



# Learning Analytics Goals, Methods, Trends

February 3rd, 2012

Bernd Krämer  
FernUniversität in Hagen, Germany

## Our Panelists Today

Lynn Patterson, Kennesaw State University, USA

Denis Gillet, EPFL, Switzerland

Dirk Malzahn, OrgaTech GmbH, Germany

Andrew Sung, New Mexico Tech, USA

Stephen White, University of Huddersfield, UK

# Analytics

Use of

- IT
- OR
- Statistics

To extract useful information from data

Google/ Web Analytics

Business Analytics

Learning Analytics

...

## Learning Analytics?



# Example: Network of Interactions (SNAPP)

Your location: Discussions > Assessment Discussion

## Assessment Discussion

Description (click to expand)

Create Message

Expand All Collapse All

- Subject
  - Exam Schedule %
  - anatomy\_formative\_answers %
    - Re:anatomy\_formative\_answers %
  - GL\_block\_quiz %
  - GL\_quiz\_7\_question %
  - BCA\_POEM - Formative %
    - Re:BCA\_POEM - formative %
  - Quiz\_question %
  - Assessment Committee Meeting 10/08/09 %
    - Re:Assessment Committee Meeting 10/08/09 %
  - formative\_quiz\_stats %
    - Re:formative quiz stats %
    - Re:formative quiz stats %
  - formative\_quiz %
    - Re:formative quiz %
    - Re:formative quiz %

