Overview

• Background
• Alleviating the entrance to SGs: ‘Simple’ SGs
• Language Technology & TEL/SG
• Assessment, Evaluation & SGs
• Questions
Background
1. Distance education (academic):
   - 6 bachelor
   - 13 master programmes
   - Special programmes

2. CELSTEC:
   - Master Learning Sciences
   - Research & Innovation (learning sciences & technology-enhanced learning)

3. Look:
   - Teacher training in the Netherlands
Facts & Figures

• Founded in 1984, one of the 14 Dutch universities:

• Approx. 20000 students (part-time)
  - 60% working; 50-50 M-F
  - 33% between 26-35, 33% between 35-45 (10% < 25, 25% > 45)

• Adult education, continuous education
  - only entry requirements: EU nationality and above 18 y

• 650 fte

• Local study centers in the Netherlands & Flanders

• Main office in Heerlen
Serious Games Programme
(Wim Westera)

Educational Focus (design, evaluation, ..):
• EMERGO toolkit & methodology
• Collaborative Scripting Games
• ARLearn (Google StreetView)
• Sensors: Game-based Communication Skills
• Game Learning Patterns
• Cases: CHERMUG (research methods)
• GALA (Network of Excellence)
• Open Ed. Resources: Topic SG
• Master course
Alleviating the Entrance to Serious Games

'Simple' Serious Games
Alleviating the Entrance to Serious Games

Games receive much attention in education. However, the actual use is limited:
- Games are the least used ICT applications in education [1]

Barriers:
- High technical demands (games hardware & development) & related costs
- Organising game difficult (lesson plan fit & measurable accomplishments)
- Support of serious games difficult for teachers (knowledge required, number of students to assist)
Alleviating the Entrance to Serious Games

Research question:

• Is it possible to create games with commonly available ICT tools?
  • which can easily be created, adapted, adopted and applied by teachers
  • How do teachers/students perceive these kind of games?
Alleviating the Entrance to Serious Games

Two case studies:

1. A game environment build within one of the most commonly used tools i.e. a Wiki: a ‘Wiki-game’
   Focus: technically as simple as possible. But a realistic, important learning objective: argumentation

2. A game environment for augmented virtuality / augmented reality on top of Google App Engine, Google StreetView and Google Android
   Focus: adopting 3D / reality in serious games. But making it easy and affordable by re-using existing tools & representations.
Case 1: Wiki-games 'Argument'

In Argument [2] teams argue about a given position. Each team defends their opinion with arguments and counter arguments. A team may use 'external evidence' and 'cheats'. A team receives scores depending of how convincing their arguing is perceived.

Example:
Team 1 - pro: Your team is in favor of the use of serious games in education. Argue and document why you are in favor of the use of serious games in education.
Team 1 - contra: Your team is absolutely opposing the use of serious games in education. .........................“
Wiki-games ‘Argument’

Wiki with:
• Assignment & background material
• Game rules (in text)
• Team page
• Hall of Fame
• Group discussion forum (reflection)

>> Four game rounds:
1. Short essay pro or against
2. Five arguments pro or against
   (with cheats & external evidence)
3. Counter arguments
4. Closing pitch

It is played as a board game meaning the players score each other manually following a giving set of rules.
Example: Opening screen of the Template version

1. Copy and paste the contents of this page to your Wiki page ‘Home’
2. Replace the yellow-marked hyperlinks with your hyperlinks

Welkom bij ARGUMENT

een Wiki met een game-element of een game met een wiki-element

spel waarin jij met jouw team de degens kruist met een tegenstander over een bepaalde
vragen met een beknopte inleiding, argumenten, tegenargumenten en een slotconclusie verdedig jouw team
je dat doet hoe hoger je score is. Het team met de hoogste score komt in de “Hall of

Home
Assignment
Calendar
Game Rules & Hints
Wiki Hints

Team 1 – Contra
Team 1 – Pro

Hall of Fame
Wiki-games 'Argument' Evaluation

Two evaluations rounds:

• Teachers 'as students' using Argument:
  • to validate the game perception, usability & effectiveness

