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Disclosures: I am an Education and Simulation Consultant with TC Curriculum & Instructional Design, LLC, Healthcare Section Editor for Simulation and Gaming, and I teach graduate courses in Instructional Technology.

Objectives

Distinguish between using technology in a lesson and using technology to differentiate instruction.

Explain how research and learning theory guide practice and the effective use of technology in education.

Justify the use of technology for enriching and differentiating instruction for the learner.

Summarize the major learning theories and practices that support the use of technology in education.

Some present and emerging technologies that impact how we educate

Research information anytime, anywhere

Collaborate, create, and produce

Mobile learning and wearable technology

E-learning

Serious gaming and game-based learning

3D printing

Virtual labs

Cloud-based computing

Innovative apps

“Show me what you are thinking” – Tools for reflection and assessment

Future trends / emphasis in K-12 education?

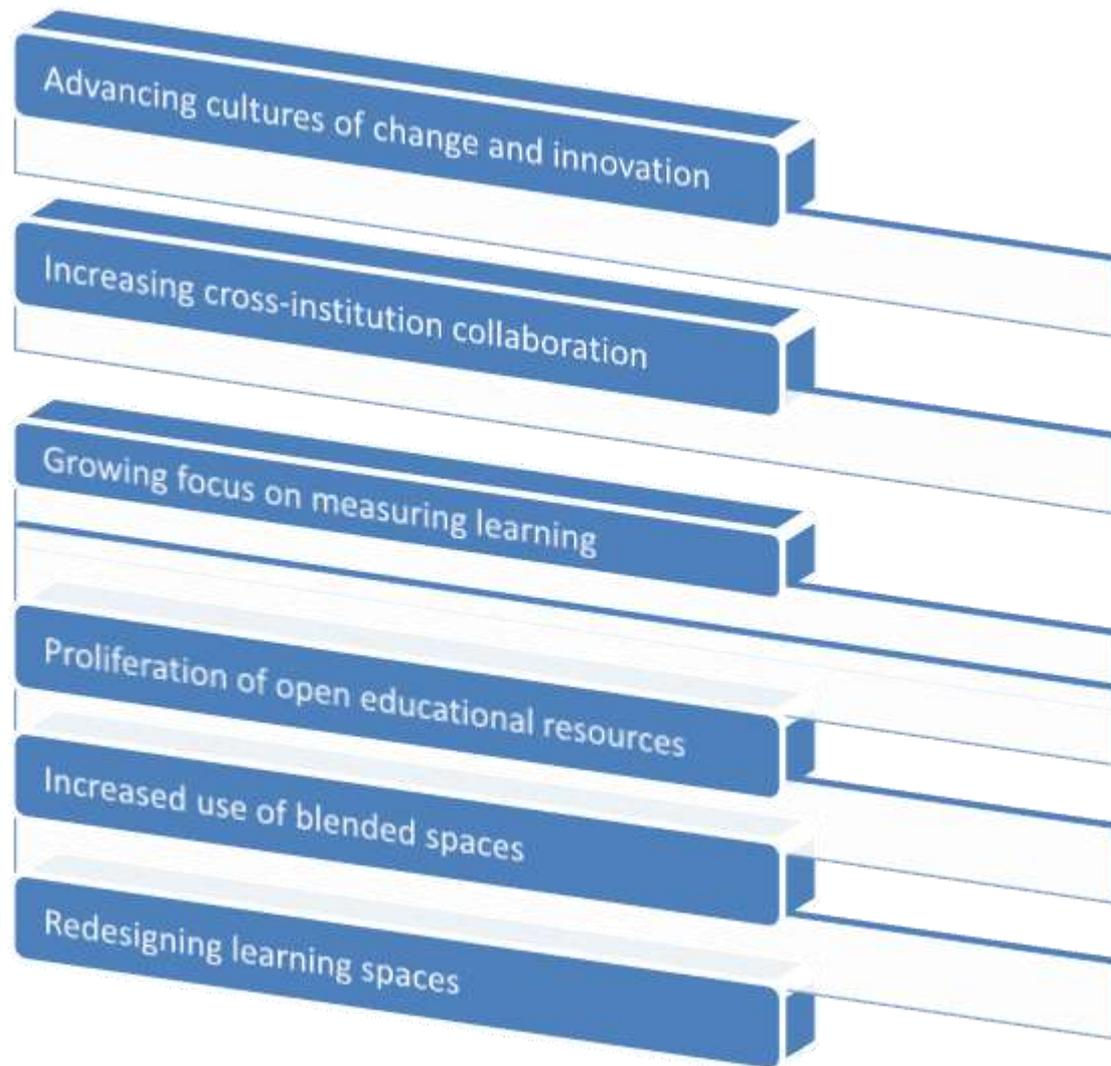
Virtual or online learning. As noted by US Dept of Ed, “48 states and the District of Columbia currently support online learning opportunities that range from supplementing classroom instruction on an occasional basis to enrolling students in full-time programs.”

