Samenvatting Education & ICT

VOCUS heeft deze samenvatting te danken aan Noor Tabak.

Het gebruik van deze samenvatting is bedoeld als studeerhulp na het lezen van de verplichte literatuur. Gebruik van deze samenvatting is geheel voor eigen risico.

Soms wordt er verwezen naar bladzijden of tabellen in het originele boek.

Succes met studeren!

Inhoud

Lecture 1

Introduction, Kozma/Clark debate

Trend Report: bestudeerd technische ontwikkelingen om mensen te informeren en om te bekijken hoe technische ontwikkelingen educatie verbeterd.

SURF Trendreport 2016

1. Didactic enrichment: leraren tools geven om beter les te kunnen geven. Bv. Virtual reality, gaming, internet of things

2. Organizing flexibility: zelf je leren inrichten. Open content, personal and adaptive learning evironment, digital badges

3. Adaptive learning: hoe zinnig is jou manier van leren? Bv. tijd, methode. Learning analytics, artificial intelligence

Examples of Issues of magister:

- Ethical: wie is verantwoordelijk voor de data?
- Learner behavior: hoe beïnvloed magister de motivatie van leerlingen?
- People invlolved: stakeholders: teachers, students, parents, schoolboard government, educational scientists.
- Potential shortcommings: niet elke leraar gebruikt magister. Dit veroorzaakt verwarring voor de leerlingen.

Moore's law: elke 1,5 jaar verdubbelt de ??

Internet growth: het internet is sneller gegroeid dan men verwacht had.

Characteristics of intenet

- Distributed (cloud): no central computer. Distributed in Alaska.
- People are anonymous on the internet
- Ernormous growth after development of the 'web'
- Web 2.0: after 2005 the web became social and there are new players in te field

Een mobiel beperkt de cognitive capaciteit. Zelf al is de telefoon niet zichtbaar.

Definition ICT: INformatieand Communication Technologie. Combination of many different technologies.

- Front / peer-to-peertechnology
- Bound to school/ not bound to school
- Formal / informal
- Stand-alone/ networked

21st century skills:

- Collection of information
- Collaboration
- Communication
- Creativity
- Critical thinking
- Character

Does ICT have a unique contribution to learning?

- Commmon asumption: ICT cheangeseveryting
- Also possible: ICT changs everything, but not for the best
- Als possible: ICT does not have a unique contriubutien

Tih is is de base for te debate between Kozma and Clark

Clark: message and medium are completely separated from each other. The medium doesn't really matter. It's the instructional method which influence learning. The grocery truck metaphor (the truck that brings the food to the grocery store doesn't influences the food it's bringing). If the learning gain is equal, choose the less expensive and most cognitively efficient method. Different media attributes accomplish the same learning goals. Media influence the cost or speed (efficiency) of learning but the method cause learning.

The attributes from a medium form a intermediary between the variable that are instrumental in learning gains and the cognitive effect on a learning task.

If somethings works, don't change it. Don't innovate if the new medium doesn't have a bigger impact on the learning results.

Method: ways to activate, replace, compensate for cognitive processes to accomplish goals. The provision of cognitive processes or strategies that are necessary for learning but which students can not or will not provide for themselves.

Medium: technology and practical formats.

Delivery technologies: influence the cost and access of instruction and information.

Design technologies: make it possible to influence student achievement.

Counter arguments (tegenargumenten):

- Reasoning based on the usual uses of a medium: according to others media and methods are inseperately. According to Clark a particular method is not bounded to a particular kind of medium. The usual uses of a medium don't limit the context or method it's presenting.
- Meta-analytical evidence: showed that positive learning benefits are reached through use of media. But it is not the medium but the teaching method that is responsible for the learning gain. The same method can be used in live instruction and the learning results are the same.
- Empiralistic envy: Cunningham didn't agreed with Clark about the statement that instructinal method is respossible for the achievement gains. He disagrees because of the unreconstructed (ongestructureerd) empirialism of the argument.
- Necessary Media Attributes: different media attributes can accomplish the same learning goal (cognitive effect). Others say that media comparisation studies are useless and certain media attributes do make a specific contribution to achieving learning goals.
- Kozma's argument: Kozma states that the medium does add something special. Clark states that the study has failed to control the instructional method, otherwise there would not have been found a relationship between the medium and the learning results.

Structural and surface features of research constructs:

- Structural: characteristics which are limited and domain specific. - media attributes- effect the economics but not the learning effectiveness of instruction.
- Structural (nesassery): features that underlie a system. - instructional methods

Kozma: the media does add something special: animation, interaction, activities prior knowledge. Media en instructional method are inseparately. Multiple situations, context. There isn't a good theory that integrates media with instruction.

We failed to establish a relationschip between education and media because. Our theories, research and design are based on the behavoirism: stimuli (surface features of media) and responses (on a test). In these studies is somethings missing: mentalist notion, descriptions of the cognitive, affective or social processes, descriptions of underlying structure and functions of media which might serve as the causal mechanisme that influence these processes.

Knowledge and learning isn't a property from the learners' cognitive recourses or the external environment but they interact. This interaction is influenced by the extent to which internal and external resources fit together.

White (1984, 1993) developed a computer based learning environment: Thinker Tool:

- Motivation phase: teacher discribes a situation and students predict the outcome. The various outcomes are the motivation.
- Model evaluation phase: student work in pairs to solve the problem. The exercises get harder every time.
- Formalization phase: students must come up with a law that descripes the behavior of the micro world. They are given alternative laws and the have to select the best one.
- Transfer phase: students use the laws that they have formulated to answere the question which was asked in the motivation phase.

Conclusion study White: both the students who studied with a commercial texbook and with ThinkerTool performed significantly better than control groups but students using ThinkerTool demonstrated a significant greater improvement as well. Constructivism and cognitivism.

The Jasper Woodbury Series: videodisk-based problem situation in mathematics that focus on the gap between school-learned knowledge and knowledge of situations in the real world. The set provides a real-world context for learning complex mathematics problems. The students received guidance in solving the problem. The experimental group scored significantly higher on task which were integrated with the real world than the group who received instruction and didn't integrated problem solving and context. Cognitivism (builds on prior knowledge and constructivism (learning is integrated in a real world context, teacher acting as a guide, use of multimedia.)

The role of media: from an interactive perspective learning with media can be seen as a complementary process within representations are constructed and procedures performed, sometimes by the learner and sometimes by the medium.

Capability of computers which contributed to learning in the ThinkerTool project:

- Object in motions
- Manipulation (by students)

Contribution that the vidoedisk made in learning:

- The video can present complex, dynamic social context this helps constructing mental structures.
- The video structures are more memorable than text
- With the use of video, students can use their cognitive recourses to learn target problem-solving skills. (If you use reading, the capability of reading from the students may distract form the actual purpose.)

- The possibility to pause, review and search for information helps with identifying needed information and contributes to transfer the problem solving skills to the real world.
- The visual and social nature helps students to activate situation based prior knowledge.

Students can provide useful representations and operations for themselves from the environment, regardless of which medium is uses. But when students do have a lack in prior knowledge, limitations in working capability or other reasons, they will benefit from a medium which presents these representations and operations. Over time, these representations and operations become internalized such that students can generate for themselves what was generated for them by the medium.

Implications:

- For theory: the attributes (kenmerken) of a medium = capabilities (capaciteiten). Each medium has an unique cluster of attributes. This has two implications for the focus of our theory:
    - We must specify the causal mechanisms by which cognitive and social processes are influenced as students interact with a medium's defining capabilities (for example the capability of a computer to move pictures by actions of the users).
    - We must specify the appropriate uses (when and how) of these capability to influence the learning for particular students, tasks and situations.

The media theories and research must reflect the capability of media and the complexity of the social situation.

- For research: the goal of research is to isolate the causal entities (eenheden) and structure that produce events and to describe the interaction of these events in social situations. Analytic and systematic approach:
    - Analytic approach: observation of the phenonemia through the period of change. Internal validity.
    - Systemic approach: each event can influence the classroom as whole, through interaction and relationships. Observing interaction of variables in the natural setting-> external validity.
    - The analytic and systemic approach can be used complementary to identify causal mechanisms and to observe how they interact in complex social situations. In media research: the complementary between these mechanisms can be used to isolate media attributes and observe how learners interact with these influence learning processes.
- For practise: media capability must enable (activeren) methods and the methods should take advantage of the capability of the media. Media will only make a significant contribution if their application (toepassing) are designed into complex social and cultural environments of learning and made widely accessible.

The design itself is the first step in the conversation between designer and user. The design emerge (verschijnen) when the user interact with them. The conversation between design and user will be different for each user. The task of the designer is to use the capability of media to create object that generate interessting en effective conversations, that invluence learning.

Conclusion lecture 1:

- ICT changes many tings, tis is not always taken into acount
- Kozma/ Clark debate: apperntly not resloved, yet
- The effectiveness of ICT in education is a great discussion topic.

Lecture 2

How is ICT used in education in the Netherlands?

Kennisnet: research ICT use in education in the Netherlands. Public organisations sponserd by the government.

Kennis monitor: online survey in Dutch schools. Perspective from stakeholders: teachers, principals, management.

Vier in balans monitor 2017; focus: actual use of ICT in teaching in primary, secondary and vocal schools.

Vier in balans monitory 2018: …

Based on the vier in balans-monitor (raport) ones in the four years and the Online survey they made a four component model:

- Vision: plans for ICT use. Idea about the role of ICT. (Often there is no vision, schools buy Chromebook for example but they don't have a vision about way the do it and what they are going to do with it)
- Competence: necessary digital skills. Teachers: knowledge and attitude. Managers: knowledge on implementation.
- Content: learning materials.
- Infrastructure: means to accomplish ICT use. Examples:
    - Interactive whiteboard, this is the most common use in primary education.
    - Number of students per computer.
    - Availability of wifi in schools
    - Devices in use (tablets, laptops, phones)
    - Hours using ICT in a week

Goals of ICT use:

- Editing text (for a project)
- Simulations or games
- Specific software to practice skills/learning material. For example: recognizing words, learning to type.
- Textbook or method bounded software
- Electronic learning environment
- Digital testing
- Digitally following student progress
- Internet to search information
- Internet to communicate and/or collaborate
- Social media

The percentage of digital learning materials is increasing for PE, SE, VE.

Apple was big on the educational market --> now it's google. The big companies are stakeholders in the education at the moment. Many people are concerned about this development.

Organizational purposes of ICT in schools:

- Informing parents
- Follow student progress (leerlingvolgsystemen bv. Magister)

- Administration (schadule, absence of sctudents, overview for internal r external use)

De kopgroep scores higher in: students get better insight in their process, learning faster, learning more, adaptably increased, teaching more efficient, students get more motivated, than the staartgroep.

The parents perspective: higher educated parents are more supportive for innovative use of ICT. Teachers are usually more sceptial of use of internet in the classroom. Two critical points:

- It is uncertain that new technical tools (Power Point and Authorware to the WiFi and other huge technology investments) improve teaching effectiveness.
- Teachers lack of clear understanding of the pedagogical principles that underlie incorporation (intergratie) of these new technologies.

Trends of ICT use in education:

- Cloud computing: digital learning materials available online. All information are stored in the cloud.
- Internet connectivity.
- Bring your own device to school.
- (Virtual reality)

Learning theories: can inform the use of ICT in education.

There is no prescription of the use of ICT in education.

According to Clark we begin with a solution and then search for problems that can be solved by those solutions. For example, buying Chromebook without a clear goal how to use them.

Learning theories

- How do people learn
- Role of student and teacher
- Behaviorism (teacher centered): focus on learning behaviour. Punishment and reward. Learning: conditioning, reacting. The student is passive. The teacher is responsible for the input. Behaviourism are focused on not making mistakes because they see mistakes as punishments.
- Cognitivism: cognitive structures. Metal process. Takes prior knowledge in account. Learning is processing information and active construction. The student is active. The teacher supports and structure the learning process. A teacher wants to transfer his knowledge, to the learners. Different kinds of knowledge:
    - Declarative knowledge: conceptual knowledge (quickly acquired but also quickly forgotten)
    - Procedural knowledge: not easy to display with knowledge sources (books), aquire more time. For example, cycling or summarising.
    - Metacognitive knowledge: knowledge about how you learn.
- (Individual) constructivism (student centred). Active instruction, interaction. All knowledge is personal knowledge. Interaction with others or tools form the basis for learning. The student is active. The teacher should guide the student. Through scaffolding, the help (which is adapted to the level of the learner) fades away over time. Fysical … is important to construct knowledge. Interaction is important. External tools are used to construct internal knowledge. Create your own knowledge representation. Interaction with a tool is learning itself. Student have to work together.

--> Difference cognitivism and constructivism: importance of knowledge, the teacher wants to give this to the students (cognitivism). The students create their own knowledge (constructivism).

