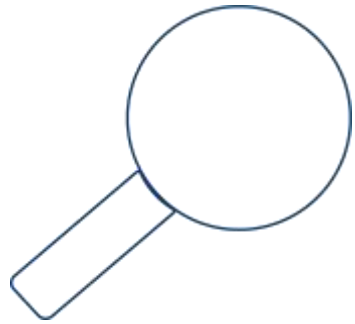
\*Mayer (Mayer, 2014)

**Lessons learned  
&  
future directions**

- There are a lot of multimedia principles ...
  - Application depends on **type of video**
  - Ongoing research for more **evidence** & further refinement
- Checklist as
  - valuable **guide** for creating demonstration videos
  - **check-up** to ensure principles are consistently applied

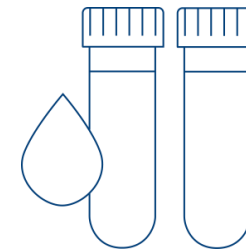
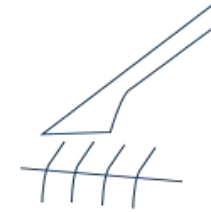


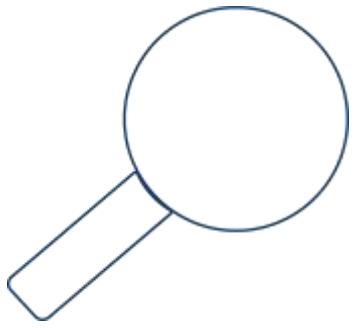




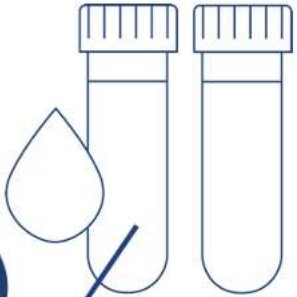
## Multimedia learning with video

Didactic succesfactors to master psychomotor skills  
in health professional education

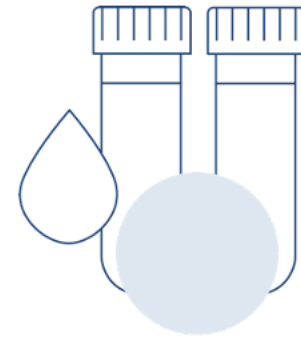




**synchronous**  
instructor led learning



**asynchronous**  
self-paced learning





# To be continued

## Thank you