Full-time online schools. Fulltime online or virtual schools. Students receive all of their instruction and earn all of their credits through the online school. Students may go to a lab, but the instruction is monitored remotely by a certified, highly trained teacher.

Blended learning. Face-to-face and online learning opportunities. Recognizes student’s learning styles and allows them greater accessibility and accommodation to educational resources especially in remote areas.

Use digital resources well. Schools can use digital resources and technology to advance learning and incorporate reflection and feedback throughout the learning process.

Future trends / emphasis in higher education?



Advance more innovation and creativity through problem-based learning – mirror the workplace

Compile and share cloud-based resources to improve quality and accessibility

Analyze learning-related data from number of logins to mastery of concepts

Move to blended learning to increase accessibility

Transition from traditional classroom settings to collaborative work spaces that promote active-learning activities

What this can look like to the learner...



Announcements

Instructor Information

Syllabus

Course Content

Discussion Board

Bb Voice Board

Blackboard Tools

▼ Course Tools

Achievements

Announcements

Blackboard Collat

Blogs

Cengage Learning

MindLinks

Commercial Cont

Contacts

Course Calendar

Course Messages

Course Portfolios

Date Management

Discussion Board

Glossary

Goals

Journals

McGraw-Hill Higher Education

Mediasite Options

Mediasite Recording Options

Mobile Compatible Test List

My Mediasite

Pearson's MyLab & Mastering

Respondus LockDown

Browser

Rubrics

SafeAssign

Self and Peer Assessment

Send Email

SoftChalk - Synchronize

Copied Content

SoftChalk Publish with

ScoreCenter

Tasks

Tests, Surveys, and Pools

Wikis

WileyPLUS

↳clicker Instructor Tools

► Evaluation

What's the latest version of the iPad app?

- Our [KBG resources](#) article has all the information on what's new and fixed in this version.

To sign up for an account:

1. If you haven't already installed the Twitter for iPad app, go to about.twitter.com/products/ipad and follow the instructions on that page.
2. Once the app is installed on your iPad, you can sign in with an existing account or sign up for a new account directly from the app.
3. Tap the blue **Sign up** button on the welcome screen and fill out the fields asking for your **name**, **phone number**, **desired username**, and **password**.
4. In order to verify your number, we will send you an SMS text message with a code. Enter the verification code in the box provided. [Learn more about having a phone number associated with your account here.](#)
5. If your desired username is already taken, it will turn red and a message will drop down below the username field telling you to choose a new username.
6. Once you've chosen a username that has not been taken, a blue check mark will appear next to the username.
7. When you have completed the form, tap **Sign up**.
8. A message will pop up telling you your account has been successfully created.

Note: If you'd like to sign up with an email address, you can do so by clicking on the "Use email instead" link at the bottom of the sign up page.

<https://support.twitter.com/groups/54-mobile-apps/topics/222-ios/articles/20169499-getting-started-with-twitter-for-ipad#>

3. You have options on how to join the event. With WebEx you can choose to download a plug-in one time, or run a temporary application to enter the meeting. To download the plug-in you need administrator rights, and this may require assistance from your IT team. To run the temporary application, you do not need administrator rights.

Click on the yellow bar or the Use Java hyperlink to install the one time plug in, this will require admin rights

OR, choose to Run the temporary application to join the meeting.

4. After choosing the one time plug-in or to run the temporary application, you may need to click on the yellow bar to initiate the download process.