- Embodied cognition: cognitions routed in sensory/ bodily experiences. For example, making notes by hand results in better study results then typing.
- Connectivism: knowledge is distributed in a network. Knowing where to find information is knowledge in itself. Everyone is a node in the network. The digital network is extremely important.

To successfully integrate technology into the higher education classroom there has to be made a shift from a lecture model to a mastery model, which is focused on cooperative and learner-centred instruction. Computers cannot easily fit in the teacher-centred model because teacher is seen as the expert: main source of knowledge in the classroom and computer need a one-on-one interaction with the student. Cooperative and learner-centred instruction can fit in computers because students control their learning procces and so their interaction with the technology (Salinans).

Functional principles learner-centered model (constructivism):

- Choice about projects, graded assignments, areas of personal relevance.
- Individual pace and flexability of time.
- Demonstrating knowledge in unique ways.
- Students are engaged and participate in individual and group learning activities.
- Students have increasing responsibility for the learning process.
- Refine their understanding by using critical thinking skills.

What to do with this knowledge:

- Evaluate existing applications of ICT
- Use in instructional design of e-Learning.

There is a difference between

- Level of activities (lesson plan: when, how)
- Level of content (software/ design)

In reality there is no best theory. Most of the time there is used a mix of theorys.

Important questions:

- What view of learning is presupposed?
- How is feedback given and how is it used (as a reward/punishment?)
- What is the role of teacher, peers, students?
- What type of interaction does ICT support?
- Is that the best way to reach the goal?

Analysing ICT:

- Using learning theories
- Considering important student results

Marth garden: based on rewards. It is a computer- adaptive monitoring system that use high frequency measurements.

According to Salinas 2008 there is synergy in learning and technology:

- Learning theories benefit form technology and views about learning. Learning theories <--> technology.

- Learning theories benefit from technology: ICT can be used as a tool: keeps up with and analyzes student progress.
    - Implementation: personalized learning (e.g., scaffolding), more possibilities for adaptive teaching
    - Development: new views of learning, technology as an inspiration, connectivism
- Technology benefits from learning theories: advanced technologies make use of advanced views of learning, for example applications of studentcentred views of learning.

Learning theories led to:

- Evaluating/ analysing use of ICT
- Informing design of instructional materials:
    - Work flow / orchestration of lesson plan (and use of ICT 'objects')
    - Design within software
    - Development of technology

ICT provides opportunities for implementation and testing learning theories.

Affordance (gunsten/ voordelen) of ICT:

- Mix of work forms
- Multiple modalities (written, videos etc.)
- Time and space independency (processes more efficient)
- Interaction (multiple types)
- Personification

Stakeholders in using in ICT in education.

- Teachers: many researchers consider the teachers as the most important actors.
    - Internal factors: factoren die bepalen of de leraar ict gebruikt in educatie. Kan een beperkende of stimulerende werking hebben.
        - Intrinsic (interest in tools) and extrinsic motivation (comparing to colleagues)
        - Learning theories/beliefs about education
        - Differences in beliefs, attitudes, and skills among teachers: Key area of interest for researchers today
        - Adoption of new role (guiding ICT use)
        - Continual changes in technology: Perpetual novices
        - (Lack of) professional training
        - Age? (Lack) of experience?
        - Management Vision → shared vision?
    - External factors
    - ICT competence: technical knowledge and skills:
        - Technical knowledge/Feeling competent
        - Knowing how to integrate ICT
        - Personal use of ICT

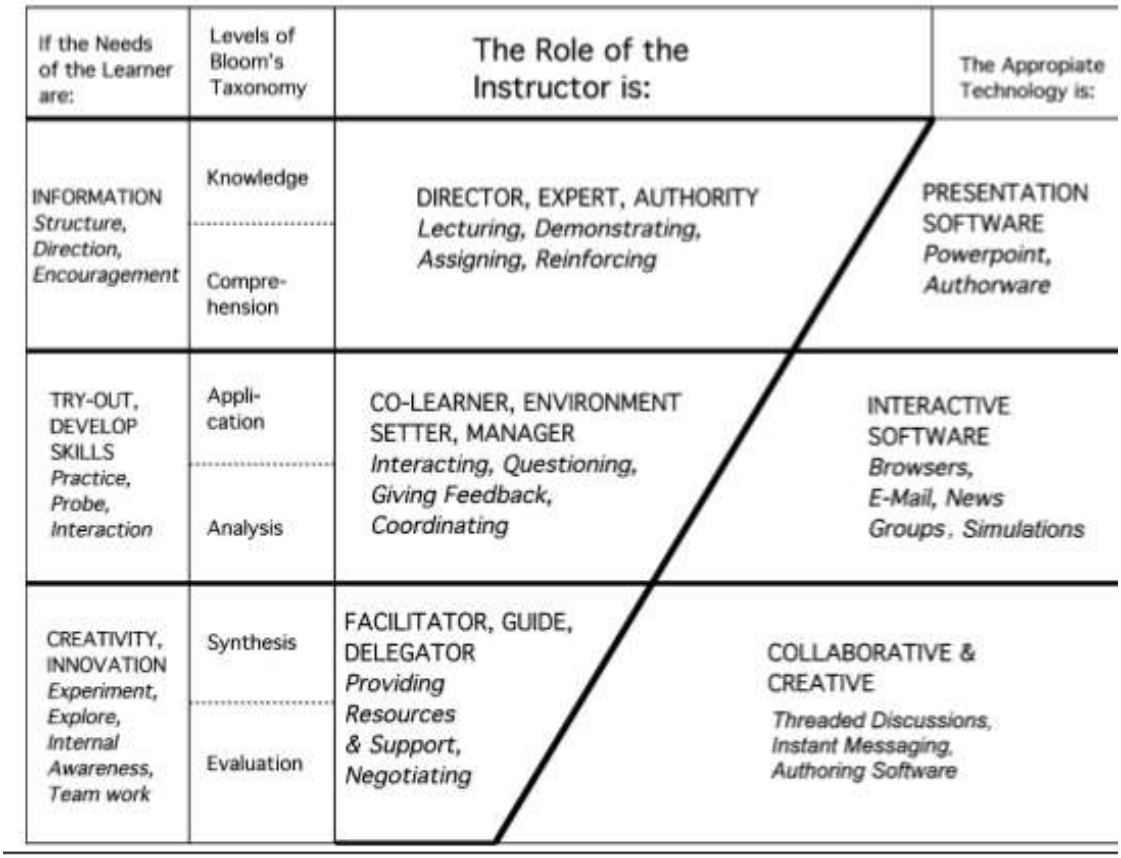
Various functions of ICT

- Primary process: supporting/enhancing students' learning and supporting teaching processes
- Secondary process: how do teachers keep up with tracking system and administration?

- Students: there is no generation that's all acting and thinking identically about technology.
- Government: provide money/ provide time/ teacher education/ vision (knowledge economy)/ perform and finance research.
- School management: school philosophy/ ICT vision and plan/ infrastructure and technical support/ providing opportunities to experiment/ sharing knowledge and providing examples.
- Companies
- Media/ journalist
- Parents
- Sientist (missing)
- Who is involved in creating the educational design and who is going to use the design.

Salinas

Objectives (doelstellingen) liked to the role of the instructor in the classroom and the fuction technology can play:



Example Kozma & Clark assignment, week 1 (making a ppt-slide about there view on message and medium):

- All of the needs are involved: information, try-out and develop skills, creativity.
- What level of Blooms taxonomy are involved: all of them
- Used ICT: powerpoint
- Other tool: showing the actual tool. Using ICT in the discussion.

Provides the same information as a

texbook would. Teacher centred.
Learner centred

Characteristics of the new learning environment:

- Enhanced motivation, new roles for students and instructors and improved learning outcomes.
- Optimal motivation for learning is intrinsic.
- Training for instructors about the expanded range of methodologies. In addition to selecting and applying appropriate technologies; an example of a typical class. Instructor introduces a broad topic.

1. Individual exploration. Student explores information with the help of materials provided in multimedia form. The instructor monitors progress through the computer and helps students if needed.
2. Small group activities. The group solves problems and works on collaborative learning exercises. The input en output is generated through the computer.
3. Whole class exercises. The computer provides the preparation materials.

Expanded range of learning outcome:

- Achievement is the discovery and application of new knowledge (instead of memorization or application of given principles).
- Learning outcomes will vary from student to student because the learning is student directed and the student decides herself how much time and effort to spend on each topic.
- Qualitative feedback from the instructor to the student, based on the computer who monitors and reports the activities of the student. The progress is compared to her own previous record.
- Technology teach student problem solving strategies, logical thought, and learning structures in general. The student can use these skills in all kind of analysis and problem-solving situations.

Conclusion: From Dewey to Gates: A model to integrate psychoeducational priciples in the selction and use of instructional technology (Salinas, 2008) article: technology must be integrated in a learner-centered model: technology must be fully integrated in higher education. Student will not only learn basic knowledge but also how to explore, create new knowledge and solve problems.

E-learning: instructional content or learning experience delivered or enabled (ingeschakeld) by electronic technologies.

The dimensions of E- learning:

Dimension	Attribute*	Meaning	Example
Synchronicity	Asynchronous	content delivery occurs at a different time than receipt by the student	lecture module delivered via email
	Synchronous	content delivery occurs at the same time as receipt by the student	lecture delivery via web cast
Location	Same place	students use an application at the same physical location as other students and/or the instructor	using a GSS to solve a problem in a classroom
	Distributed	Students use an application at various physical locations, separate from other students and the instructor	using a GSS to solve a problem from distributed locations
Independence	Individual	students work independently from one another to complete learning tasks	students complete e-learning modules autonomously
	Collaborative	students work collaboratively with one another to complete learning tasks	students participate in discussion forums to share ideas
Mode	Electronically only	all content is delivered via technology, there is no face-to-face component	an electronically enabled distance learning course
	Blended	e-learning is used to supplement traditional classroom learning	in class lectures are enhanced with hands-on computer exercises

* The definitions of these attributes are discussed in a variety of sources including (Ong et al., 2004), (Jack and Curt, 2001), and (Greenagel, 2002)

Each course component will consist of a single attribute value of each dimension.

Reasons why e-learning is the fast growing sub-sector of the eduction market:

- The demand (eis) for post secondary educaton is increasing. Because of the limited capacity of existing classrooms and high cost of new ones, e-learning is an attractive alternative.
- Traditional higher education institutions offer e-learning to compete with the growing number of virtual higher education. They enlarge their target market internationaly.
- E-learnings improve the overall efficiency of organizations by reengineer their existing time and paper-intensive processes.
- E-learning makes it possible to learn every day, this is useful in a knowledge economy.

E-learning stakeholders motivations and concerns:

- Students: consumers of e-learning:
    - Motivations: gain access to higher education.
    - Concerns: different skill set is required: critical thinking, research and evaluation skills. Students are more independent, so they have to by highly motivated and committed to learning.
- Instructors: guiding the educational experience of students.
    - Motivations: a variety of reasons. Example: encouraged by their institutions, have an interest in the benefits of technology mediated learning.
    - Concerns:
        - Require skill. Instructors are no longer the primary source of students knowledge but they are the manager of students knowledge resources. Instructors may have to learn new software applications.
        - Instructors may also be concerned with the acceptance of e-learning tools among their students
        - Time: it takes the instructor time to create and administer e-learning courses.
- Educational institutions: colleges and universities (in context of higher education)
    - Motivations: providing distance learning to get access to a larger pool of students.
    - Concerns:

        - Budget: tight budgets make it difficult t implement campus wide e-learning solutions. Which results in the tendency that every department implement their own e-learning. This is less efficient and can make the process more complicated when invlolved with more than one department. Also, the technological infrasturcture (as technology equipped classrooms) can involve costly upgrades.
        - Effecitiveness of e-learnings: measured by the return on investment in the technology infrastructure and course content development and learning outcomes.
        - Resistance from faculty. In their opinion face-to-face instruction works better.
        - Accaptance of online education by employers.
- Content providers: instructors or external sources.
    - Motivations: providing content modules that will result in effective learning. Commercial content providers are motivated by profit.
    - Concerns:
        - Intellectual capital right, copy right.
        - Technology standards: e-learning content providers need to take in account that learning can be impacted by the type of content, the learning environment and the characteristics of each learner.
- Technology providers: develop the technology that enables e-learning delivery.
    - Motivations: providing content modules that will result in effective learning.
    - Concerns:
        - Technology standards: constant evolution in hardware and consumer expectants creates pressure for technology providers
        - Many of the e-learnings are not developed on proven educational principles and thus do not take the different ways that people learn into consideration.
- Accreditation bodies: organizations that evaluate the quality of education instutions offerings. Should provide real guidelines.
    - Motivations: it is important that they include e-learning in their standards to stay relevant because of electronic grows.
    - Concerns:
        - The number of learning institions grows and the nature of the work that these bodies do is changed.
        - Unique considerations for evaluating e-learning: alternative design of instruction, alternative providers of higher education and expanded focus on training.
- Employers: organizations that will potentially hire graduates of higher education instituions.
    - Motivations: considering e-learning as a higher education alternative enlarge their pool of potential hires.
    - Concers: e-learning decreases interpersonal interaction and employers find those really important.

