UNIVERSITY OF EASTERN FINLAND

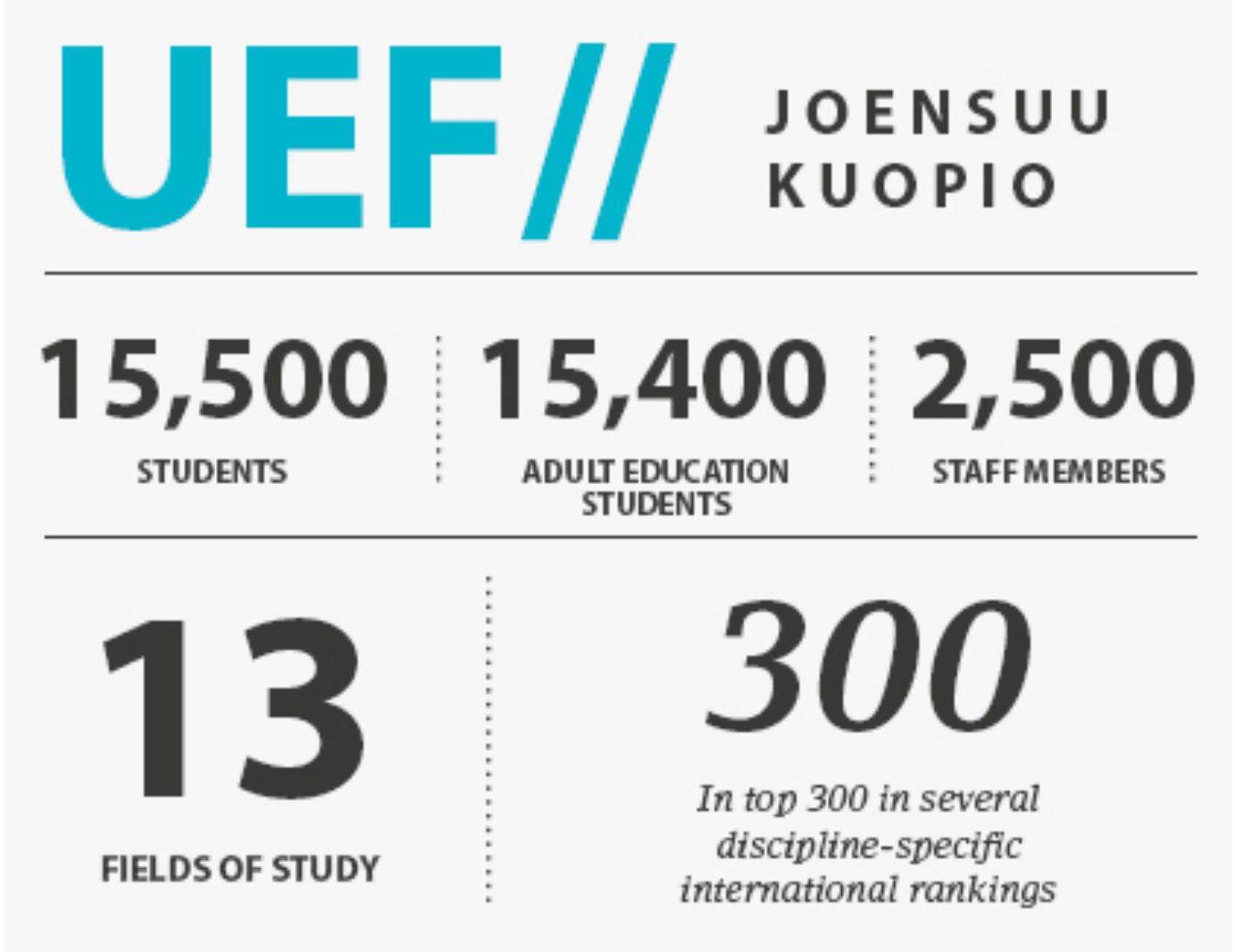
Kick-off Lecture
Designing Smart Learning Environment, 5 ECTS

Content

1. Part I: Short introduction and characteristic features of smart learning environments
2. Part II: Practical arrangements

Solomon Sunday Oyelere

UEF // University of Eastern Finland


UEF//
JOENSUU
KUOPIO
15,500
STUDENTS
15,400
ADULT EDUCATION STUDENTS
2,500
STAFF MEMBERS
13
FIELDS OF STUDY
300
In top 300 in several discipline-specific international rankings

About Me

Academic degress

- Doctor of Philosophy (PhD), University of Eastern Finland, Computer science, January 2018
- Master of Science (MSc), Technische Universität llmenau, Germany, Research in Computer and Systems Engineering, 2013
- Bachelor of Technology (B.Tech) (Hons), Federal University of Technology, Yola, Nigeria, Computer Science, 2008

Teaching qualification and training

- Professional teacher education training, Häme University of Applied Science, Finland, 2018