After choosing you may need to click on the yellow bar to start the download

http://www.loma.org/uploadedFiles/LOMAorg/LOMA_Root/HelpCenter/Reference/LoginWebEx.pdf

Authoring an electronic portfolio

Here are the steps in authoring an electronic "presentation" portfolio:

1. Create a first page as an introduction and table of contents
2. Set up a structure around the goals/themes identified in purpose statement
3. One page for each goal/theme with links to first page
4. Upload artifacts to page or create hyperlinks to documents online
5. Write reflections about how the artifacts demonstrate achievement of goals
6. Write future learning goals
7. Publish portfolio online

Below there is more detail on each step, using Google Sites, which is Google's version of a wiki.

Create a first page - Introduction & Table of Contents

Write an Introduction to the Reader (sometimes this is the last thing you write, although it is the first thing people will read). Identify the purpose of this portfolio, the audience, and the contents. Why did you create this portfolio?

For example, see [this page](#)

<https://sites.google.com/site/eportfolioapps/online-tutorials-sites/sites-how-to>

Meta-analysis (of more than 100 studies) from 1996 -2008 K-12, Undergraduate, Graduate, Medical / Healthcare

Online students perform better than those receiving face to face instruction.

Blended environments tended to do better. **The media was not necessarily responsible for the positive outcomes**, but instead, the additional time and instructional elements.

Guided facilitation and tools that prompted reflection led to better learning outcomes.

Self-explanation and application of the content in authentic ways, peer interaction, and student-centered or moderated instruction led to better outcomes.

The way the medium is used, including the user's ability to manipulate and control it is more important than having access to it.

Zhang et al., 2006

US Dept of Education, 2010

Faculty training

Simulation, like many tools and strategies...

Not a separate learning modality, but one educational tool and strategy.

Significant growth in healthcare the past ten years. Many directors and educators thrust into positions without background experiences in instructional design. Some as early as one year out of residency.

Workshops help, but may be developed and taught by people with similar backgrounds or in the same situation.

(Clapper, 2014)

When do faculty receive instruction on techniques for applying learning theory to practice and making technology a tool for learning rather than just a “tool to use” or even a “tool of frustration?”

Think about the slide shown earlier and how overwhelming some learning environments can be for faculty in addition to the learners.

Faculty training

Faculty need to see a reason to change (Argyris and Schön, 1992).

Some barriers to using digital technology that should be addressed when considering faculty training:

- Teachers feel overwhelmed and pressed for time
- Blocked access to resources and sites
- Fear of failure (especially in front of peers and other professionals like themselves) (Hunt-Barron, 2015)

Theories and concepts supporting the correct use of technology in education

Differentiated Instruction

Situational interest

Zone of Proximal Development

Constructivism

Cognitive load

Theory of Margin

Situated cognition

Social cognitive theory

**Learning through the
experience – Experiential
learning**

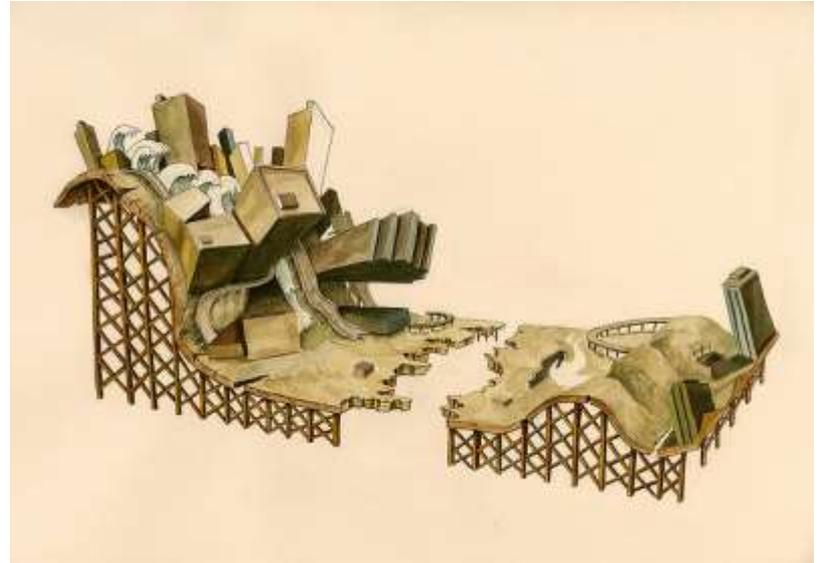
**Learning Styles - Dunn
and Dunn**

**Information processing
theory**

Multiple Intelligences

And many more

Technology



Frames of Reference and Piaget's Schemata

Frames of reference. Most attributed to Kurt Lewin and other social psychologists.