E-learning stakeholders responibility matrix (Wagner):

	Student	Instructor	Institution	Content Provider	Technology Provider	Accreditation Body	Employer
Student	• participate in collaborative exercises to enhance learning • share experiences and encourage use	• participate proactively in exercises • provide feedback regarding overall effectiveness	• use e-learning technologies according to institutional policies	• provide feedback regarding the appropriateness of content for e-learning	• provide feedback regarding the effectiveness of technologies	• Demand accreditation for e-learning programs • Provide feedback	• promote the validity of e-learning during interviews
Instructor	• provide effectively designed courses incorporating e-learning content • provide technical and motivational support to encourage use	• share experiences and encourage use • promote standardization	• use e-learning technologies according to institutional policies and standards	• ensure protection of copyrights • provide feedback regarding the level of effectiveness experienced by students collectively	• provide feedback regarding the effectiveness of technologies	• adhere to accreditation standards	• educate on the validity of e-learning
Institution	• standardize the e-learning experience across courses • provide technical support • protect sensitive student information	• provide training in instructional design and technology • provide technical support • provide incentives • enforce standardization	• recognize e-learning credits • share e-learning experiences and courses • encourage standardization	• ensure protection of copyrights • provide funding for content development	• provide feedback to improve future versions • supply appropriate infrastructure to support technology	• adhere to accreditation standards • provide evidence for quality assurance	• seek course accreditation to provide evidence for quality assurance • educate on the validity of e-learning
Content Provider	• select appropriate content and media for e-learning • comply with usability standards	• provide content that meets course & program needs • comply with learning & usability standards	• provide content that meets institutional needs • Comply with learning standards	• comply with standards for interoperability	• comply with standards for interoperability	• adhere to accreditation standards	• provide content relevant to work environment
Technology Provider	• consider learning principles when designing • allow adjustments for individual learning styles • comply with usability standards	• consider usability and teaching principles when designing • comply with learning & usability standards	• comply with standards for interoperability • provide technical support and training	• comply with standards for interoperability • Provide technical support	• comply with existing standards, and collaborate to develop new standards when necessary	• adhere to accreditation standards	• provide an effective learning environment to maximize learning of potential employees
Accreditation Body	• enforce standards to ensure quality of accredited courses	• provide clear guidelines for requirements	• provide clear guidelines and timely services	• provide clear guidelines for requirements	• provide clear guidelines for requirements	• collaborate to ensure consistency	• enforce effective standards to ensure quality of graduates
Employer	• recognize the validity of e-learning	• provide feedback regarding success of graduates	• provide feedback regarding success of graduates	• provide feedback regarding relevance in workplace	• provide feedback regarding success of graduates	• ensure that standards provide appropriate measures	• share experiences and encourage acceptance of e-learning

* Matrix generated by the authors according to the procedure outlined in Section 3

This matrix could by used by Institutions of higher education as starting point when undertaking a new e-learning initiative. The matrix will help institutions to identify the appropriate stakeholders' and develop a set of expectations for each. When instiutions undertake a e-learning initiative they should stive to involve a team with representation form each relevant stakeholder. A project champoin is needed to communicate the responsibilities and the importance of cooperation to each group

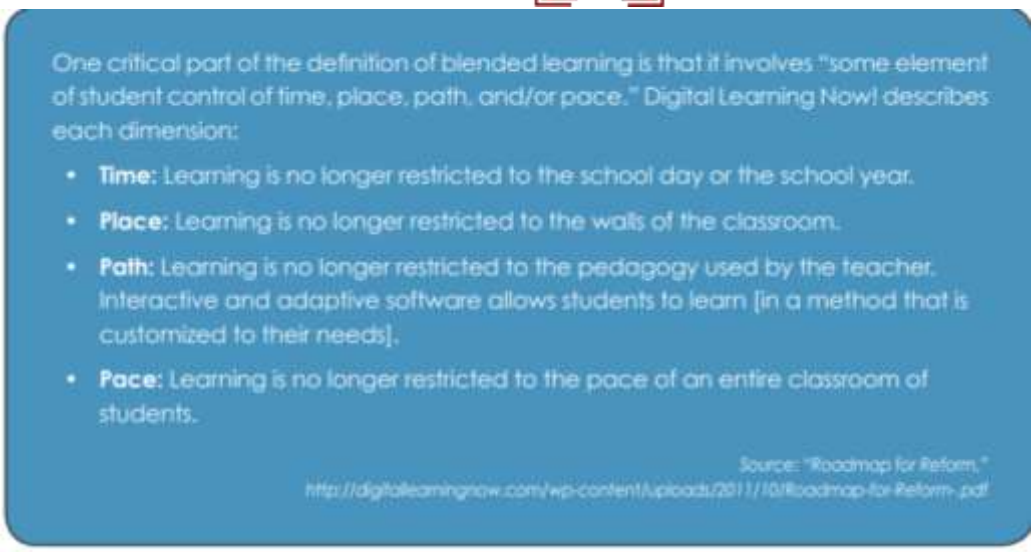
Digital natives: under 40 generations. This group learns differently then older ages groups because they are grown up with increased use of electronics and a decrease of reading. They tent to have a more fragmented sense of time, areduces attention span.

Lecture 3

Blended learning forms and types:

- Combination of learning theories
- Combination of online and face-to-face learning
- Done deliberately (=opzettelijk), not by accident
- Use of ICT (bv. Social media) to redefine (=herdefiniëren) instruction
- Combination of education followed online in which student control over time, place, path, and/or pace AND education at a supervised brick-and-mortar location away from home. (Staker and Horn)

-> Blended learning is a mix of instruction types/ methodes(?) with structure.



Feature of blended learning:

- The various modalities (manieren) online and offline are connected, they inform each other.
- If students have control over their pace, this control extend to the entire subject that's blended.

Characteristics, different types of blended learning:

1. Formal (classroom, teacher) and informal (not a typical learning situation; a student can choose their own time and place, there isn't always a teacher) learning.
2. Workplace and classroom; this distinction is used by compagnies.
3. Instruction types (lectures, workgroups, working at home; combining different types of activities)
4. Online and offline

These practises combined with online education are a form of blended learning:

- Traditional instruction: a structured education program that focuses on face to-face teacher-centered instruction.
- Technology-rich instruction: traditional instruction with digital enhancements such as elektronical white boards.

Two types of online learing (they distinct from blended learning):

- Informal online learning: any time a studend uses technology to learn outside of a structured education program.
- Full-time online learning: a structured education program, content and instruction are deliverd over the internet.

Advantages of blended learning:

- Easier to implement some learning (mail question- online and offline)
- Promote active learning when not in a formal learning situation (improving homework) and spacing
- More accessible (online)
- Cost reduction and adapt to learners' needs

Disadvantages of blended learning:

- Student (lack of) self-management
- More demanding- more time consuming -> the student has to be an active learner at home
- (Blended learning is not available for every one because 1/3 of the world's population doesn't have excess to internet.)

Theoretical background: origins of blended learning.

- Blended learning is based on the constructivism. Learner must be central, teacher as a facilitator.
- Alison King 1993: "From sage on the stage to guide on the side." The classic model of teaching-learning is outdated, not effective for the 21st century. Because it's necessary to actively process information, this is consistent with cognitive theories.
- 'Helps students become critical thinkers and creative problem solvers.'

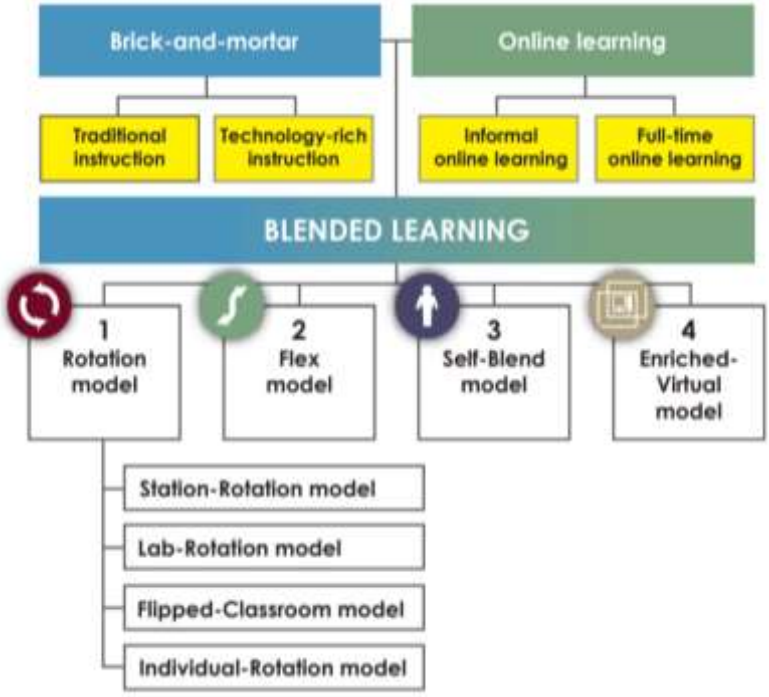
Picciano: waves in blended learning

- Fist wave (1990s)
  - Establishment (=oprichten) van het internet.
  - Mostly based on text.
  - Asynchronous communication (email)
- Second wave (early 2000s)
  - Speed improves
  - More interaction through social media
  - From distance learning to blended learning, Internet technology was used in mainstream education
  - Better course management tools (Blackboard, Desire2Learn)
  - The mainstay (=steunpilaar) for profit colleges stayed the fully online model because it was cost effective for instructions to don't have a real building.
- Third wave (2008-2013)
  - MOOC by Dave Cormier and Bryan Alexander: Massive (annybody/ manny people can enrolle) Online Open (for everyone) Course.
  - Few problems with the MOOCs:
    - Huge dropout rates and lower grades then students who followed face-to-face instruction.
    - Much variaton in quality
    - Students who have remediation and other learning needs and who lack the basic skills of reading, writing and math would probably better be served by face-to-face instruction.
    - Interaction is sometimes minimal
    - Assessment and certification how?
- Fourth wave (2014-present)
  - Improving blended learning:
    - More interaction between students and faculty
    - Better use of multimedia and social media
    - Mobile learning
  - Better MOOC pedagogy
  - New facilities and approaches have expanded: learning analytics, adoptive and personalized learning, game-based learning, open resources.

Conclusions key studies on blended learning:

- Blended learning leads to higher learning outcoms than face-to face and fully online learning.

- The workingload increases when teaching online or when offering blended learning.
- Faculties and administrators become more supportive of online and blended learning.
- Not every college and university is open for changes, wat betreft online learning (MOOC). Institutions where governance is minimal or non-existent encounter much less faculty resistance.
- Different points of view: Kulik states that computer-based education had a beneficial effect on academic achievement- Clark states that message and medium are completely separately- Kozma ad Koumis see a medium as integral to the delivery of instruction.



Forms of blended learning (Staker and Horn):

- Rotation model: fixed schedule of switching between types of learning (online and offline)
    - Station – rotation: switching between activities in the classroom, at least one station for online learning. Students rotate through all of the stations.
    - Flipped classroom: content and instruction online, practises/ projects in the classroom
    - Lab-rotation: same as station, but includes different locations at the campus. At least one of these spaces is a learning lab for predominantly (voornamelijk) online learning.
    - Individual – rotation: students rotate on an individually customized, fixed schedule among learning modalities (students do not necessarily rotate to each available station or modality). An algorithm or teacher(s) sets individual student schedules.
- Flexmodel: content and instruction delivered through the internet. Students move on an individually customized, fluid schedule among learning modalities. Teacher is on-site (ter plekke), available on as-needed basis. Varies from minimal to more face-to-face support.
- Self-blend model: completely online course. Supplements traditional courses. Not necessarily tied to any particular time or place. Students self-blend some individual online courses and take other courses at a brick-and-mortar campus with face-to-face teachers.

- Enriched virtual model: contend and instruction deliverd partly in school, partly online. No daily school (sets it apart from flipping). Whole curriculum works like this (sets it apart from self-blend (course-by-course).

Flipped classroom: information transmission at home. Information practise and apply in class

1. Prio to lessen: learn new material
2. During a lesson: explanation, practice, active learning
3. Required presence during the lesson.
4. After lessen: reflection and checking.

Flipping the classroom reduces the cost because there is less time used in the classroom. Flipping the classroom results in lower grades. Flipping the classroom enhances student's activity and awareness. Motivation, age, home situation are variables that influence the student's outcome in flipping the classroom situations.

The weakest point of flipping the classroom is that it's not clear what has to been done in the class. Teaching has been moved out of the classroom. Teachers got the feeling they are not allowed to teach anymore in the classroom but what do they have to do then?