### Social Networks Adapting Pedagogical Practice (SNAPP)

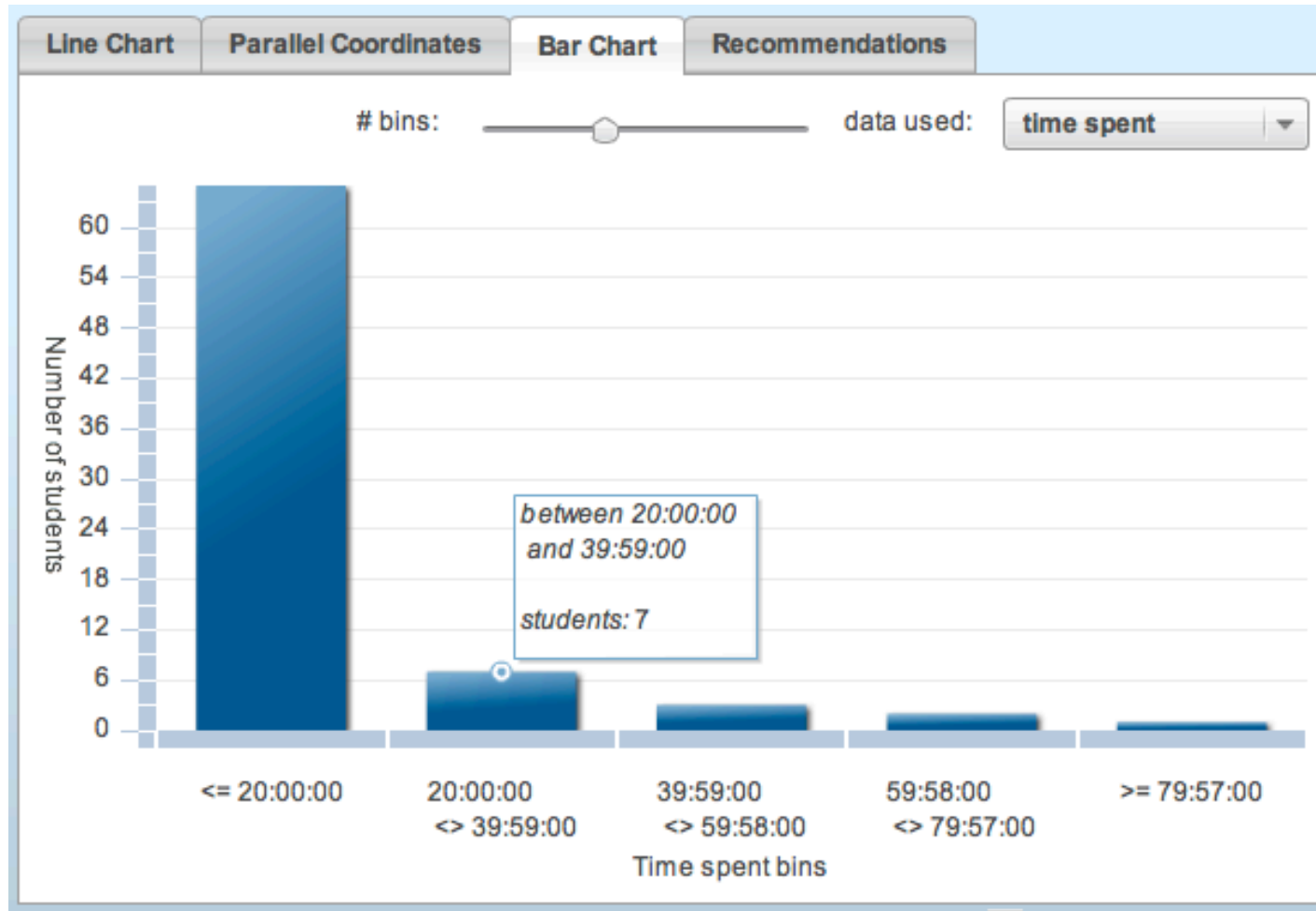
Visualization Statistics Export Help

Controls

- Zoom In
- Zoom Out
- Show self-loops
- Selection: [Dropdown]
- Layout: [Dropdown]
- Filter
  - Enable Filtering
  - Filter by Number of Connections: [Dropdown]
- People
  - Show Names
  - Scale Nodes by Number of Posts
- Connections
  - Show Posts between Participants
  - Scale Connections by No Posts
- Line Type
  - Box
  - Circle

Univ. of Wolongong:  
<http://research.uow.edu.au/learningnetworks/seeing/snapp/>

## Example: Student Activity Monitor (KU Leuven)



## Target Groups & Purposes

- Educators
  - Improve teaching support (IST guidance, learning design, content, ...)
  - Understand & predict student performance and behavior
  - ...
- Individual learners
  - Personalize recommendations, learning environments options
  - Optimize learning process
  - ...
- Groups of learners
  - Analyze & exploit social interaction structure
  - Enhance collaborative interaction
  - ...
- Tool builders

## Topics of Interest

- What can we observe and how?
- What is working best and worst?
- How can we increase the attention of students?
- Which methods and tools work well in which context?
- What are current research challenges?
- What about privacy?
- ...





# LEARNING ANALYTICS

## THE GOOD, THE BAD AND THE UGLY

DENIS GILLET

SWISS FEDERAL INSTITUTE OF TECHNOLOGY IN LAUSANNE - EPFL

ACHI, VALENCIA, SPAIN, FEBRUARY 3, 2012







# BACKGROUND

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- **STELLAR** European Network of Excellence on Technology Enhanced Learning
  - **Project:** <http://www.stellarnet.eu>
  - **Portal:** <http://www.teleurope.eu>
- Activities and Instruments dedicated to **Research and Education 2.0**



# BACKGROUND

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- **ROLE** European Integrated Research Project on Responsive Open Personal Learning Environments (**PLE**)
  - <http://www.role-project.eu>
  - <http://www.role-widgetstore.eu>
  - <http://graasp.epfl.ch>
- **Ecosystem** of services, platforms and actors supporting self-directed learning



# THE GOOD

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- **The Will**
  - Advanced Visualization
  - Informed Recommendation
  - Group, Personal and Ubiquitous Awareness (the augmented learner)
- **The Way**
  - Educational Data Mining
  - Federated Repositories