Schemata. Most attributed to Jean Piaget.

Some similarities and differences, but the important takeaway:

People learn things a certain way and organize those thoughts and actions into mental models.

It is how they learned it. It is what they know. It is real.

Jeanne Ormrod's marble building



Exercise 1



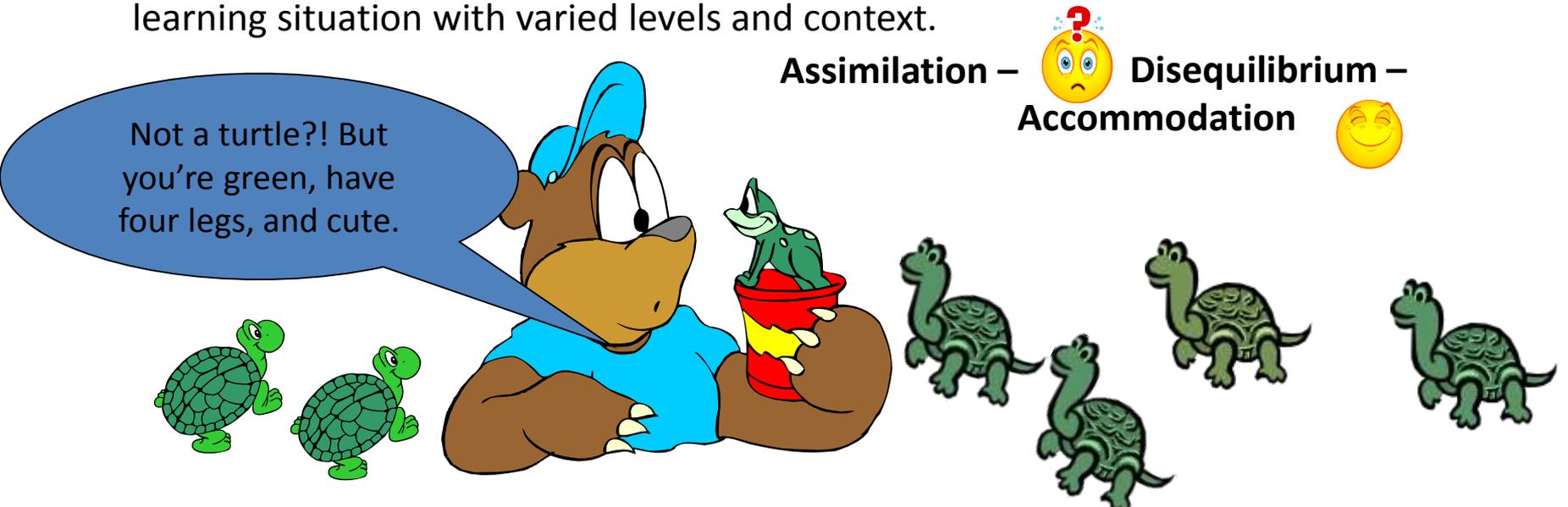
Not this kind

Constructivism

Maria Montessori, Jean Piaget, and John Dewey

- Constructivism as an educational philosophy becomes a basis for “Transformational learning” which you may read about in many adult learning journals.
- Piaget, (1962): Learner enters the environment with past experiences, schemata, or frames of reference that can be built upon or restructured if they have a reason to change them... (Importance of experience *and* reflection).
- Knowledge is constructed by the learner individually and with the assistance of others (Piaget,1962; 2008; Vygotsky, 1978).

Learner experiences are very unique to each person. That is why they come into the learning situation with varied levels and context.



Cooperative learning and the Zone of Proximal Development

David and Roger Johnson are perhaps best known for their research and practice with cooperative learning. *Not to be confused with group work* (Clapper, 2015a).

The *zone of proximal development (ZPD)* (Vygotsky, 1978): describes the difference between (a) what the learners can learn on their own and (b) what they can learn under the guidance of a facilitator or others in the learning environment.

Use intentional learning activities where learners can work together to move toward learning objectives (Barkley et al., 2005). Even working alone, learners can **use technology to organize or construct a product**. Learners can **use technology to share the product, which can assist others with moving through the ZPD**.