Under which conditions is Flipping the Classroom effective?

- No reduction of face to face
- Use of quizzes
- Good student activity/awareness
- "older students" are often easier
- Good student home situation
    - What values you from home
    - Stimulating home --> better school achievement
- Motivation students

Social media:

Web 1.0

- Websites consisted static information
- Web pages connected through hyperlinks
- Web as encyclopaedia
- No interaction
- Social media ('chat') did exist: IRC- chat later ICQ -> MSN

Web 2.0

- Popularization of social media
- Move of tools to the web (technical chalange)
- Less anomity
- New tools for interaction social media use

Definitions of social media:

- An online toolbox of digital materials that allow collaboration, communication, and learning independent of time and place.
- Employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content.

What can you actually do with social media?

- Publishing media – video, text
- Debate, discussion
- Extended and informal communication
- Knowledge construction
- Logistics (e.g. arranging a meeting)
- Crowd sourcing and crowd funding
- Games

Benefits of social media in in school

- Diversity of methods –A giant toolbox
- Break down school walls
- Facilitate (co-)creation of materials
- Materials can be published for all the world to see
- The development process can be made transparent e.g., vlog updates

Challenges of social media:

- Misuse or abuse of technology
- (lack of) anonymity
- (lack of) social presence
- 'Juggling multiple social worlds'

Does social media interfere with performance?

1. People are bad at multitasking 'Cognitive bottleneck'
2. But (methodological issues):
    a. How much ICT use during a lesson?
    b. Relation ICT use and academic achievement

Lecture 4

Multimedia learning

Multimedia learning:

Multimedia: presenting words and pictures

Multimedia learning: building mental representations form words and pictures

Multimedia instruction: presenting words and pictures that are intended to promote learning.

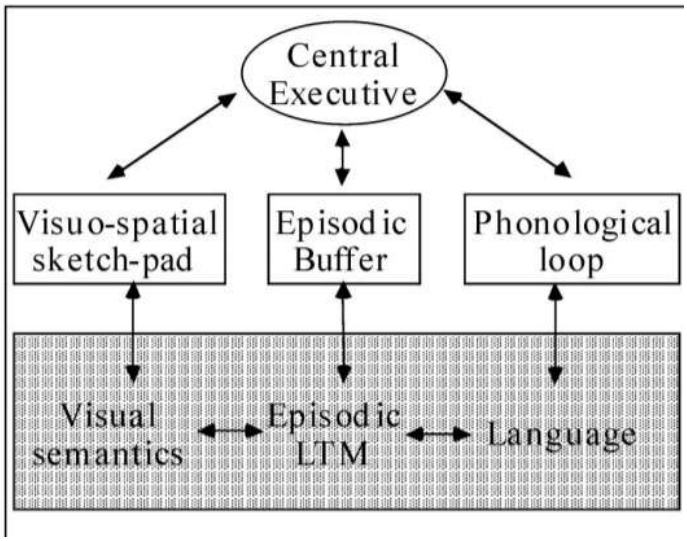
Examples multimedia learning: instructional videos, animations, lectures, computer-based learning environments.

Multimedia is special because it can be heard and seen. Auditive and visual information.

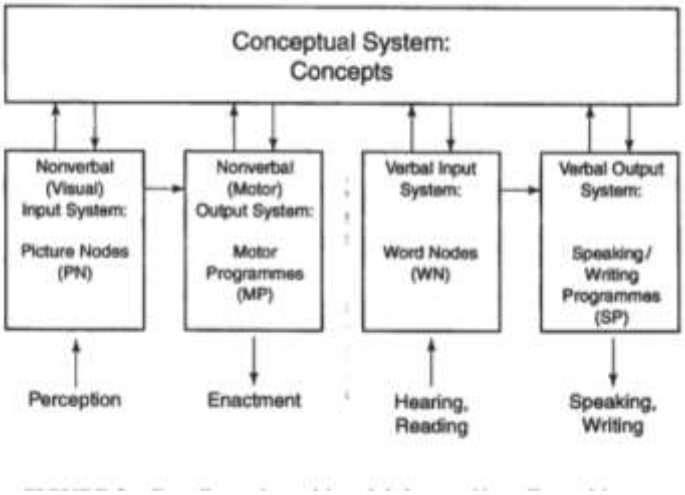
Dual coding theory Paivio: visual and verbal information are processed differently and along distinct channels in our cognitive architecture, creating separate representation for information processed in each channel. Both visual and verbal representing an item together provides a better chance of remembering that item than having only a single code (verbal or visual code), if those codes are at least partially independent. Bv. Ezelsbruggetjes om een andere taal te leren. Er wordt eerst een associatie van het vreemde woord met het woord in de moeder taal gemaakt en dan wordt er een mental image van het woord gemaakt.

Working memory model Baddeley: working memory capacity is very limited, yet long-term memory has unlimited capacity.

- Phonological loop: maintaining and manipulating speech-based information.
- Visuospatial sketchpad: maintaining and manipulating visual or spatial information.
- Central executive: selecting strategies and integrating information
- Episodic buffer: a limited capacity store that can integrate information from the visuopatial sketchpad and from the phonological loop, creating a multimodal code.



Multimodal theory Engelkamp's: not only verbal and visual but also actions are incorporated in the design.



Definition semantic

These two older theories are based on factual information, not learning.

Learning is understanding, so building a rich cognitive representation in the long-term memory. New information is processed in Wm and integrated into existing schemas in LTM.

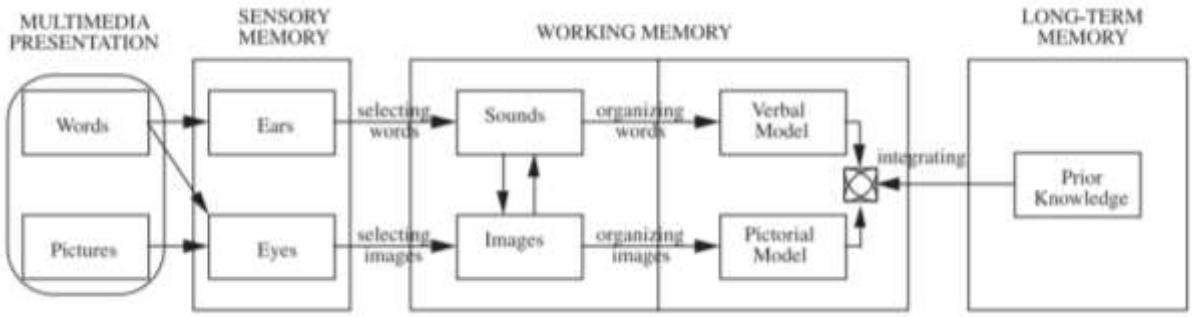
Cognitive load theory (Sweller): to avoid overwhelming the STM capacity automatic processing and schema's (for organizing complex knowledge) are necessary. The working memory is limited. Novel material must be organized and incorporated into long term memory via a limited working memory.

- Extraneous: how is the information presented? Everything that is distracting form learning should be removed.
- Intristic: how complex is the new information? Determined by the number of interacting elements in a content area.
- (Germane): the effort involved in the processing, construction and automation of schemas.

Extraneous load should be as small as possible so the split-attention effect and the redundancy effect should be removed.

Multimedia theory (Mayer): a learner construct his own knowledge. Borrowed ideas form previous discussed theories: Information can be encoded by using either a verbal or visual code,t here is a difference between how these two are coded -> Paivio. Limited-capacity working memory -> Baddeley. Distinction between extraneous and intrinsic cognitive load -> Sweller.

Novel material must be organized and incorporated into long term memory via a limited working memory. His preferred mode of presentation is to present auditory words so they do not conflict with the visual code that is needed for pictures. Working memory is used to integrate the verbal model, pictorial model, and prior knowledge stored in LTM. Many instructional materials and techniques are ineffective because they ignore that limitations of human working memories.



Information can be visual or verbal using those together works better then using one of those separately.

Modality effect: combining visual and auditory information has a bigger effect on learning than only visual or only auditory information.

Redundancy effect: presenting things in the multimedia representation that aren't necessary for understanding the representation/learning. Those extra things shoed be removed.

Split-attention effect (extraneous lead): it's better to integrate the information in the picture. In this way you prevent yourself from splitting your attention.

Novice learner: someone who has low prior knowledge about a subject.

Most of these design principles are important to consider for novice learners

Expertise-reversal effect: design principle that are effective for novice learners may not be effective or even hinder learning for more knowledgeable learners.

Animate theory Nathan: students read a verbal description of the problem and translate it into a pictorial model of the situation, without the help of pictures. Then they evaluate the success of their mathematical constructions by determining whether the animation matches the pictorial situation model that they had constructed from reading the problem. The question is are the students cappable of constructing a correct pictorial model from the text. Stundents who used ANIMATED

scored significantly higher on a test then students who only constructed mathematical relations without the help of animated feedback.

Andvantages of multiple codes:

1. Increase recall: one code can serve as backup when the other code is forgotten. Visual, verbal and additional memory code for the motor programs (actions).
2. Reduce interference: you can remember more when some of the information is verbal and some is visual.
3. Complementary roles: by complemetary different representations (narration and pictures) which complement each other, learners will benefit from the sum of their advantages.
4. Increase understanding: finding answers to both theoretical and instructional questions.

Studying (animated) videos (Hoffler and Leutner)

Instructional animation versus static pictures

Animation: series of rapidly changing computer screen displays suggesting movement to the viewer.

Mixed findings: many studies that did find a advantage of animation over static pictures had more/different information in the animation or failed to control for other factors.

Meta-analytic review: measuring the overall effect and moderating factors: does something works or not? A factor determent if somethings works or not. Example snow boots.

Findings: overall effect: small advantage of instructional animations over static pictures. The effect is a very heterogenous effect. There are some moderated effects.

Dis/ advantages of animations: visualizing a process or procedure. In an animation you can't see the information from a given frame which is beyond.

Dis/ advantages of static images: abstract signalling cues (like arrows) have to be interpreted and integrated with the pictorial information which leads to more cognitive lead. Key pictures, that illustrate very specific moments of the process or procedure, could enhance the learning efficacy. A certain level of realism improves pictures.

Some factors determine whether animations are better for learning than static pictures or not:

1. Role of animations: representational animations (for example how to bandage a hand) -> decorational animations. Representational animations are far more superior to static pictures than are decorational animations
2. Realism: animations are better when they are highly realistic.
3. Type of knowledge: animation are especially effective for procedural motor-skills (and less for declarative knowledge and problem-solving knowledge). For example: how to bandage a hand, these skills often involve human movement.

(Those 4 variables are measured in the research but aren't statistically significant :

4. Type of animation: there is no statistically significant difference between video-based animations and computer-based animations if the compute-based decoration animations are excluded.
5. Annotating text: animations are superior to static pictures. However, statistic pictures with text have a larger effect size then pictures with text.
6. Signaling cues in static pictures: animations are superior to static pictures when the pictures do not have signaling cues but seemingly less so when static pictures do have signaling cues. However, the effect-size difference is not statistically significant in the expected direction.

7. Instrucional domain: visualizations in the domain of military have a statistically significant larger mean weighted effect than those in the domains of physics and biology and other domains. But this difference may be confounded because the military domain is focussed on procedural-moter knowledge.)

This research states that Mayer's multimedia principle static pictures and text are better for learning then text alone, isn't true for the studies in this meta-analyses. Signalling cues aren't responsible for the advantages of instructional animations over static pictures.

There is still research ongoing about static information vs. Dynamic information. New moderating factors:

1. Gender: advantage of animation over static visualizations larger for males than females.
2. Age: the advantage of animation over static visualization declines by age. So getting older leads to a smaller positive effect of animations.

How to design video examples? How are learners motivated and how do they learn

Characteristic of the role model (instructor)

Model-observer similarity (MOS) hypothese (Bandura and Schunk): greater similarity between the student and the model ->leads to more attention and confidence and this-> leads to higher learning outcomes.

The findings are mixed, possibly because the example content was often not controlled.

Age, putative expertise, gender, gender replication -> Vincent didn't find any effect. None of this factor influenced the learning confidence. Findings provide evidence against the model-observer similarity hypothesis. Only age had a effect on the learning outcomes. Higher ages (adults) result in higher student outcomes.

Model-observer similarity only matters for:

- Young childeren
- Low self-efficacy learners
- When video examples focus on behaviour

Further research:

- It doesn’t matter if the person is in the video visible. This doesn't effect the student outcomes.
- The same counts for the head. If you cut out the head, the student's outcomes are still the same.
- There has been found a difference in student outcomes in a situation in which the camera perspective is in the fist person perspective then the third person. First person works better.
- Frontal perspective of a person works better then the lateral (schuin) perspective.
- Bonus 1: effect of model accent: university students performed better on a transfer test after watching an animation without an accent then student who watched an animation with an accent. In Vincent research is no evidence founded in student outcomes when learning videos are spoken with or without an accent. The thing he did found was that a big accent (Brabans) leads to extraneous load, it cost more effort to understand the video.
- Bonus 2: People remember more if they get taught at the same place where they are tested. Example learning in see and at land. Realistic setting: good fit of the learning material and the environment results in higher student outcomes. Later replications show that the setting didn't really result in higher student outcomes.