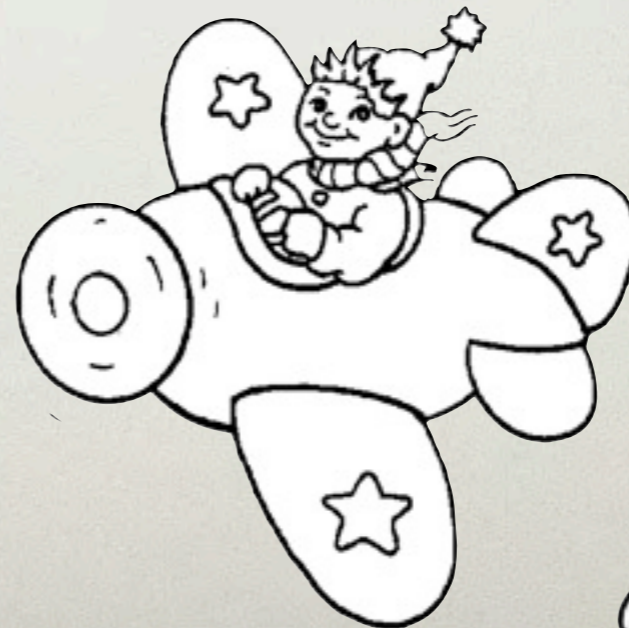
# THE BAD

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- The **LMS King** is (almost) dead, Long live the new **PLE King**
- From controlled institutional settings to plastic cloud ecosystems



LMS bringing all passengers from A to B



PLE enabling the personal exploration of the cloud



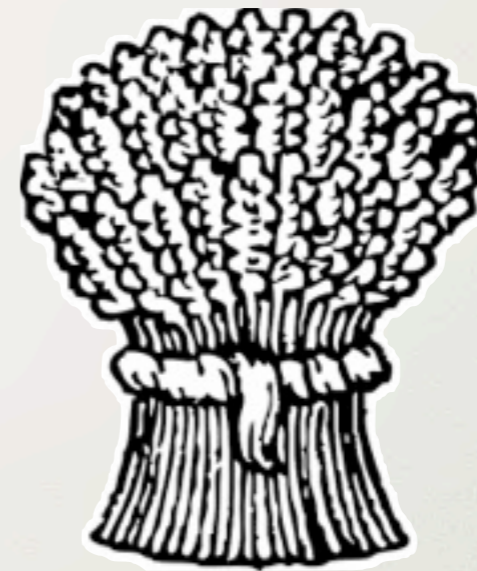


# THE BAD

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- Where can we find their data ?

Federated repositories



Harvesting  
By whom,  
where ?

- How do we deal with multiple identities ?

e-Identity



Identity  
matching



# THE UGLY

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- **Added value** (if any) for students or teachers ?
- **Privacy** Kid should not be tracked (traces and patterns anonymized thanks to group login)
- **Trust** Who host the data and their analytics ?
- **Context** Relevance with activities and modalities (most of the time lost in analytics)
- **Ubiquity** Blurring frontier between social activities, knowledge management and learning



# CONTACT & LINKS

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- <http://interaction.epfl.ch>