Exercise 2



Not this kind

The Dunn and Dunn Model of Learning Styles

The Dunn and Dunn model (1978; 1992) identified three modality preferences that affect the way a person learns. Updated in 2009 according to international findings.

Dunn et al. (2009) found that most learners can possess up to six perceptual modalities including: **a) auditory**, **b) visual/picture**, **c) visual/print**, **d) tactual**, **e) kinesthetic** and/or **f) verbal/kinesthetic** (p. 136).

Use technologies that help them see it, hear it, and do it in many ways



Think about it. **People remember...**



20%

20% of what they hear



30%

30% of what they see



70%

An amazing 70% of what they see & hear!



Learning styles in use

clavicle?

auditory

“What’s going with a shoulder dystocia and how does a clinician deal with it?”

visual/picture



visual/print



Management of Shoulder Dystocia

Shal Sivastava & Sanjiv Datta

Journal of Obstetrics, Gynaecology and Reproductive Health, 2010; 1(1): 1-10

ISSN 2278-3845

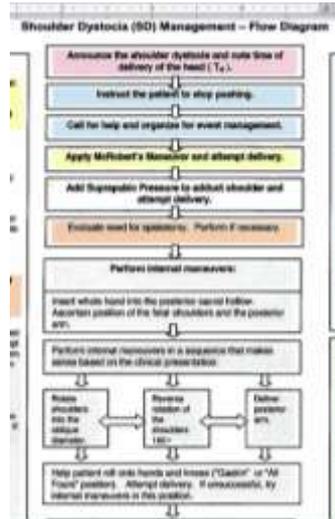
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tactual



verbal/kinesthetic

kinesthetic

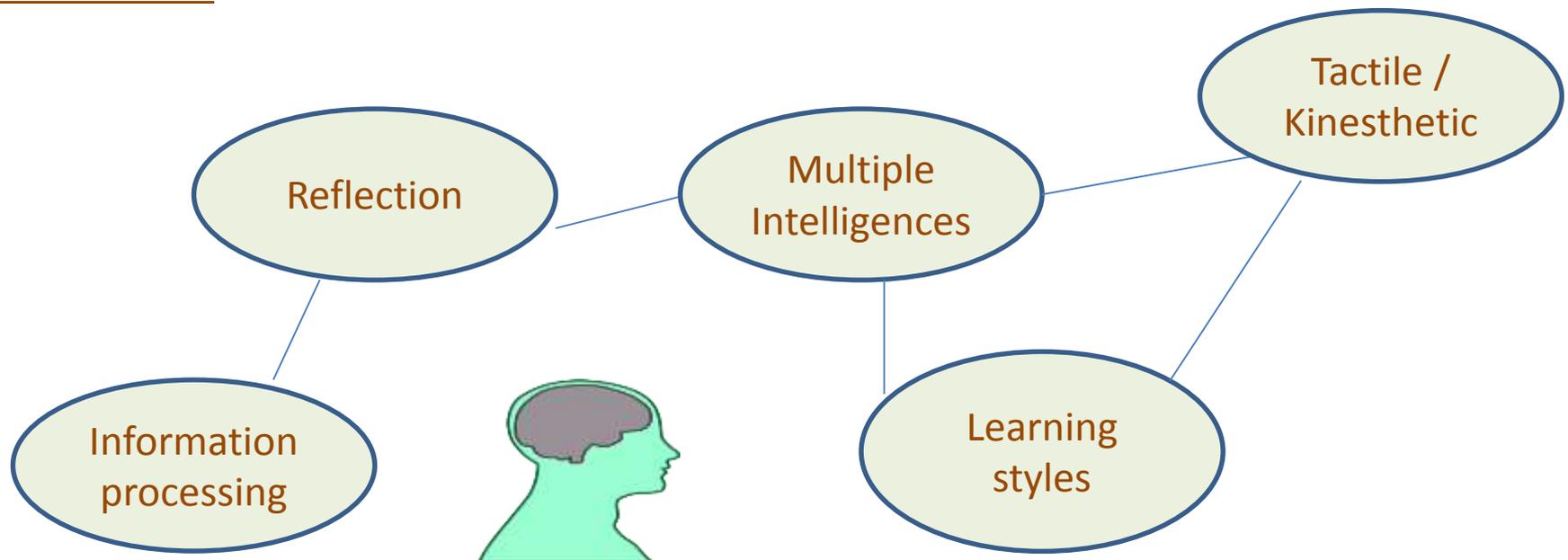


Information Processing Theory

Compliments constructivism because the foundation is built upon the idea of self-regulation, relating new information with existing information, and processing information in the working memory.