To sum up:

- My research suggests that modal age and camera perspective are important design factor to consider.
- Less important factors are: model gender, model accent, model visibility, setting.
- Currently investigations; model age, model attractiveness, model clothing.
- Note that there are important other design factors that hold true for all types of instructional videos: add pauses, segment videos, give learners control, use human oices, use personal language.

Generating videos

Learning from studying vs. creating videos

- Learning from instructional video is immensely popular and a key ingredient of many contemporary (hedendaagse) instructional approaches.
- Growing interest in the effects of instructing students to generate their own instructional videos as a learning activity.
- Recent laboratory research under the header of 'teaching on video' has shown that generating an instructional (teaching) video can be an effective strategy for learning

Experiments: restudy condition, summarize condition and generation a teaching on video condition.

Results:

- Teaching on video improved test performance compared to restudying. Gernerating an instructional video was not more effective than summarizing.
- Teaching on video was perceived as more enjoyable than restudying or summarizing. Enjoyment of summarizing did not differ significantly from restudying.
- Students in the Video Condition and the Summarizing Condition, have invested more effort then those in the Restudy Condition. There was no significant difference between the Video Condition and the Summarizing Condition.
- The effectiveness of teaching on video for test performance is not mediated by learning effort investment. There has be found an significant indirect effect of enjoyment on test performance.

Mechanism that drives the teaching on video effect:

- Generative learning hypotheses: teaching improves learning because explaining stimulates learners to engage in generative processes that are effective for (deep) learning.
- Social presence hypotheses: generative explanations -> feeling of social presence (audience) -> generative processes ++ AND physological arousal -> learning. The audience and the arousal influence the quatility of the teaching and the learning. On a (meta)cognitive level an awareness of the potential audience and the belief that the explanations can affect others could be a motivatinal factor. On a physiological level feelings of social presence could lead to a higher level of arousal (feeling excited or activated).
    - A moderate degree of arousal can enhance various cognitive processes that play a role in learning.
    - In social psychology research it is well-documented that the effect an audience has on task performance is partly mediated by arousal.

- Teaching on video primarily compared to (re)studying, so it is unclear whether benefits are a result of generative processes or social presence. Some findings point towards social precedence.
    - Teaching effective, but only on video, not in writing
    - Generating explanations for a family member enhanced transfer performance compared to generating explanations for oneself
    - Generating explanations for a fictitious peer impairs (verminderd) learning compared to self-explaining

Experiment: is teaching on video effective in applied setting and for primary school students?

Aim of the experiment:

- Investigate whether generating a teaching video during homework would improve primary school students' learning compared to:
    - Restudying (lacks social presence component, no generative processing
    - Summarizing (lacks social presence component, promotes generative processing)
- Effects on self-reported learning enjoyment explored, because:
    - Learning enjoyment is an important aspect of intrinsic motivation (Deci & Ryan, 1985)
    - Learning enjoyment is an indicator of whether or not students would use a learning strategy outside of the experimental context
    - When combined with test performance, provides indication of efficiency of learning.
- It is possible that primary school students do not benefit as much from generating a teaching video as adolescents and adults do, because they have fewer cognitive resources available to deal with the task demands and the presure of the imagined audience. Nevertheless, research did suggest that studying materials with a teaching expectancy can help primary school students to achieve better learning outcomes than studying for a test in a classroom setting.

Results:

- No difference among conditions in the group have been found with regards to age, gender, or self-reported prior knowledge. Self-reported prior knowledge was very low.
- No differences among conditions on reported time invested in studying, or between reported time invested in generating the summary vs. Video
- Reported time invested in learning phase is higher with video if you compare video with studying. Summarizing is also more time consuming then studying.
- Teaching on video leads to higher test performance.
- If you create a video at home you seem to preform better in class. Also the video condition results in higher learning enjoyment then the study and summarise condition.

Current research: does teaching on video during homework improve primary school students' learning compared to restudying or summarizing?

Hypothesis: Video creation was expected to be most effective for learning, because of the social presence component. Video creation was expected to be most enjoyable.

Results:

- Generating a teaching video is an effective and enjoyable homework activity for primary school students.

- Social presence could affect learning outcomes directly (for example through arousal) and indirectly by affecting the generative processes that take place; cognitive processes (as focusing on the main ideas) and motivational effects.

Research: testing social presence hypothesis with problem-solving tasks (examples).

Social presence: The degree to which the audience is real or to which learners are aware of th

Conditions: actual audience: teacher or 'fake" teacher. Teacher for a big or small group.

Results:

- Teaching on video does not seem to enhance the acquisition of problem-solving skills from examples.
- Just studying is found more effective and/or efficient then teaching a real audience or a large audience.
- Findings suggest that social presence matters, but that higher levels of social presence is a detriment (nadeel) to learning.

To sum up:

- Generating teaching video does not stimulate acquisition (verwerving) of example (procedural knowledge), but does help students learn the content or text (conceptual knowledge). Works both in lab and applied settings.
- Best to either explain to oneself or to a fictitious student on audio or video.

Lecture 5

Game Based Learning (digital)

Reasons why people like to play computer games: chateristics:

- Goal/ challenge: clear goal, you know what you want to realise
- Interactivity:
- Feedback: bv. More points, more lifes
- Adaptivity: dimension in adapativitiy in GBL:
    - Focus onstudent-centered learning
    - Adaptivity= interactivity is involved = formative assessment (assessment to improve someones performace). The game adapts to the level of the learner.
    - Adaptivity in computer games, 3 dementions:
        - Online and offline adaptivity (interest, learning preferences), measure those things before starting the game, and adapt the game on those personal cateristics.
        - Process (follow the actions of the player while gaming, for example how many times do you press the button) and product (you can add an attribute)
        - Overt (it interfeares, for example eye tracking) and covert (measurements which you can't see as a playser) assessment
    - Flow: very focusing one thing, forgetting the world around you. the individual is functionating at his/her fullest capacity.The task is not to difficult and not to easy, this makes you staying invloved in the game. Good games aim to be within a player's zone of proximal development.
- Rules/ constraints:

- (Competition): winning and losing based on luck, expertise etc.
- (Narrative)

Characeristics relevant for learning

- Goals
- Interactivity:
- Feedback:
- Adaptivity: the game world adapts to the performance of the game player.

In addition:

- Multiple representations: a player learns that things can represent something else. Like a gum can represent a car for example.
- Situatedness: creating authentic learning environments.
- Gracful failure: there are no consequences of failing. (The player can try it again and again and again). This motivates the player to explore and learn from their mistakes.
- Embodied cognition: train in movement. For example, how much pressure a doctor should press on a knife.
- Sociocultural context: social interaction in a game. For example, a player learns the appropriate way of speaking.

Arguments for game based learning:

- Motivation: through game features that are motivational of nature (incentive structures such as stars and enjoyable activities) learners stay engaged over longer periods.
- Player engagement: four types of engagement (affective, cognitive, behavioral, sociocultural). The goal of all these types of engagement, is to foster cognitive engagement -> achieving the learning goal.
- Adaptivity: the capability of the game to engage each learner in a way that reflects his or her specific situation. First the variable that the game is supposed to adapt for has to be measured. Next the game has to provide an appropriate response to the learner, such as scafholding and feedback.
- Graceful Failure: failure is by design an expected and sometimes even necessary step in the learning proces. A player can try something in the game because failure will not be punished, after a trial the player can draw conclusions, try again and find out what happened in the game. The player doesn't know what he/she did wrong.

Cognitive load theory is agents grace failure. Grace failure increases the load on the working memory. According to the theory the working memory is limited. Like problem based learning. To reduce the load on the working memory you could give a learner a worked example.

Cateristics of game-based learning mentioned in the tutorial session:

- Sessions
- Groups
- Clear goal
- (Use of ict -> game based learning doesn't have to be on the computers)
- Adaptivity
- Situatedness
- Flow
- Feedback
- Competition
- Multiple representations

- Fun
- Failure
- Variation
- Choice
- Personalization
- Narrative/ story

What kind of (learning) effects/outcomes can we expect from computer games? Foundations of game-based learning

- Cognitive: learning knowledge and skills. Designers have to consider how the content should be represented, how learning machanics should be designd and conitive lead experience by the learner during game play. Ways that games can facilitate cognitive processing:
    - Situatedness: meaningful and relevant context
    - Transfer of learning; transfer the knowledge from a school context to the real world.
    - Scaffholding and relevant feedback: which skills have to be learned are dynamically evaluated and the support is fading as the learner progresses.
    - Dynamic assessment (beoordeling): it is necessary to know when to fade or change the scaffolds or when the learner receives a more difficult exercise.
    - Information Design: Representation of Information: the visual nature of games result in a tension between the desire to reduce cognitive load and the desire to enhance the visual appeal of the information.
    - Interaction Design: Learning Mechanics: linking learning objectives to instructional strategies/ machanics that are based on appropriate learning theories.

The learning goal should be in line with the core tasks learners execute in the game.

- Motivational: interacton with the game -> motivate learners -> stimulate cognitive processing -> improving learning. Reasons why students want to learn something:
    - Intrinsic motivation: students are motivated to do an activity for their own sake (belang). Learning and game mechanics have to be tightly linked to achieve learning. Core elements of game design which are intrinsically motivating players are challenge, curiosity and fantasy.
    - Values and interests:
        - Situational interest: immediate affective response to an activity, resulting in learners' directing of their attention to the task.
        - Individual interest: intrinsic desire and tendency to engage in a particular subject matter or activity.

-> When games for learning are well designed it is expected that situational interest generated by the learners will eventually develop into individual interest in the educational content.

    - Achievement-related goals:
        - Mastery goal orientation: student focus on learning new skills, mastering material and learning new things.
        - Performance orientation: students focus on maximizing good evaluations.
        - Students with mastery goal orientations tend to have more adaptive patterns of motivation and learning. Competitive and collaborative play result in the stronger mastery goal orientation of the students.
- Motor: acquisition and compilation. For example learning doctors how to do a surgery, hand eye-coordination.cognition and emotion are inseperable and influence each other mutualy.
- Affective: focuses on players attitude, emotions and beliefs, well-being, self-efficacy. For example, creating awareness about cyber builing. When talking about the affective

perspective on game-based learning, it is the question if emotional aspects of play hinders or facilitate the learners engagement. Two methods of inducing (teweegbrengen) emotion:
    - Representation of information: for example visual design of learning materials (for example round shapes) -> impact learners emotional state -> enhance learning outcomes.
    - Game mechanics: can impact:
        - The students feelings of boredom/frustration/joy
        - Learning outcomes via high situational interest and related positive emotions.
        - Learning when affective tutors diagnose players emotions and respond to them.
- Sociocultural/ Communication: learning is socially constructed and motivated. Negotiate (onderhandelen), collaboration, communication. For example physicians learn to communicate with patients.
    - Activity theory: players and artifacts (voorwerpen) in games change as conditions change, in both positive and negative directions, and that change is a result of both social factors and the mediation of artifacts. Designers must consider how objects within the game can facilitate interactions because social and cultural interactions are based around interactions with objects.
    - Social context of learning: players participate in communities of practise who facilitate learning.
    - Participatory learning culture: technological communities outside of the game, are a place where players are able to learn from each other and are supportive social networks.
    - Social aspect of agency: agency (het gevoel dat wat je doet er toe doet) is important in motivation and goal orientation. Three areas related to agency can result in achieving goals:
        - Personal agency (exercised individually)
        - Proxy agency (where individuals influence others)
        - Collective agency (where individuals form groups and act together)
    - Observational Learning: videogames affect observers of the play as well. Games are uniquely positioned to teach socially/societally constructed norm.
    - Relatedness (=being connected to others) and Self Perception: relatedness promotes a sense of presence, game enjoyment and intention for future play. The progress through a game is linked to social status, when reached high ability a sense of relativeness increases.
    - Social interaction design: reality games use information from the world as part of game play. Crowdsourced games: large numbers of individuals provide real and useful data to expert while playing, to solve a real-world problem. People engage in those games because it's a group play.

All four perspectives (motivational, cognitive, sociocultural, affective) of learning should be integrated to guide the conceptualization and design of learning environments that are able to engage learners on different levels. The initial goal is to foster cognitive engagement in support of the learning goal.

!!! Playful learning (concept by Plass, Homer, Kinzer): an activity by the learner, aimed at the construction of a mental model. That is designed to include one or more elements of games for the purpose of enhancing the learning process. !!!

Mental model: a coherent (samenhangend) representation of the information in memory.