• Teacher 'as teachers' to create a new Wiki-game or to build a new instance of Argument based on a template version of Argument and instructions:
  • to validate how easy it is to create, adapt, adopt and/or apply a wiki-game
Wiki-games Evaluation Pilots

1. **Student**, focus on experiences with Argument
   **Data**: loggings, game-input, forum discussions & questionnaire.
   • 15 participants (11 female, 4 male; 24 – 54 year), 11 completed all 4 rounds in 4 weeks: game run completely over the Internet
   • Average experience: 7 years working in education (& studying for a Msc Learning Sciences)
   • Limited knowledge of wiki’s/serious games (some/no: 50/50)
   • Time -on average- approximately 1 day (8 hours).

2. **Teacher**, focus applicability, ease of use to adapt/adopt & apply:
   **Data**: products designed & questionnaire
   • 7 participants (participated also in pilot ‘student’)
   • Individual design and implementation
   • Time: 0.5 day (adapt/improve Argument) – 2 days (new Wiki-game)
Wiki-games Evaluation Pilots

1. **Students** are motivated and engaged:
   - Quality contributions good
   - Users report (subjective) increase in learning
   - Argument is interesting and challenging but not seen as a game

2. **Teachers.** Simple to work with, but wiki-tools are limited, designs varied:
   - Wiki software used (one preferred Googlesites: more powerful)
   - Game elements (e.g. extra score options)
   - Level: from primary to higher education
   - Topics: Spelling of verbs (primary education) to Research methods (higher education)
Example WIKI-games: Werk!Woord!

Werk!Woord! [2] explores the wiki-game format to motivate learners to engage in an important but normally not motivating activity: verb spelling. Teams combat to detect each others flaws in spelling and in cautiously explaining why their spelling is correct following an existing algorithm. The best team becomes the verb-spelling-champion.
WIKI-games Werk!Woord!: Results

The spelling and the understanding of how to spell was improved:

- The spelling score improved from 63% correct in the pre-test to 74% correct in the post-test.
- The spelling explanation of the right answers improved substantially from 18% to 73%.

The students were very engaged and highly motivated:
- They even encouraged their peers to complete their inputs.
Conclusion: Wiki-games

Argument & Werk!Woord! are no games in the perception of the users (do not match users’ game experience) but probably better classified as ‘gamification’

+ Both are positively appreciated since they are interesting and challenging
+ ‘simple’ games can be used to learn complex skills
+ They inspire for further exploration as a stepping stone to start using serious games
Case 2: ARLearn/StreetLearn

Immersive learning, but high modeling costs for:
- 3d environments
- Game logic
- Learning content
ARLearn/StreetLearn

- Android client, game play in the real world
- StreetLearn client a virtual environment
- or hybrid e.g.: one player can take the role of operator in StreetLearn, while other players take a different role with the smartphone client
ARLearn [3] serious game is a blueprint capturing:
- game logic
- media to be displayed (multiple-choice questions, video objects, narrative items, etc.)
- item positions

ARLearn game logic is implemented through a dependency framework making items (dis)appear on:
- **Action based** dependencies. Example: a player triggers an action by giving an answer
- **Time based** dependencies. Example: item appear at a certain point of time
- **Boolean** dependencies i.e. “AND” and “OR” statements with other dependencies
Software Architecture
Two case studies (teachers & students Cultural Science):

- **The Florence fieldtrip case (Scavenger game).** This scenario uses an excursion pattern to model a city quiz tour. It is implemented with a monitoring tool for the educator and using mobile devices with the ARLearn client installed in the physical environment with the learners.