Cognitive load. Demands on the working memory.

Use activities such as mind mapping, Thinking Map® and good instructional design principles to help the learner organize information and build connections.



Differentiated Instruction

Differentiated instruction does not fall neatly into one philosophy, ideology, or theory (Clapper, 2011). But can you see how they tie several together?

Facilitators can differentiate instruction by differentiating the content, the process, and the product (Tomlinson & McTighe, 2006).

Differentiating the content is important to address the various levels of learners in the classroom. How can you help them make multiple connections with the content?

Differentiating the process is important because the teacher selects learning activities that recognize the way the learner learns best. Think learning styles.

Differentiating the product is important because ongoing and varied forms of assessments (throughout the lesson) allow the learner to see those frames of reference and where the learner really is in their understanding.

Adult learners in your course rooms

Beyond Knowles: What those conducting simulation need to know about adult learning theory

That's Beyond Knowles



Not Beyoncé Knowles



Six characteristics of adult learners that course developers and facilitators should consider (Clapper (2010) :

1. Adult learners may have had bad learning experiences in the past.
2. Adult learners prefer learning that is active, and they want to be assisted with making meaning of the information.
3. Learning is an emotional event.
4. Adult learners prefer assessment and improvement to evaluation and failure.
5. Adult learners want to leave the lesson with a better understanding of the content.
6. Adult learners have many other priorities in their lives.

Evidence to support the correct use of technology in education

Comparison of Different Instructional Multimedia Designs for Improving Student Science-Process Skill Learning (Chien & Chang, 2012).

Randomized posttest comparison-group experimental design comparing the use of multimedia between animated and static visualizations to assist students in learning topographic measurements.

Static Graphics (SG): Static graphics were presented next to the corresponding texts.

Simple Learner-Pacing Animation (SLPA): Continuously dynamic illustrations with explanations. Includes learner-pacing function (pause, continue, and back buttons).

Full Learner-Pacing Animation (FLPA): Interactive dynamic illustrations with explanations. In addition, learners could pause or resume the animation. Further, the students could physically manipulate the graphic and control of the spatial relations such as the angles, heights, and distances, depicted in the animation.

All participants were able to control the visuals, including the frame rate.

Results

Effort. Mental effort ratings (student reported self-confidence or cognitive comfort levels) of FLPA group were, on average, lower than those of both SLPA and SG groups.

Performance. All students were required to measure a specific object with a real Abney Level using trigonometric leveling. Practical performances of FLPA group were, on average, higher than those of both SLPA and SG groups. Statistic significant level ($F(2, 24) = 6.931, p = .004, f = .76$, large effect size).

Time. FLPA group on average spent less time on learning in contrast to both SG and SLPA groups.



Evidence to support the correct use of technology in education

Lin and Griffith (2014) reviewed the studies published in academic journals for the impact of online technologies on computer-supported collaborative learning in second language and foreign language writing.

Findings from literature review: Online collaborative learning environments can enhance writing skills, critical thinking skills, and knowledge construction. In addition, they can increase participation, interaction, and reduce anxiety (think CoLT and ZPD).



Zhao and Chan (2014) examined a computer-supported knowledge-building environment of a tertiary education course.

Findings: Knowledge-building groups outperformed the comparison groups. **Student engagement** was a significant predictor of their academic literacy. Student groups engaging in more collective and meta-discourse assignments performed better on individual scores in academic literacy.

Evidence to support the correct use of technology in education

Emotional design in multimedia learning (Um, Plass, Haywood, & Homer, 2012).

Used color and shape effects in instructional design to induce positive emotions without changing the content of the materials

Emotions. The Positive Affect Scale (PAS) to ask respondents to indicate the degree to which they experience different feelings related to positive affect (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, active), using a 5-point Likert-type scale ranging from 1 (*very slightly or not at all*) to 5 (*very much*; coefficient).