Serious games: games used in formal education, for example primary school. No bussiness training.

Difference game-based learning and gamification:

- Gamifiction: working in a classroom and you bring in some elements of games. The use of game elements to **motivate** players to engage in a task they otherwise would not find attractive.
- Game-based learing: you learn in the game. Making the learning environment more interesting and engaging.

Definition GBL Plass, Hommer, Kinzen: type of (usually digital) game play with defined (bepaalde) learning outcomes.

His definition of GBL:

1. A model implemented on a digital device.
2. It has some defining characteristics: goals/challenge, interactivity, feedback, adaptivity, rules/constraints
3. Multimedia properties: multiple representations/ situatedness
4. A cognitve and a socio-constructive
5. AANVULLEN

Model of GBL:

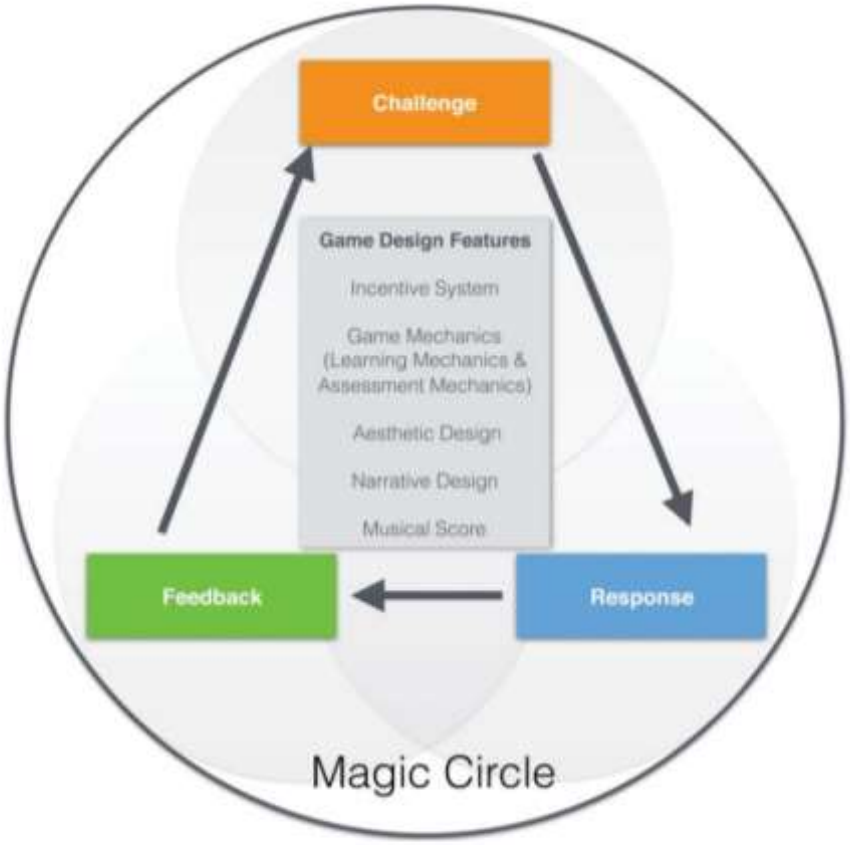


FIGURE 1 Model of game-based learning.

The game design features determine how challenge, response, and feedback are designed.

How do we learn from computer games?

1. Cognitive-affective theory of Multimedia Learning
    a. Cognitive perspective
    b. Learning theory

-> extension of of Mayers Multimedia Theory.

2. Input-Process-Outcome Game model
    a. Cognitive perspective
    b. Learning and ID theory

-> The player get feedback and because of that the user likes the game more and spents more time on the game. The player receives more feedback and likes the game even more and spends more time on the game etcetc. This improves the learning outcomes.

3. Integrated design framework of GBL
    a. Cognitive and (socio) constructive perspective
    b. Learning and ID theory
    -> instructional design and game design are intergrated.

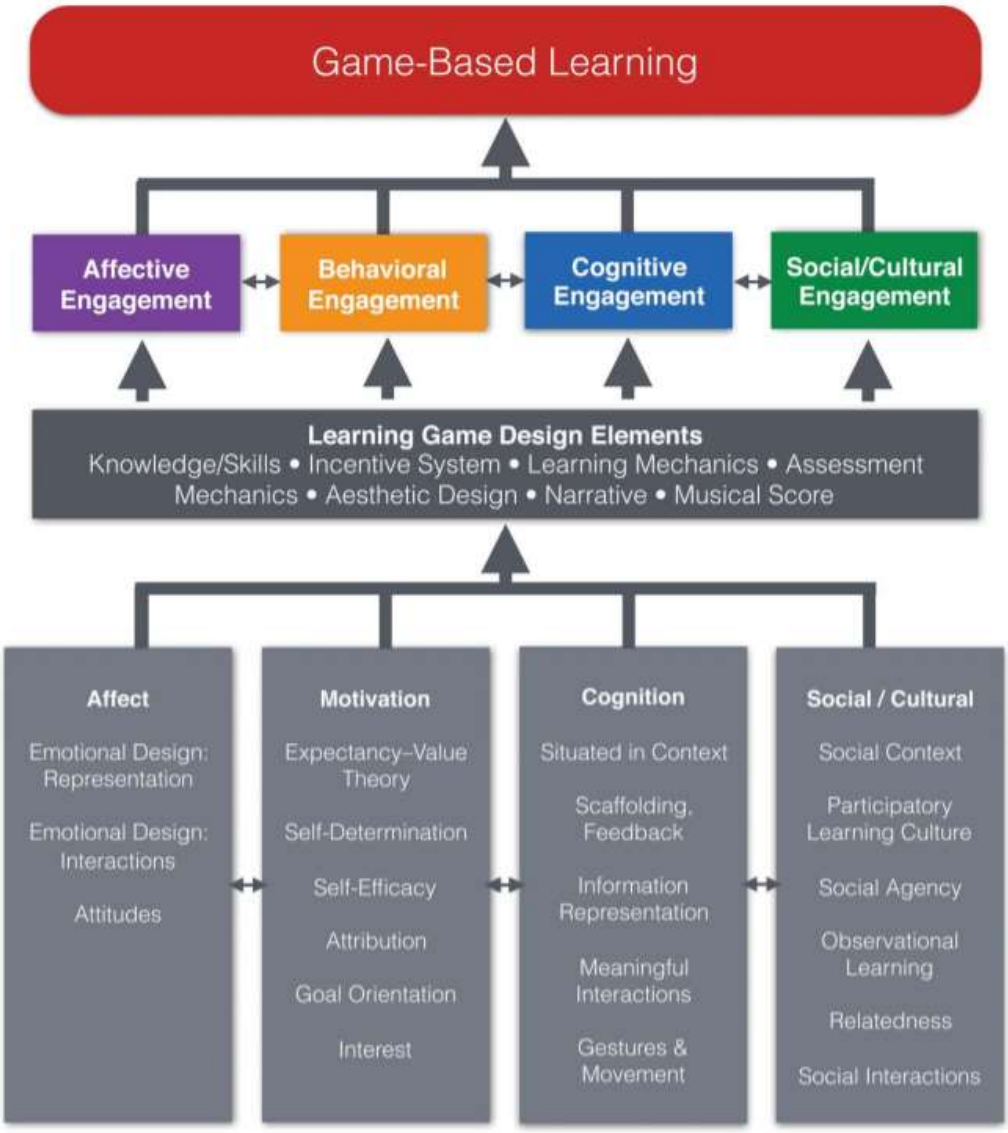


FIGURE 2 Integrated design framework of game-based and playful learning.

TOEVOEGEN PLAATJES THEORIËN

Common feature of the 3 model: active cognitiveprocessing.

Some problems (and solutions) in GBL

Problem I: applying the knowledge, learing in a game, in the real world can be difficult. Make the learning dingen explicit.

TOEVOEGEN PLAATJE PP p.24

Sulution I: guidelines from Cognitive load Theorie, Cognitive Multimida (CTMM) such as self explanionts. Proms in which your asked to explaine how you solved the problem.

Problem II: instructional support can undermine motivation.

Solution II: intrinsic integration. Deliverd the learning content in the most funny way to play the game? Learning occurs in different situations, when you compleet a task you get access to the next

action. It has been proved that integrating learning content and game machincs increases learning outcomes.

Evidence for GBL

Types of research:

- Media comparison studies. Game based environments are compared with traditional instruction situations.
- Valued-added studdies. Fo game with self e.....
- Cognitive conseque studies. Specific learning abilities. For example tetris vs. Texttwist, effect on spatial ability.

Evidence:

- There is a learning effect but it's very modest. Learning effect as well as the motivational appeal is disappointing.
- Game based learning is more effective if you apply this strategy in multiple sessions.
- The effect of game based learning in groups result in higher learning gains.
- GBL combined with other instructional methods yield higher learning gains, but are less motivating.

AANVULLEN nog een slide voor evidence. P.33?

Elements of game design for learning:

- Game mechanics: activities repeated by the learner throughout the game. Learning or assessment (beoordeling) focus or both.
- Visual aesthetic design: how tools and functions of the game mechanics are visualized, how cues are represented and how feedback is displayed.
- Narrative design: storyline that is advanced via features as dialogues and voice-overs.
- Incentive (stimulanse) system: motivational ellement. Encourage players to continue their efforts and feedbackt thay attemtp tp modify their behavior.
- Muscical score: sounds which are used to direct the player's attention to specific moments in the game.
- Content and skills: have a big inpact on all game elements. 4 functions of games that describe to what extent and with what learning goal this content is covered:
    - Preparation of future learning: provides students with shared experiences that can be used for later learning activities.
    - Teach new knowledge and skills
    - Practice and reinforce existing knwoledgeand skills
    - Develop 21st-century skills: develop more comlex sociomotional skills related to teamwork, collaboration, problem solving, creativity, communication etc.

Components of adaptation in Serious Games:

- Game world and its objects. F.e. layout of the game world can be made simler/ harder.
- Play mechanics. F.e. adjusting shooting difficulty by provinding player assistance.
- The attributes of the non-player characters in the game. F.e. increasing the abilities of the non-playing character when the player performs well.
- Game narratives. F.e. adapting the sequence of events to the pace or behavior of the player.

- Game scenarios: adapting the progression within a game level to the learning goals of the player. F.e. monitoring the players actions and based on that certain points in the plot are included in the game.

Article Oostendorp en Spek: Adapting the Complexity Level of a Serious Game to the Proficiency of Players

Offline adaptivity: adjustments which are made considering player-dependent data, before the game start.

Online adaptivity: adjusting the game to its players, while they are playing.

When a game is to difficult -> cognitive overload -> a player becomes disengaged with the game.

Game automatically assesses (beoordeeld) and adapts to the level of the player -> higher engagement -> better in-game performance.

Dynamic adaptivity: adapting the complexity of a game on the proficiences (bekwaamheid) of players.

Code Red Triage:

- Adaptive game condition: adaption the speed of going to the next level on the performence of the player. More successful players could attain the most complex case in less cases,
- Control condition: cases were presented in a gradually (stapsgewijs) increasing complexity.

Conclusion: a serious game that dynamically adapts its challenge or complexity to learners could make serious games more efficient but not more engaging. Learners in the adaptive game version learned more per victim case than in the ocntrol condition - > more efficient.

Lecture 6

Learning management systems and learning analytics

Use of information

Definition learning analystics: the measurement, collection, anlaysis and reporting of data baout learners and their context, for purposes of understanding and optiminzing learning and the environments in which it occurs. It is a proces.

Key dimensions Greller and Drechslers article: these dimensions need to be coverd by the design to ensure an appropriate exploitation (verwerking) of learning analytics in an educationally beneficial way.

- Stakeholders: who? Who makes the discission to use the learner analystics or to tell students about their learner behavor?
    - Two kinds:
        - Data clients: beneficiaries of the LA process, are entitled to act upon the outcome. F.e. teachers.
        - Data subjects: suppliers of data. F.e. learners.
    - Different stakeholders:
        - Students: compare their performance to the overall performance of a course or personal recommendations for learning paths.
        - Teachers: course monitoring systems which makes it possible to focus their attention on particular pupils and collect group modles which can lead to shared understanding of domain topics or better currilum design.
        - Institution: monitor the performence of students regarding dorp-outand graduation rate.
        - Other stakeholders: relevant entities. F.e. computer agents.
- Objectives? Why?
    - Reflection: critical self-evaluation of data client as indicatied by their own datasets in order to obtain self-knowledge. Or critical self evaluation based on other stakeholders (f.e. teacher has to reflect his teaching style by the datasets of his students).
    - Prediction: this can lead to earlier interventions or to adaptive services and curricula by for example learner profilice which can be built dynamically and automatically.
- Data: what? What kind of data is collected? Like mouscliks
    - Open: weet wat er verzameld wordt en data is beschikbaar voor data clients.
    - Protected: data clients weten niet welke data er van hun verzameld worden en die data is niet beschikbaar voor hen.