- **The Amsterdam case (Adventure game).** In this case, a police story in the drug milieu is used to motivate cultural heritage learning content about Amsterdam. This scenario follows an expository approach where learners remotely access the real world context via the desktop StreetLearn client.
Example StreetLearn

- Locations: History of locations of importance
- Pick-ups: Objects collected
- Inventory: Objects applied

- Objects to be collected / interaction & information objects
Example StreetLearn

Example storyline: a detective story & a cultural heritage tour in Amsterdam
Example StreetLearn

Welcome Message
It is the year 1973. You are police inspector Ada Jobse investigating the smuggling of marihuana. An anonymous witness has informed the Amsterdam police that large amounts of marihuana are smuggled in Dutch fishing boats from Lebanon to IJmuiden, in the north of the Netherlands. The marihuana is distributed in Amsterdam. Inspector Jobse tries to find out from where the marihuana is stored and how it is sold.
Conclusion ARLearn/StreetLearn

- Teachers & students are positive, with suggestions.
- Teachers easily pick-up the game concept & are able to communicate their game ideas in natural language. The actual editing i.e. transforming their ideas into ARLearn/StreetLearn scripts is -for an expert- relatively straightforward.

- The ARLearn framework (under development) lacks a number of components: e.g. assessment, teacher dashboard, authoring).
- Evaluation on the learning effects is still required.
Alleviating the Entrance to Serious Games?

Wiki-games contribute to a further exploration of serious games.
• Very easy: teachers can successfully make their own wiki-games
• Examples are effective with regard to learning effects
• They are motivating but classify better as gamification than as games
• Dedicated tools (widgets) may enhance / ease their use

ARLearn offers an immersive experience based on existing technologies:
• Teachers are able to suggest game scenarios, but do need support
• The games are realistic (serious) games
• Technology is offering more but more development effort required

…. Apps, Tools & Templates for ‘simple’ games / gamification are a challenging market and may fit education very well .......
Language Technologies & TEL/SG
Writings are important in all knowledge-intensive professions:

• Engineers (for example) spend between 20-40% of their workday writing (Kreth, 2000)

Writing is an important part of school and academic life. Writing is an important part of learning and part of formal assessment.

Communication in social media is still to a large extent text driven.

.... Feedback on text is important but labour intensive ....
Research question:
- how can we improve the quality or efficiency of tools & tutoring?

   - automatic recognition of questions and selection of peer tutors

2. Games: how can we enhance the interaction in SGs [6]
   - “The main challenge for creating the next generation of serious games has been established in close collaboration with the gaming industry and potential clients and is to make them more intelligent.”

3. Formative feedback on (short) essays: peer comparison [7]
   - automatic feedback based on comparison of key concepts used between peers
Question Answering in TEL
Introduction
Why Question-Answering

Objectives
• Connecting the learners (proactive sharing)
• Creating sustainable support facilities (effective support)

Stakeholder workshops
• A set of critical support activities

One of the main examples raised, question-answering
  • High frequency
  • Disruptive
  • Important for the learner
What is a Question?

What is the difference between heat and temperature? If it gets warmer, the temperature gets higher too! But apparently the same amount of heat can lead to different temperature increases. How come?
Question Answering in TEL
Main steps

1. A student poses a question.
2. The system determines with the help of LSA:
   - text fragments to help answering the question;
   - the topic(s) of the question;
   - the most suitable peer-learners.
3. The system sets up a wiki with the question, the text fragments and guidelines.
4. The selected peer-students receive an invitation to assist.
5. The questions poser and his peers discuss and phrase an answer in the wiki.
6. The question poser closes the discussion and rates the answer.
- My neighbour has a **Volvo**.
- Henk uses a **car** to go to his work.

**LSA (Latent Semantic Analysis)**
"Knowledge Dating"
possible selection criteria

Personality characteristics

Preferences: language, time

Personal Interests

Geographical distance

Topic knowledge

Job / Position

Knowledge relative to the peer

Workload

Virtual Network: closeness

Ability to explain
Student Question interface

Vraag-Antwoord Module

Klik hier voor uw vraag of antwoord pagina, of stel een nieuwe vraag

Vraag-Antwoord-module kunt u vragen stellen over de **inhoud** van de cursus. Uw vraag wordt naar een soort prikbord (wiki) en doorgestuurd naar daarvoor speciaal geselecteerde medestudenten. Vragen en technische problemen moet u bij de help-desk zijn.

Het belangrijkste is de daarbij behorende vraag zo goed mogelijk zodat het ook voor een ander duidelijk is wat uw vraag inhoudt.