- <http://graaasp.epfl.ch>







## **Digital World 2012**

**eKNOW 2012 The Fourth International Conference on Information, Process, and Knowledge Management**

**Panel eKNOW / eLmL**

# **Improvement of Error Prediction in Custom Software Systems**

Dirk Malzahn

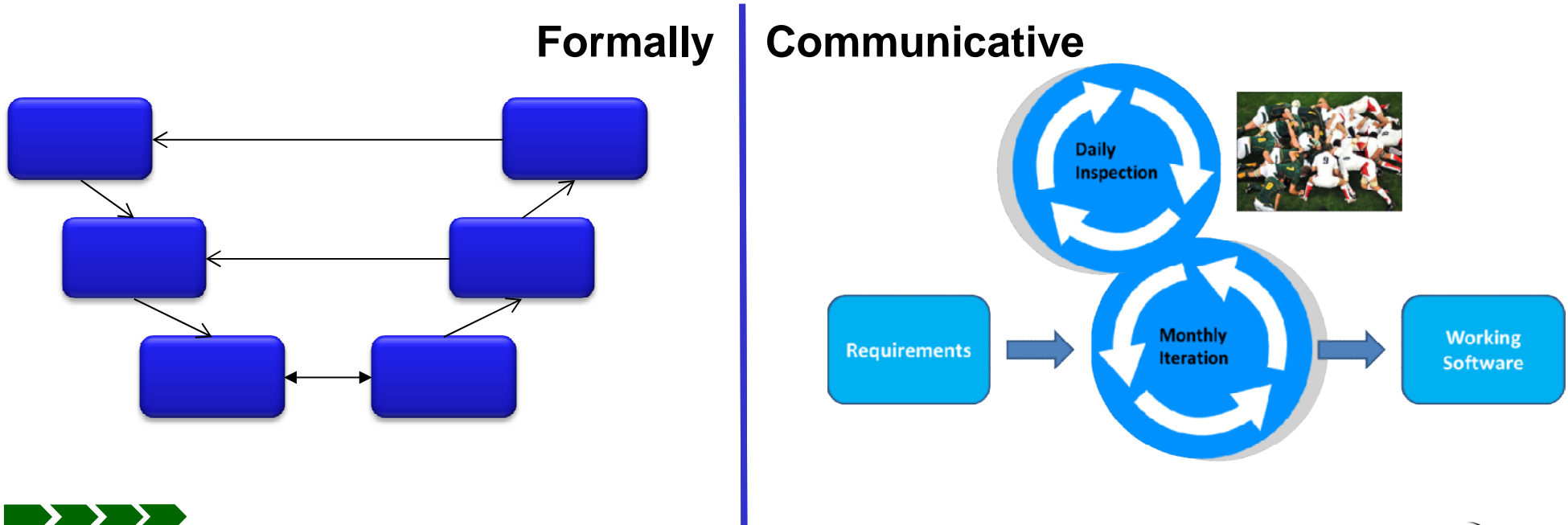
OrgaTech GmbH, Germany



# Introduction



- The Quality of Custom Software is highly dependent on the qualification of software developers, using appropriate methods
- Dependent on qualification, experience and social and communication skills of the developers, the selected methodology has significant influence on the quality of the project and product