    - Difficulties: it's not true that the data set only includes meaningful data. It is hard to make a data set for one person (f.e. working together on the same laptop).
- Insturments: theory, statistics. Trough different technologies, like machine learning or social network anlaysis, LA can contribute infomation support systemes to the stakholders and report on demand.
    - Different ways of appproaching data: theoretical constructs, algorithms, or weightings.-> translating raw data into inforation. Different methods used to translsate the data result in different outcomes.
- External constraints: how much should people be informerd about they being measured.
    - Conventions:ethics, personal privacy and similar socially motivated limitations.
        - The question is to whom does the data belong? Now it belongs to the owner of the data collecgtion tool, data client. It is illigal to intergrate background information of the students with educational performance data.
    - Norms: restricted by laws or specific mandated policies or standarts.
- Internal limitations: what is relevant? Required competences and critical thinking.
    - Competences:
        - Interpretation: do the data clients have the necessary competences to interpret and act upon the results? Do they understand the visualisation or presentation of the information?
        - Critical thinking: Do they understand which data is represented and which data is absent? How will they use this information?
    - Acceptance: influences the application or decision making that follows an anytics process.

The place of pedagogy in the learning analytics framework

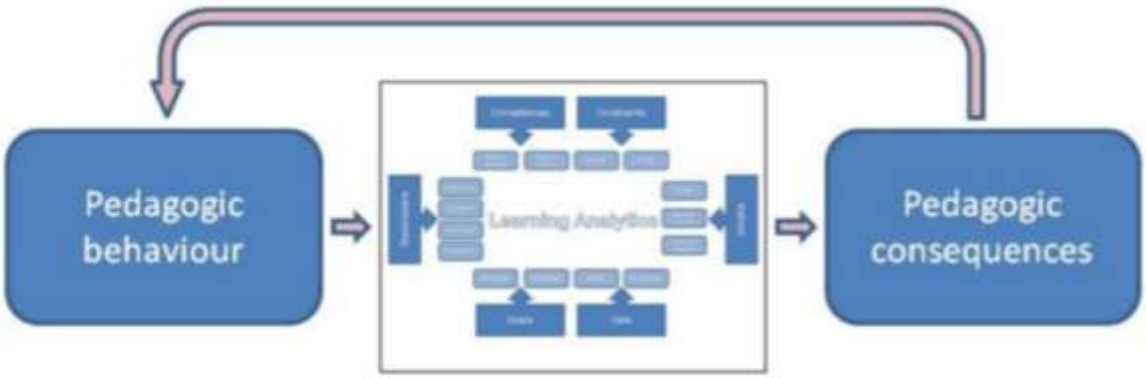
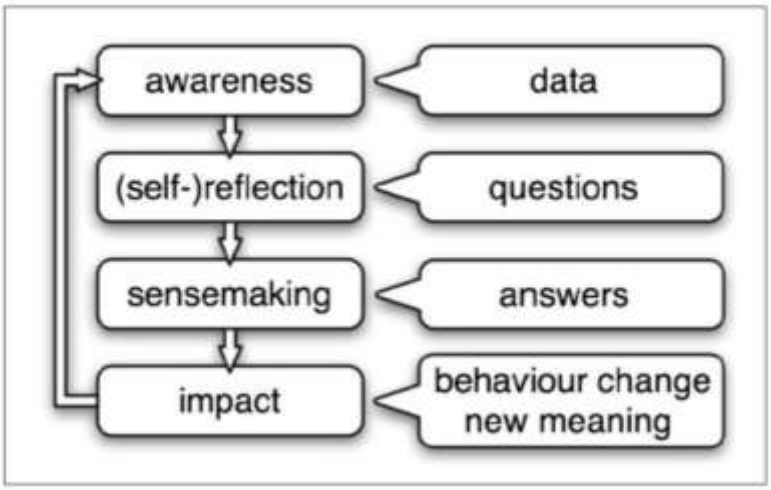


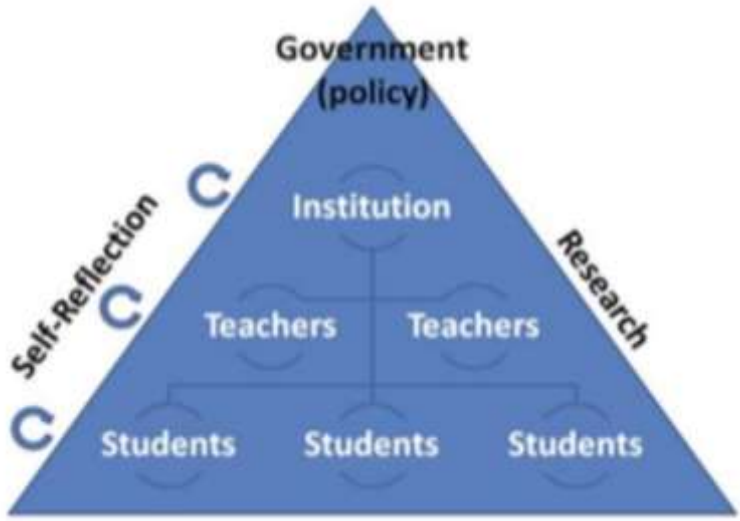
Figure 4. Learning analytics and pedagogy

- Pedagogic behaviour: learner/ teacher behavoir that is motivated by didactic designs. This is implicity contrained in the imput data sets.
- Pedagogic consequences: adjustmetns tot het didactic strategy or learning design based on the outcomes of the LA process.

Learning analytic process model Verbert et al.



Stakeholders: information flow between stakeholders: greller and drachsler.



Data analyses from the student level can inform the teachers. The teachers can use this informatieon to plan targeted interventions or adusting their pedogagical stratagie. Institutions can retrieve benifits from students and teacher data in order to provide staff development opportunities or to plan policies like quality assurance and efficiency measures. Self-reflection could result in new insights by refelction on their performance on alle 3 levels. Research could be done for the purpose of evaluating or innovating teaching processes or learning service. Government agencies may collect cross-instituational data to asses (beoordelen) the requirements of Higer Education Institues.

Challenges:

- Who owns the data (behaviour)? Is it the univerisity or the compagny blackbord, do you need to give them permission? Where is the data being stored.
- What if a student objects?
- Promising ideas, no wide implementation yet
- Lack of (good) theory
- What information do we have, what is relevant

Examples to measure information (from Verbart and Govaerts)

- Reflection and awareness

- During face-to-face lectures: examples:
  - Yu et al. measuring awarness trough a camara and microphone.
  - Backstage: engagement messured by Twitter activity
  - Classroom Salon: meassures social colaboration on annoting lecture slides during a face-to-face lecturs.
- During group work: examples:
  - TinkerBoard: visualised which activity each group is doing and how intensively.
  - Collaid: visualised data of how students colaborate in three circels
- During blended or online learning: examples:
  - Course Signals: predicts and visualizes learning outcomes based on three data sources: grades in the course so far, time on task, and past performance. Red and green light.
  - Dashboard developed at Carnegie Mellon University: visiualised performance level on different couse activities.
  - In general these dashboards give an overview of time spend, artifacts produced, resources used, social interaction and some visualize results of self-assessments (zelfevaluaties) and are used to create awarness of students.

- Detection and prediction
- Intelligent tutoring: to determine how are the six dimensions for Greller and Drechsler represented in these examples?

Applying this kind of data

- There is a little correlation between grade and seat in a lecture hal but no causalation (oorzaak).
- There is a difference between student and teacher perception
- There are different reasons why people choose their seat.

People will exploid any incentives they can find.

Ethical issues (Salade and Prinsloo 2013)

Socio- critical- perspective: being critically aware of the way our cultural polical, social, psycal and economic context and power relationships shape our responses to the ethical dillemas and issues in learning analytics.

Definition of learning analytics: the collection, analysis, use, and appropriate dissemination of student-generated, actionable data with the purpose of creating appropriate cognitive, administrative, and effective support for learners.

- Power: who is in charge, who makes the desisions
- Surveilance: does this change the behavor for example?
- Transparancy: what is the aim? The purpose for which data is being collected.
- Identity

Purpose of learning analytics

- Maximizing graduation, improving completion rates, maximizing profit?
- Management of students' understanding and perceptions

Categories of ethical issues for learning analytics (Slada and Prinsloo 2013):

- Lociaton and interpretation of data:
    - Data spread over multiple locations:
        - Should ofline and outside school activiets als be analyzed? (for more valid conclusions) part of the picture is missing
        - Gathering data from social media: allowable?
    - Data are not neutral:
        - Anlaytics= statistics (network of probabilities)
        - Conscious choices are made what to visualize, and what not.
    - Misinterpretation of educational data:
        - Many correlations: significant relations inevitable
        - Reliability of the data
        - Validity of conclusions: oversimplifcation
        - Confusing correlation an causation
        - Risk: a return to behaviorism as a learnin theory if we confine anlytics to behavioral data. Only interpretating the behavoir of the students and miss the reasons why they act that way.
- Informed consent, privacy and deidentification of data
- Management of data
    - Transparant data management: sort data into categories that identify the necessary level of protection.
    - Prisoner to past choices: mistakes will still be visuable. Harmful in the short and/ or long term
    - Data protection
    - The right to be forgotten: there is an option to get your data deleted online nowadays

Principles for an ethical framework for considering learning analytic as moral practice:

1. Learning analytics as moral practice: learning anlaytics should result in understanding rather than measuring.
2. Srudent as agent: students shouldnt't only serve as information source but learning anlytics should serve their learning an development as well.
3. Student identity and performace are temporal dynamic constucts: learing analytics providesa snapshot view of a learner at a particular time and context and students have to evolve en adjust and learn frompast experience without those experiences becoming permentent faults Iprisonar to past choices).
4. Students succes is a complex and multidimensional phenomenon: and so the data retrieved from learning analytics is incomplet and the analyes may be misinterpretated and biased.
5. Transparency: about the purposes for which data will be used and under which conditions, who has acces and how the identity of individuals will be protected.
6. Higher education cannot afford to not use date: the chance to improve outcomes of students shouldn't be missed.

Considerations for leaning analytics as moral practice:

- Who Benefits and Under What Conditions?
    - Students and instituons.
        - Students as active agents; they decide the scope and the purpose of data harveted form them and under what conditions.

        - Educational institutions: need to optimize the selection of data hervasted (verzameld) and analysed).
    - Agreements about data policies between studdents and institions will lead to reliable and comprehensivesness of data -> this leads to personalization and const-effectiveness.
- Conditions for consent, deidentification, and opting out: that the benefit for the majority supersedes the right of the individual to withhold permission for use of his or her data. Students may choose to not collaborate in personlized learning, on the condition that sutdents are informarmed about the consequences of their decisions. Institutions have to guarentee that students data will be deidentified after a certain number of years.
- Vulnerability and harm:
    - To prevent vulnerability institutions should aim to ensure that analyses are conducted on rebust and suitably represnetative data sets.
    - Redress for students; als er eentransparant systeem en geinformeerde consent wordt ingevoerd wordt de kans op misbruik en schade verkleind.
    - Redress for institutions: als systemen en benaderingen transparant zijn, is er meer kans dat studenten misbruik maken van het systeem.
- Data collection, analyses, access and storage:
    - Collection of data: different site have different policies, those have to be taken in consideration when gettering information from different sources.
    - Analyses of data: the context of data analyzed are carfully considerend before tentative predicions and anlyses are made.
    - Access to data: data should be protected. It is suggested that students have ready access to their personalized stored data, as well as an overview of those stakeholders granted access to specific data sets.
    - Preservation and storage of data: it isn't clear who is the owner of data obtained form the Internet. Institutions should provide guarantees and guidelines with regard to the preservation and storage of data in line with national and international regulatory and legislative frameworks.