Cursusonderdeel: **Onbekend**

Send
Results Experiment

Online course with 11 topics; 22 study-hours
110 students in 2 groups: 78 active (40 : 38)

8 weeks: 101 questions, 68 students active involved:

<table>
<thead>
<tr>
<th>Questions</th>
<th>59</th>
<th>42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solved</td>
<td>42 (71%)</td>
<td>19 (45%)</td>
</tr>
<tr>
<td>Accept first invite</td>
<td>80%</td>
<td>50%</td>
</tr>
<tr>
<td>Average response time:</td>
<td>5.6</td>
<td>9.6 days</td>
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</table>
Chatbot & Serious Games
extending the interaction

Emergo chatengine simulator

CONNECT

Hé, pur jij komt hier stage loopen. Welkom bij de poli seksuologie. Mijn naam is Lucer en ik werk hier als psycholog/sexuoloog. Ik ben jouw begeleider voor de komende periode. Neem plaats ... ben je klaar voor een korte uitleg over stages bij onze poli?

Tekst invoer:
Introduction (1)

How and to what degree can (simple) chatbots be used to enhance the interaction (motivation and effectiveness) and to broaden the type of scenarios in SGs?

- (Extending) SGs with simple/affordable/available technologies (Wiki-games/collaborative scripting/StreetLearn/ ...)

- The use of virtual assistants, conversational agents, virtual agents, dialogue systems, or chatbots, etc. is part of research and applications in an increasing number of areas

- In education, there are few but outstanding examples, e.g. Autotutor (Graesser et al, 2008); mostly depending of advanced Language Technologies

- In SG interactions and input are mostly limited to navigation, selection and simple (alpha) numeric input

- For commercial use, “relatively simple” chatbots seem already widely applicable (Van Lun, 2011): “Analyst Firm Gartner predicts that “by year-end 2013, at least 15 percent of Fortune 1000 companies will use a virtual assistant to serve up Web self-service content to enhance their CRM offerings and service delivery””
Introduction (2)

The project consisted of the following tasks:

- Survey of chatbots & select one
- Develop a ‘proof of concept’ prototype linked to an EMERGO [5] case:
  - Use Case 2: Student chats with the chatbot
  - Use Case 3: Student asks or gets progress of the conversation
  - Use case 5: Technical Integration with EMERGO

Additionally, external to the project, an evaluation of usability and usefulness
EMERGO

EMERGO is a SG toolkit and methodology for acquiring complex cognitive skills (e-cases):

- realistic problem situations,
- learners participate as actor
- learners constantly are being confronted with the consequences of their actions
- when applying knowledge and skills in finding solutions

EMERGO is:

- Open Source
- Web based
- Efficient (a production ratio of 1:25 required to design and develop a new case (Nadolski et al, 2008))
EMERGO Example

Water management “the estuary Scheldt”, in context:
- Ecology, geology, land use planning, and chemistry

An authentic case with:
- Tools (e.g. maps)
- Resources (scientific papers, reports)
- Experts
- Assignments:
  - starting with a official contract for a consultancy job) and
  - evolving over time
EMERGO Typical Interaction

The student interviews an expert by selecting one of the available questions

← → Chatbot?
Chatbots

“Chatbots”

• have been around for over 30 years:
  - Eliza, a program representing a psychologist (Weizenbaum, 1966).
• are versatile and of varying complexity (quality):
  - text only
  - speech synthesis & recognition
  - affective state detection & responses.

Our focus:

• Relatively simple, rule based approaches for chatbots
• Trial to what extent they can be used (e.g. strength and limitations) and are useful (e.g. motivating, improved learning outcomes).
EMERGO-Chatbot test case

**Context:** e-practicum students, in the role of trainee, get acquainted with the various aspects of the profession of sexologist.

**Objective:** to give the trainee at their first day the opportunity to get acquainted with the work, activities and approach of a sexologist.

**Materials:** 90 questions & videos (14 categories) on 4 topics:
(1) the education and training of a sexologist,
(2) the work and co-operations
(3) symptoms and treatments
(4) professional attitude and general questions on sexology.