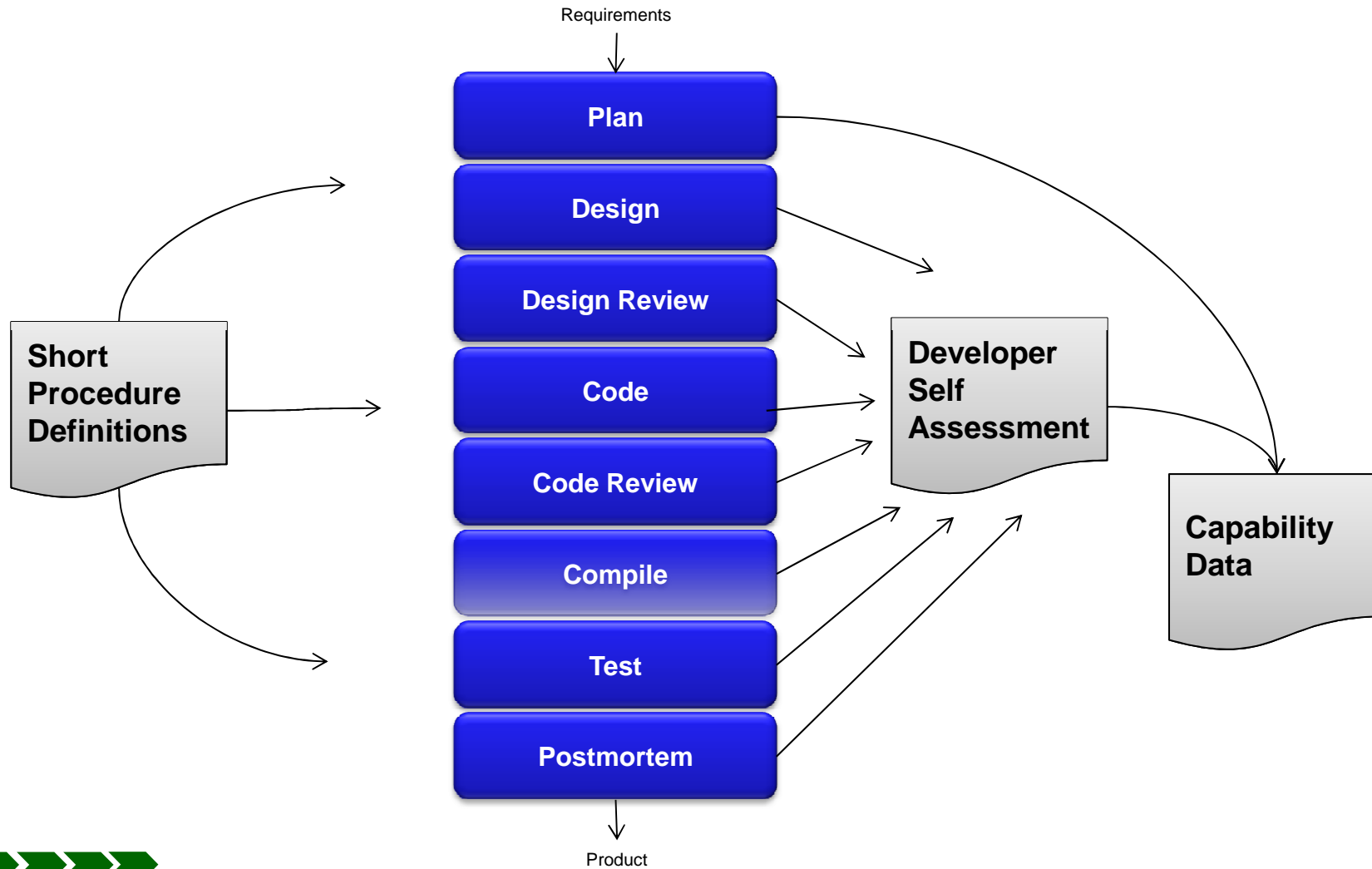


# SEI Personal Software Process



29.02.2012

3

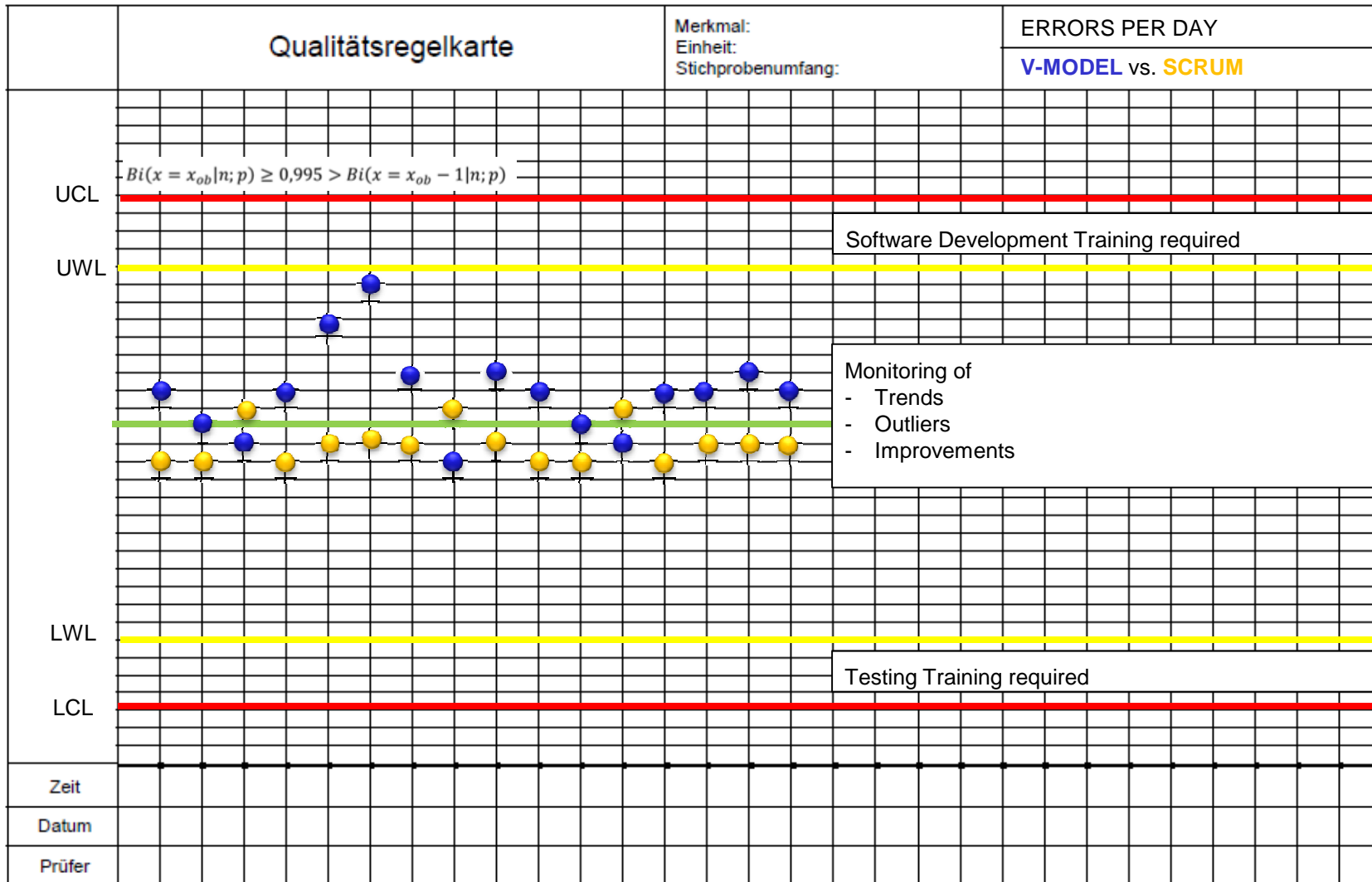


# Error Tracking, Methodology Selection and Training Needs Analysis by Shewhart Control Charts



29.02.2012

4



# Compare Self Assessment and Error Tracking

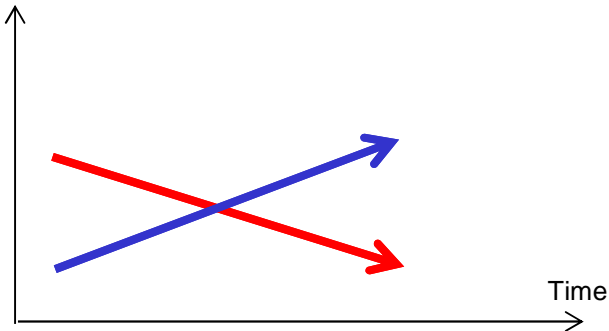


29.02.2012

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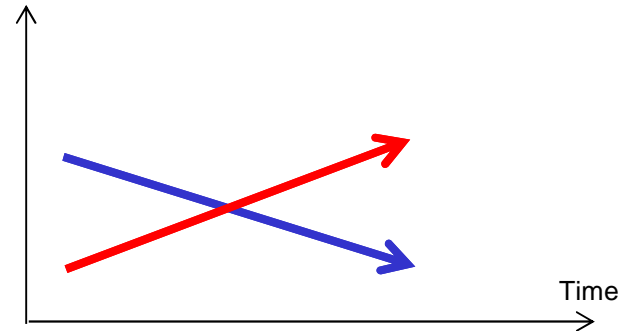
## SUCCESS

Errors /  
Self Assessment



## FAILURE

Errors /  
Self Assessment

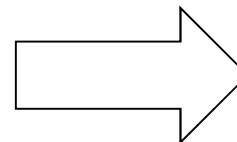


Errors /  
Self Assessment

## MODEL INCOMPLETE



Time



## ENHANCE APPROACH OR DATA BASIS



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# Socorro, New Mexico

(settled 1598)



# Learning Assessment

- Why?
- What to assess?
  - course objectives
  - learning outcomes
- Who to conduct assessment?
  - instructors
  - students
  - other stakeholders



# Learning Assessment

- How to assess?
  - questionnaires, surveys  
(students, graduates, alumni, employers, etc.)
  - teaching evaluations
  - instructor / faculty self-study

# Course Objectives and Program Outcomes

- Course objectives can be measured immediately at course completion
- Program outcomes require longer-term evaluation through a variety of mechanisms
- Formulate relevant, meaningful, and measurable objectives and outcomes
- Develop effective algorithms and tools for measurement
- Documentation is required

# E-learning Assessment

- Course objectives
- Educational program outcomes
- Technology and delivery method
- Cost-effectiveness, etc.

# Data Collection and Analysis

- Challenges in E-learning Assessment
  - diverse audience
  - geographical / temporal constraints
  - different tools, technologies, delivery modes
- E-learning provides many opportunities for data collection
- Evaluation of learning effectiveness can be assisted / enhanced through data analysis

# Questions

- ⇒ To what extent can data analytics be used to
  - simplify the task of E-learning assessment?
  - produce reliable assessment of learning effectiveness?
  
- ⇒ Methods / guidelines / tools / algorithms?