Prior knowledge. Assessed using a seven-item, self-report checklist. Learners indicated their level of knowledge of the topic of the learning material: immunization.

Transfer. The transfer test measured participants' ability to apply the concepts learned to solve problems and consisted of four questions.

Learning outcomes. A comprehension test measured learners' understanding of key concepts of the materials.

Effort / Cognitive load. To measure the *cognitive load* experienced by learners, participants completed a 9-point Likert-type Cognitive Load Subjective Experience Questionnaire targeting invested mental effort.

Results

Effort / Cognitive load. Positive emotions induced *during* the learning task reduced the perceived difficulty of the task.

Positive emotions induced *before* the learning increased the satisfaction toward the same learning material and experience.

Comprehension. Learners who studied the materials that were designed to induce positive emotions performed better.

Transfer. Positive emotions, externally or internally, increased participants' performance on the transfer test.

Remember: Memory and emotions closely intertwined!

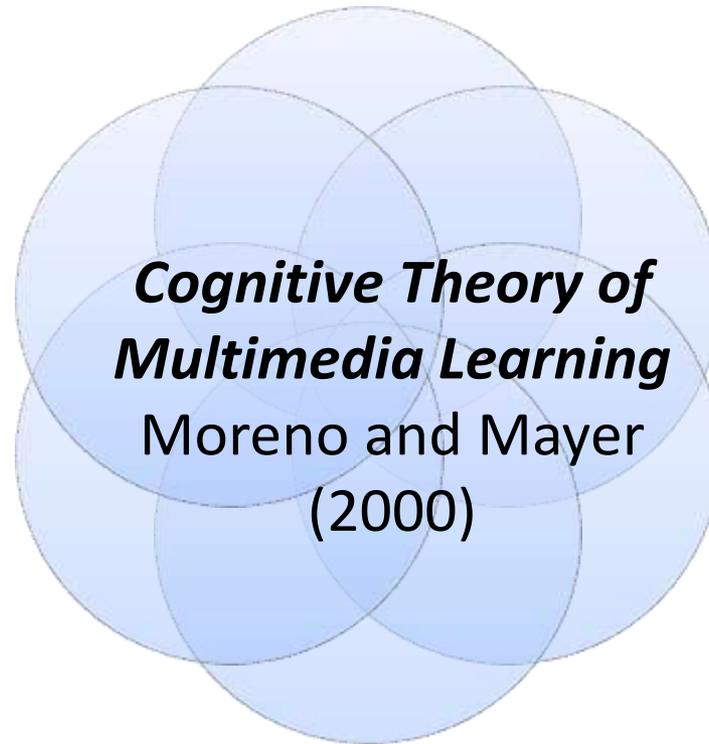


**Based on several experiments
that test the way that learners
process multimedia**

Show connections: Students learn better when on-screen text and visual materials are physically integrated rather than separated.

Students receiving instruction by narration and animations outperform those who learn with concurrent on-screen text and animations

(the researchers estimate that the learner may be missing part of the visual information while they are reading the text).



Redundant verbal messages negatively affect learning when they are used in presentations of animations and explanations.

Multimedia presentations should represent the verbal and non-verbal steps in synchrony.

Learners can hold images and verbal representations in working memory at the same time and can build connections between them.

Think animation with narration!

Applying theory to practice....some final thoughts on application

Use technology to enhance the quality of the learning experience and enrich the learning environment.

Research and teach best-practices so learners can have the best learning experiences and quality frames of reference.

When using simulation, make opportunities to teach before the scenario to ensure that everyone has the latest information and a shared mental model going into the scenario.

Select technologies that are easy for the learner to learn and use. Ask yourself, **“will learning the technology be harder or take longer than learning the content itself?”**

Naming one’s practice is an ongoing routine. Look to the past to help you design the future (Clapper, 2015b).