**Chatbot:** mixed dialogue & student decides when to stop.
Summary of Results

technical

**Luctor:**

- **Chatbot based on ProgramD**
  - Simple pattern matching (AIML) to detect questions
  - Adaptations/extensions e.g. predicate handling & storage
- **A fall-back dialogue strategy:**
  - Hinting
  - Summarizing and hinting what could be next
- **Integrated with EMERGO**
- **Chat overview (inspection and analysis)**
Summary of Results
formative evaluation

Q1. It is possible to pose the questions planned being a trainee;
Q2. The chatbot responds in a fairly natural and acceptable way;
Q3. The interaction model is more challenging than the traditional one;
Q4. Educational usefulness

Q1 & Q2: Varied responses: difficult to ok
   Many questions are semantic-/linguistically very close → difficult to pose (guessing)/distinguish. Recognition is 1 to 1 (1 question 1 answer) instead of n to 1 (n similar questions to 1 answer)

Q3: Plus: model is more challenging

Q4: The learning aim is too open:
   Scenario trialed is too open, no structure;
   - there are too many questions
   - all questions are “right”
   → so no real feedback required other than recognized or not
Future work

• Cases with more focused aims and question constraints

• Reasoning Layer to model and monitor structured dialogues, e.g.:
  - In take consultations (Psychology)
  - Advisory (Law)

• Additional dialogue strategies, e.g.:
  - Combining open input with selected choices
  - Dialogue Overview & Progress Indicator

• Authoring tools & methods for dialogue input

• ... Experiments
Formative feedback on (short) essays

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<th>II</th>
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<td>Personal recommender system</td>
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</table>
Formative feedback on (short) essays

Students find it difficult to determine what they have learned and the scope of their expertise. Regular, formative feedback on their writings motivates and increases learning.
Novices and experts differ in:

- How they express the concepts underlying a domain
- How they discriminate relevant from non-relevant information, and
- How they use and relate the concepts to one another
Writing Tasks
Formative feedback: initial research questions

• Is it possible to build a visual, ‘individual’ representation of a text on a selected topic, with simple, standard term extraction and word clouds tools, that according to its/the writer covers the core concepts of the text?
• Similarly, is it possible to build a visual, ‘group’ representation of set of selected texts on a selected topic that according to their authors covers the core concepts of the accumulated text?
• Do the writers/participants perceive the resulting representations as useful input when they want to compare and contrast the individual versus the group perspective on the selected topic?
Initial trials

Initial study used word clouds and concept maps to semi-automatically generate graphical visual representations of articles.

The authors were asked about:
- The quality of their text visualisation
- The quality of an integrated text visualisation
- The value of their text and the integrated visualisation to compare and contrast

Respondents could fairly easily identify the overlapping and missing concepts between their individual and group representations.
Initial trials
Follow-up (in preparation)
Summary Writing Guidance

Design and development of app-based guidance in summarization training to improve summarizing skills and comprehension of text and hypertext:

1. link the text content to existing prior knowledge (elaboration),
2. promotes self-testing which helps them to identify their comprehension gaps and fix them and (self-testing)
3. directs students' attention to important content parts (visualization)
Analyse – Visualise – Compare & Discuss
Analyse – Visualise – Compare & Discuss

I

II

Recommendation

Ad-hoc transient community

Personal recommender system

System

Model

Learning activity

Suitable

Time

Learning

Specific

Recommendation

Problem

Specific knowledge

Available

Provide

Support

User

Information

Information

Social

Learner

Data

Participants

Technique

Context

Community

Techniques

CELSTEC

celstec.org
Evaluation, Assessment & Serious Games
threats/challenges to explore
Evaluation & Serious Games

A review of the literature of the potential positive effects of games on learning:

• only 129 studies out of 7392 reported effects based on empirical evidence

Assessment & Serious Games

"Serious games will not grow as an industry unless the learning experience is definable, quantifiable and measurable." & "Assessment is the future of serious games." [*]

Learning by doing in complex authentic environments (games) improves the learning outcome and should give insight in the learners' competences, however, typically, learning outcomes are assessed outside the game not inside.


Questions & Discussion

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References/Links

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