# Data Analysis Techniques

- Factor analysis
- Learning machine modeling, feature ranking and selection
- Important factors in e-learning effectiveness?
  - Motivation of students
  - Preparation and experience of teacher
  - Ease of use of technology
  - Delivery method

# Learning Analytics: Goals, Methods, Trends

eKnow / eLmL Panel

Stephen White  
IARIA Fellow

*The analogy used by Simon really hit home to me...*

Keynote Address, Ascilite 2011, 6 Dec., Hobart, Tasmania  
[www.leishman-associates.com.au/ascilite2011](http://www.leishman-associates.com.au/ascilite2011)

# Learning Analytics

## Dream, Nightmare or Fairydust?

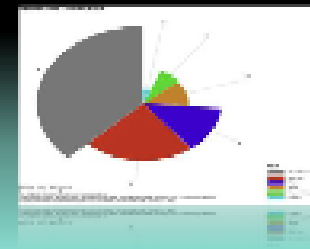
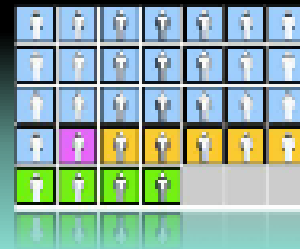
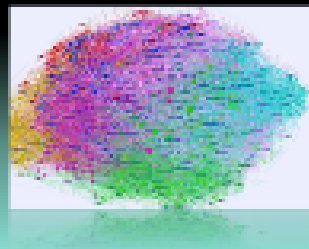
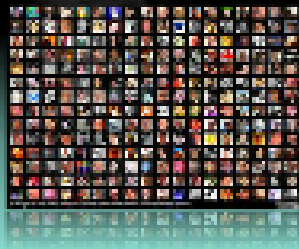


**Simon Buckingham Shum**

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<http://people.kmi.open.ac.uk/sbs/2011/12/learning-analytics-ascilite2011-keynote/>



# the biggest innovation in aquatics has arrived.

Understanding what is happening inside your aquarium is vital to ensuring that the aquatic life remains healthy. This revolutionary water monitoring device allows you to continuously track the changes in the water parameters, alerting you to the problems before they affect the fish. Protect your fish with a seneye monitor.

Search entire shop here



twitter There are lots of options for connecting your seneye device to your P

SENEYE  
HOVITE



## How is your aquatic ecosystem?



“This means that the keeper can be notified before water conditions directly harm the fish—an assured outcome of predictive software that lets you know if it looks like the pH is due to drop, or the temperature is on its way up.

**This way, it’s a real fish saver, as opposed to a forensic examiner, post-wipeout.”**

*(From a review of Seneye, in a hobbyist magazine)*

## How is your learning ecosystem?



This means that the **teacher** can be notified before **learning** conditions directly harm the **students** — an assured outcome of predictive software that lets you know if it looks like **engagement** is due to drop, or **attainment** is on its way up.

**This way, it’s a real student saver, as opposed to a forensic examiner, post-wipeout.**

new

## join us in the water sensing revolution

The seneye device is revolutionising keeping fish by allowing dramatically reduced fish death. The seneye allows fish keepers to truly understand what happens inside their aquarium or pond by monitoring the harmful parameters which aren't detectable to the human eye. A seneye device dramatically improves the frequency, accuracy, sensitivity, and robustness of water sensing to ensure that aquatic life does not just survive, but thrive!



### seneye home



### seneye pond



### seneye reef



*also ideal for planted tanks*



compare



### cloud

A revolution in aquatic water monitoring, the seneye cloud seamlessly allows you to view the results from your seneye device on any internet enabled product. Your readings can be automatically uploaded using a **variety of connection** and then viewed where ever you are.



### seneye+

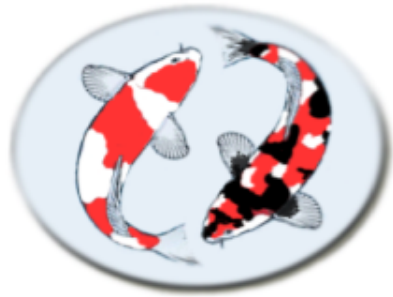
The seneye+ includes the disposable seneye slide, e-mail alerts, sms alerts, automatic online graphing, and personalised advice. Replacing and activating the slide takes a minute and then the your device will take readings for pH and ammonia.



### dashboard

Easily view all your readings online from any location and instantly see if they are OK. Simply log on to your personalised online dashboard to see graphs of your readings as well as predictions on if there is going to be a problem in the future.

The pond version is something that I had been discussing recently...