Ethical guidelines needed? Topics to consider:

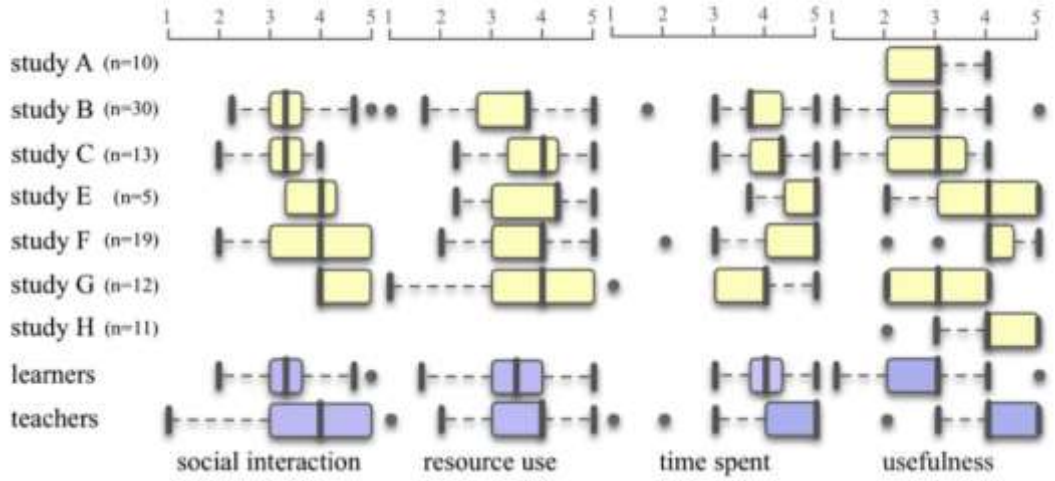
- Higher education instituions cannot afford to not use learning analytics.
- Students and institutions should collaborate as stakeholders in learning analytics.
- The benefit for the majority supersedes the right of the individual to withhold permission for use of his or her data.
- What if low risk (and therefore low-cost) students seek preferential treatment? (e.g. reduced entrance requirements, perhaps at a cost to perceived high- risk students)
- What recourse do institutions have when students provide false or incomplete information that may provide them with additional support at a cost to the institution (and to other students)?

Conclusion about learning analytics:

- Powerful tool to anlayse and imporve learnign in many ways.
- Many practical and ethical issues to consider
- Data tells part of the whole story, at best.

Analysis of learning analytics dashboards Verbart and Govaerts:

- What are relevant user actions?
    - Artifacts produced. Such as blogs, twitter, responses to questions, resources students create.
    - Social interaction. Such as amount of speech by the learner or comments on blogs.
    - Resource use: to provide awareness for teachers on resource use by their students. To identify indicators on the relevancy of resources or to estimate effort.
    - Time spent: teachers can identify potential students at risk, students can compair their efforts with those of their peers etc.
    - Exercise and test results



This is based on quantitative data. One area of research is to investigate whether we can augment (uitbreiden/ aanvullen) this approach with qualitative data. There is a need to research what data about the learning process and the learner can be useful for learning analytics dashboard applications.

- How can data on relevant actions be captured?
    - Physical sensors: cameras and microphones:
    - Virtual sensors: actions within a software application such as posing, reading, replying.
    - Manual reporting by teachers or learners: to capture time spend and provide self-assessment ratings for topics. Manual reporting surve as a reflection trigger -> reflect on what they are doing -> potentialy increase effectiveness and efficiency. Automatic tracking is more consistent, but one major concern is to track all, or at least a major part of learning activities.
- How are awareness, reflection, sense-making, and impact enabled (ingeschakeld for different kinds of users through appropriate devices?
    - Desktops and laptops: most used devices to both visualize and track data.
    - Tablets: are used in learning analytics dashboard applications
    - Mobile devices: benefits increased mobility and ubiquitous access to visualizations and statistics.
    - Tabletops: are becoming more popular to facilitate group work.
- How are learning analytics dashboard applications evaluated? How can impact of dashboards on learning behavior be measured?
    - Effectiveness: for example better engagement or higher grades.

- Efficiency
- Usability and usefulness: perceived usefulness is often higher for teachers than for students. Students perceive usefulness higher if dashboards present a more complete description of their learning activities.

Lecture 7

Virtual and augmented reality

VR and AR (virtual and argmented reality)

Both technologies not considerd new/ emerging anymore

VR: older, more established than AR. AR is much more complex. Not new.

AR: considerd to be almost establish now.

Characteristics of VR and AR:

- Virtual relaity:
  - Complete immersion in virtual wolrd
  - No interaction with real world
  - Everything you see is simulated by a computer (interactive movie)
- Augmented reality
  - Augments the real wordl with virtuel object.
  - Interaction with the real world. The computer has to know what objects are there in the actual enviroment, to 'response' in a correct way.
  - What you see is a combination of real world and simulation.

History of VR:

- 1830: stereoscope: two mirors in the middel, seeing 2 different images with your two ice -> seeing a 3d picture.
- 1955 : the sensorama: by Morton heiling. An experience theater. All your sensories are sensored: feeling, watchig etc.
- 1989 Leep cyberface: by Eric Howlett. Fist HMD (head mounted display). Fist commercially available set. One common problem is the storage of the computer, where do you leave it.
- 1995: Nintendo Virtual Boy. Monochramatic display: no collors (2 collors). No head-tracking. Commercial fealure (after a lot of hype) because it didn't actualy worked.
- Started in 2012 as Kickstarter campaign: Oculus Rift: much wider FOV (field of view). Lower latency: benefit from hardware development. Acquired by Facebook in 2014.
- Started as a gift in 2014: Google Cardboard. Start of mobile VR. Enormously cheaper. You can find a wide range of headset designs. You can put your phone inside.

Example applications of VR and AR:

- Droomvlucht for disabled
- Google expeditions: virtualy looking around in a different part in the world.
- ARBieb: scanning a book with your phone. Gives information of the book and experiences of people with that book.

- Pain reduction: using aVR-bril. The visualise what happens inside pations when being operated. This reduces the pain of the pations.
- Virtual surgery: practacing medical skills on a virtual pations. Relative safe enviroment.
- Public speaking: different kinds of envoriments are possible. For example students or foodball stadion. For the people practacing their presentations skills the public feels real. Feedback is given about for example speed of talking or body position.
- Virtual lab: CSI simulation. Students learn about biolology and genetics. Learning through a game.
- Factory assembly work: suporting the employ.
- History lessen: augemented reality is helping undo the Eruo-centric version of U.S. history. You point your phone to an object and it shows you more sides of the story behind the object. An object like a boat of Colombus.
- Animals: showing cows green pictures helps to improve the milk porduction of the cow.

-> Lot of those applications are tide in with gamification.

What do these examples show?

- Very wide range of applications.
- Both virtual and augmented reality applications.
- Combination with game-based learning not required, but common in instruction.

Pokemon Go: effect on coginite performance and EQ. By Ruiz-Ariza, Casuaso, Suarez-Manzano, Martinez. AR can improve diverse abilities, also physical activity. Effect of 8 weeks of playing pokemon go. Age 12-15. Results: mixed, some evidence for socialibility. Reason for playing: boys: fun and girls: boreddome.

VR and educational theory: article Fowler: pedagogical underspinnings of using VR.

- Focus on technological possibilities.
- If mentioned at all: constuctivism
- Model: affordances for learning. Spatail knowlede represtation, experientail learning, engegemtn, contexual learning, collaborative learning.
- Optimal level of fidelity? How much realism is require? Can there be too much realism?

Key concept: immersion. Do you feel that you are really in a situation, actual being there?

Deriving learning activiteis form the model:

1. Use a learning stage (conceptualisation, construcion, dialogue)
2. Use Bloom s taxonomy of learning outcomes (knowing, understanding, creating etc.)
3. Desing learning activity (acquire information, investigate issue, look at the world form different perspective etc.)

Disadvantages of VR:

1. Nausea (after prolonged use)

2. Maybe not suited for everyone
3. Restricted movement (your on a liech)
4. No interaction with outside world
5. Learning effects: empirical support? Not a lot of evidence.
6. Risk: cognitive (over) load.

Possibilities for education (even considering lack of positive findings):

1. There is a lot of enthusiasm about both VR and AR
2. Creative applications
3. Simulation of risky situations
4. Practice with safe environment

Conclusions:

1. VR and AR: promising technologies, much has already been realized.
2. Cost less of an issua than a few years ago.
3. In education: multiple resons for applying VR and AR.
4. Evidence for learning effects: very weak.
5. Use as addition, not as replacement for education. And not for too long at a time?
6. Lack of theory.

Virtual reality and learning: Where is the pedagogy?

Three defining characteristics of a 3-D VE: the illusion of three dimensions, smooth temporal and physical changes, and a high level of interactivity.

- Representational fidelity: qualitiy of display. High fidelity displays -> most realistic -> visual qualities of the display, consistancy of object behavior, realism of the communication and available actions, quality (behavioural and visual) of the user representation.
- Learner interaction: representation through the use of an avata -> able to communicate, show emotions, and control and create objects.
- Identity construction: user representation through an avatar -> through its appearance and actions becomes identified with the actual user.

Five functional properties that can benefit learning:

- Spatial knowledge representation
- Experiential learning
- Engagement
- Contextual learning
- Collaborative learning

Three characteristics of the learner's experience:

- Construction of identity
- Sense of presence
- Sense of co-presence

VR and educational theory: article Fowler: pedagogical underspinnings of using VR.

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- Model: affordances for learning. Spetail knowlede represtation, experientail learning, engegemtn, contexual learning, collaborative learning.
- Optimal level of fidelity? How much realism is require? Can there be too much realism?

Key concept: immersion. Do you feel that you are really in a situation, actual being there?

Immersion may bridge the pedagogy, technology and psychological. Immersion can arise for a from a complex interaction representational fidelity and learner interaction.

Framework of Mayer and Fowler: key stages of learning: they begin with pedagogical "affordances" to design the technology to maximise the learning outcomes.

- Conceptualisation: an initial understanding of the concept will be formed . Primary courseware: presentation to the learner, lectures or books but including multimedia representations that can provide high fidelity.
- Construction: start to explore, manipulate or ask questions.
- Dialogue: a learner may test their understainding through some kind of discussion or interaction with others.

Instead of immerse the terms empathy, reification (make the concept more concreet) and identification could be used.

Design for learning: holistic activity of designing and planning activities as part of a particular learning session or course defined by a set of specific learning outcomes.

Learning design: a particular systematic approach or language to describe the specification of learning activities.

Learning object is something different as a learning activity.

Contextual variables (of learning):

• Locus of control (the teacher or learner?) • Group dynamics (individual or group?) • Teacher dynamics (one to one, one to many, many to many?) • Activity or task authenticity (realism?) • Level of interactivity (high, medium or low?) • Source of information (social, reflection, informational, experiential?)

Lecture 8

13 januari 2020

Future developments in education and ICT

Some notes on the literature

Stakeholders in educations:

- Politics decide about the money and about the direction in wich education goes.
- Education management
- Teachers: dont have much time for thinking about innovations in education. Increasing workload leads to a little room for innovations.
- The publicers make educational materials.

Challanges:

- Market: competion and fragmentation of digital learning services makret. He thinks there is to little competion. For example every univeristy in the Netherlands uses BB.
- Intergratino: lack of intergration. Compagnies are only concurend with their product and dont look furtur than that.
- Operational: it is difficult to implement personalised learning. Adoptive to the learner.
- People: a dedicated information teachnology team. Most ICT departments are bussy enough and arent interested in implementing new things, no time.
- Economics: on a budget.

People who make decisions are usualy old and this result in no inovations.

Artificiual Intelligence

Moore's law: is the observation that the number of transistors in a dense integrated circuit doubles about every two years.

What is intelligence?

Intelligence has been defined in many ways:

- The capacity for logic
- Understanding
- Self-awereness
- Learning
- Emotional knowledge
- Resoning
- Planning
- Creativity
- Etc.

Are computer intelligent?

Dr Alan Turing the 'father'of Artificual Inteligence. Turing machine 1936.

He was the first who mathameticly explored what a computer could en couldn't do. He succeded breacking the enigma code, a code used by the Gemans in WO II.

Turing test: the experiment consist of a human questioner, computer responden, human repondent. The human questioner has to discovere which one is the computer and which is the human. If you cant deturman which is which than a computer is intelligent to. If you get a result of 50/50 -> it is change -> the computer must me intelligent to. Inpriciple you should be able to ask everything, but infact questions are asked in a specifick domain (like planets).

Research in our department in Intelligente tutoring systems:

Decision vs Knowledge model:

- Domain expertise:the knowledege you need about a certain subjects. for example math, biologie.
- Pedagogcial expertise: Rules. for example praise pupuls who deliver good work
- Interface: knowldege in what conditions you use a table or a graphe.
- Student model: who is the student and what do we know about them.

Book: Gödel, Escher, Back: consiousness and self awerness is result of the complexity of a system.

Achievement in AI:

- 1997: The deep Blue chess machine (IBM) beats world champion, Garry Kasparov
- 2011 IBM's Watson computer wins form the televison show Jeopardy! champoins Rutter and Jennings. The show is about a set of answeres and someone has to guess the questions it is about.
- 2016: Google DeepMinds's AlphaGO defeats Lee Sedon 4-1. Lee sedol is a 9th dan professional KoreansGo champion that won 27 tournaments from 2002 tot 2016. Before the match he said he would easily win 5-0 of 4-1.

Expert systems: rule-bsed expert systems

Neural networks: easialy to implement. You only get output (e.g. pictures of a cat, if someone has a desiese) but now why.

Dataming (Google and Facebook):

- Gathering van informatie (big data)
- Determining relations
- Sell data to marketing companies
- Privacy?

Datamining: use in education. What is alowed? Location tracking. Privacy.

Recent developments:

- Diagnose in medical science
- Robots
- VR