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References

- Barkley, E. F., Cross, K. P., & Major, C. H. (2005). *Collaborative learning techniques*. San Francisco, CA: Jossey-Bass.
- Chien, Y-T., & Chang, C-Y. (2012). Comparison of different instructional multimedia designs for improving student science-process skill learning. *J Sci Educ Technol*, 21, 106–113. doi 10.1007/s10956-011-9286-3
- Clapper, T. C. (2015a, in press). Cooperative-based learning and the zone of proximal development. *Simulation & Gaming*. doi: 10.1177/1046878115569044
- Clapper, T. C. (2015b, in press). Theory to practice in simulation. *Simulation & Gaming*.
- Clapper, T. C. (2014). Situational interest and instructional design: A guide for simulation facilitators. *Simulation & Gaming*, 45(2), 167-182. doi: 10.1177/1046878113518482
- Clapper, T. C. (2011). *The effect of differentiated instruction on JROTC leadership training*. (Ph.D. dissertation). Capella University, United States -- Minnesota. Dissertations & Theses: Full Text. (Publication No. AAT 3440244).
- Creative gorilla marketing (2014). Volkswagen surprises moviegoers with shocking cinema stunt. <http://www.creativeguerrillamarketing.com/guerrilla-marketing/volkswagen-surprises-moviegoers-shocking-cinema-stunt/>
- Dunn, R., & Dunn, K. (1978). *Teaching students through their individual learning styles: A practical approach*. Reston, VA: Reston Publishing.
- Dunn, R., & Dunn, K. (1992). *Teaching elementary students through their individual learning styles: Practical approaches for grades 3-6*. Boston, MA: Allyn & Bacon.
- Dunn, R., Honigsfeld, A., Doolan, L. S., Bostrom, L., Russo, K., Schiering, M. S., Suh, B., & Tenedero, H. (2009, Jan-Feb). Impact of learning-style instructional strategies on students' achievement and attitudes: Perceptions of educators in diverse institutions. *The Clearing House*, 82(3), 135-140.
- Hunt-Barron, S., Tracy, K, N., Howell, E., & Kaminski, R. (2015). Obstacles to embracing professional development with digital tools in rural landscapes. *Journal of Research in Rural Education*, 30(2), 1-14.
- Johnson, L., Adams-Becker, S., Estrada, V., & Freeman, A. (2015). NMC Horizon Report: 2015 Higher Education Edition. Austin, TX: The New Media Consortium.

Lin, S. M., & Griffith, P. (2014). Impacts of Online Technology Use in Second Language Writing: A Review of the Literature. *Reading Improvement, 51*(3), 303-312.

Moreno, R., & Mayer, R. E. (2000). A Learner-Centered Approach to Multimedia Explanations: Deriving Instructional Design Principles from Cognitive Theory. *IMEJ, 2*(2). <http://imej.wfu.edu/articles/2000/2/05/index.asp>

U.S. Department of Education (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Washington, DC: U.S. Department of Education <https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf>

U.S. Department of Education (2015). Use of technology in teaching and learning. <http://www.ed.gov/oii-news/use-technology-teaching-and-learning>

Zhang, D., Zhou, L., Briggs, R. O., & Nunamaker, J. F. Jr. (2006) Instructional video in e-learning: Assessing the impact of interactive video on learning effectiveness. *Information & Management, 43*(1), 15-27. 2006, Pages 15–27. doi:10.1016/j.im.2005.01.004

Piaget, J. (1962). *Play, dreams and imitation*. New York, NY, Norton.

Piaget, J. (2008). Intellectual evolution from adolescence to adulthood. *Human Development, 51*, 40-47.

Tomlinson, C. A., & McTighe, J. (2006). *Integrating differentiated instruction + understanding by design*. Alexandria, VA: Association for Supervision and Curriculum Development.

Tarhan, T., Ayyıldız, Y., Ogunc, A., & Sesen, B. A. (2013). A jigsaw cooperative learning application in elementary science and technology lessons: physical and chemical changes. *Research in Science & Technological Education, 31*(2), 184-203. Doi: 10.1080/02635143.2013.811404

Turan, S., Konan, A., Kılıç, Y. A., Özvaris, S. B., & Sayek, I. (2012). The effect of problem-based learning with cooperative-learning strategies in surgery clerkships. *Journal of Surgical Education, 69*(2), 227-230.

Um, E., Plass, J. L., Haywood, E. O., & Homer, B. D. (2012). Emotional design in multimedia learning *Journal of Educational Psychology, 104*(2), 485-498.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Zhao, K., & Chan, C. K.K. (2014). Fostering collective and individual learning through knowledge building. *International Journal of Computer-Supported Collaborative Learning, 9*, 63-95. Doi: 10.1007/s11412-013-9188-x