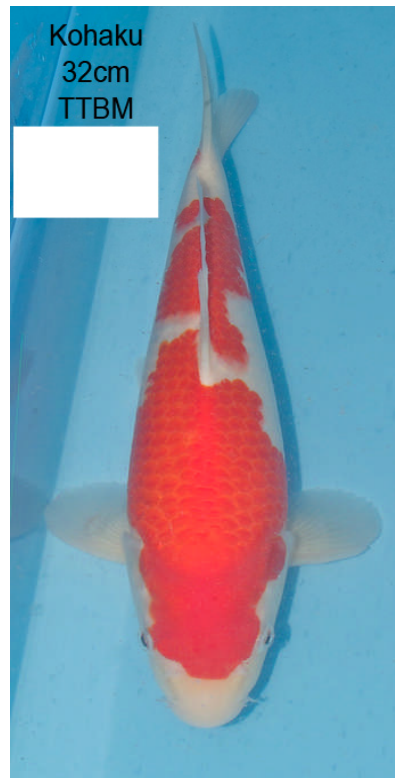


# Koi Sense

Discussion Forum



Kage Showa  
36cm  
TTBF



Kohaku  
32cm  
TTBM

(my baby champion)

... because I keep koi for a hobby – actually...

## I Keep Water, not Koi

Because an optimum environment is vital

These all contribute:

kH

pH

Nitrification

Ammonia

Nitrate

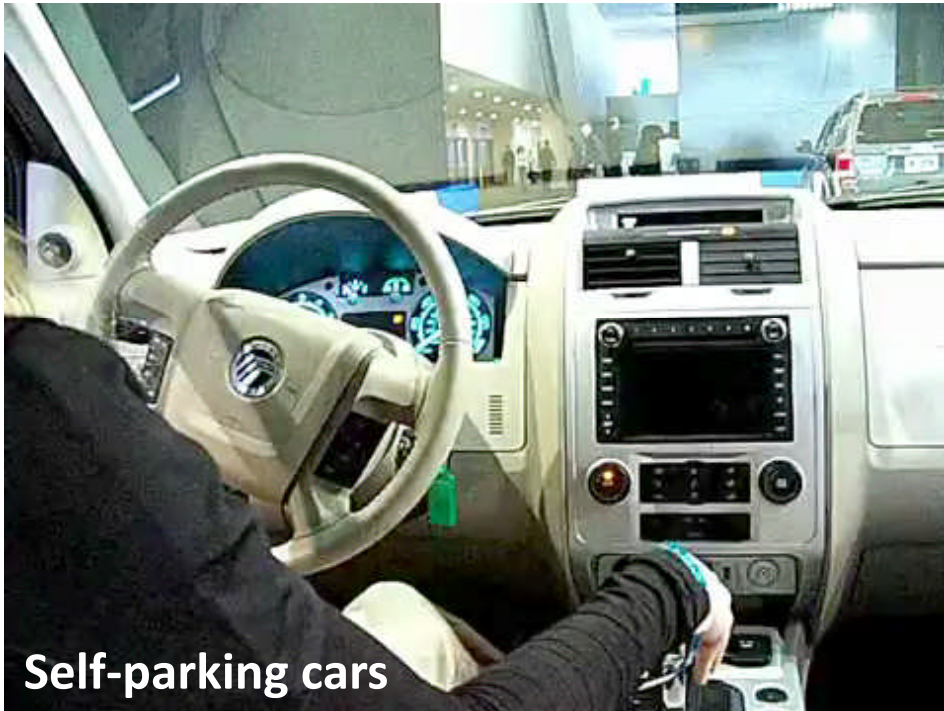
*Water tests are available – used a lot by new koi keepers - but... how the koi behave is an indicator of something not being right – by monitoring them I am monitoring the environment*



I would suggest...

# Same with education

## DANGER



**Self-parking cars**

*An impressive use of technology – which may be needed by some.*

*But... will it result in loss of ability to park?*

*What happens the day it doesn't work?*

*A tutor, through observing and interacting with their students, can identify what is good or bad.*

Potential for de-skilling tutors and adding to cognitive burden of students

So... not suggesting there is no need for learning analytics.

But... need to very carefully consider:

- When to apply?
- Who it is aimed at?
- Who will benefit?
- \* **What may we lose?**