Research

List of publications

11 journal articles

24 conference proceedings

2 chapters in research book

1 Book

Research funding

- Project title: ICT Platform for Learning and Inclusion (SELI): Amount: **1.2 million euros**
- Source: Japan Society for the Promotion of Science (JSPS) Research fellow, 2019: Amount: **4.5 million Japanese Yens**: Purpose: Implementing Smart Learning Analytics Platform at Kyoto University Japan
- Source: Jenny and Antti Wihuri Foundation: Period: 01.10.2018: Amount: **28,000 euros**
- Source: University of Eastern Finland: Period: 05.04.2018: Amount: **4,000 euros**: Purpose: Postdoctoral field research at Athabasca University, Canada

Source: University of Eastern Finland

Amount: **6,000 euros**

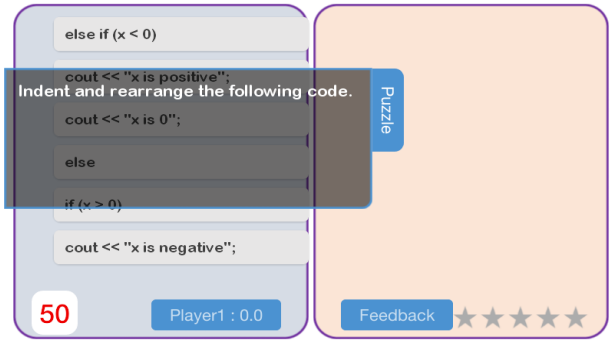
Purpose: Research grant

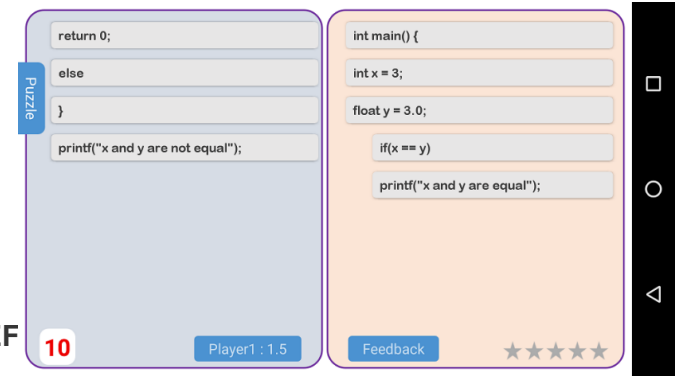
Areas of research interest

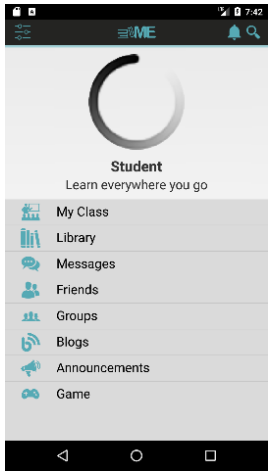
- Computer Science Education Research
- Mobile Learning Solution
- Game-Based Learning … application of indigenous games to support programming education
- Application of IoT in Smart Learning Systems

Game-Based Learning – MobileEdu Puzzle

- **Board Games for Teaching Computer Programming e**.g. Indigenous African Game …3500-year old board game

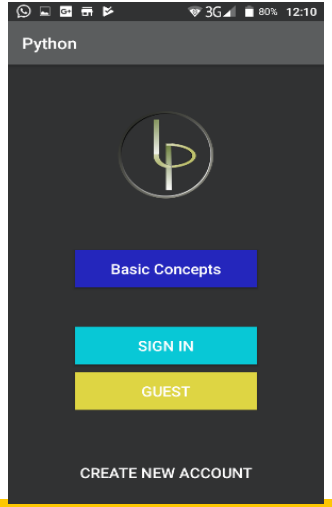




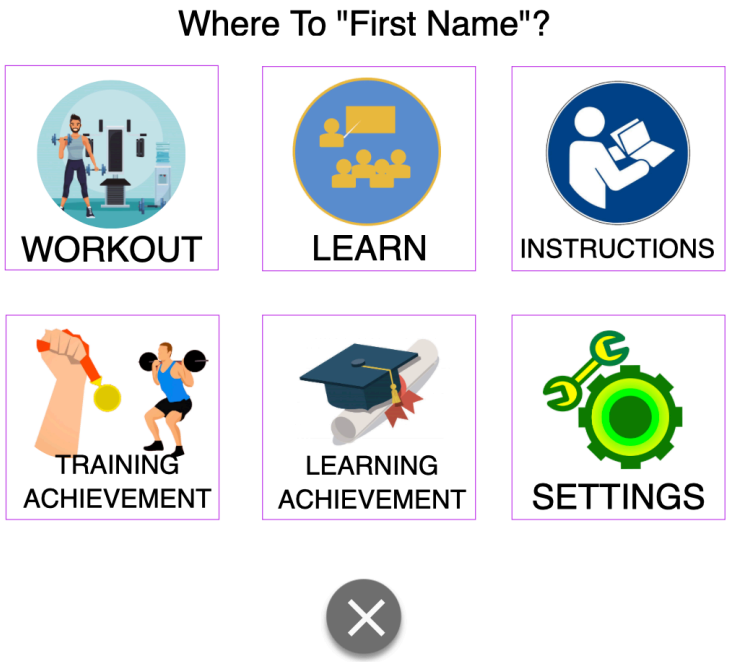


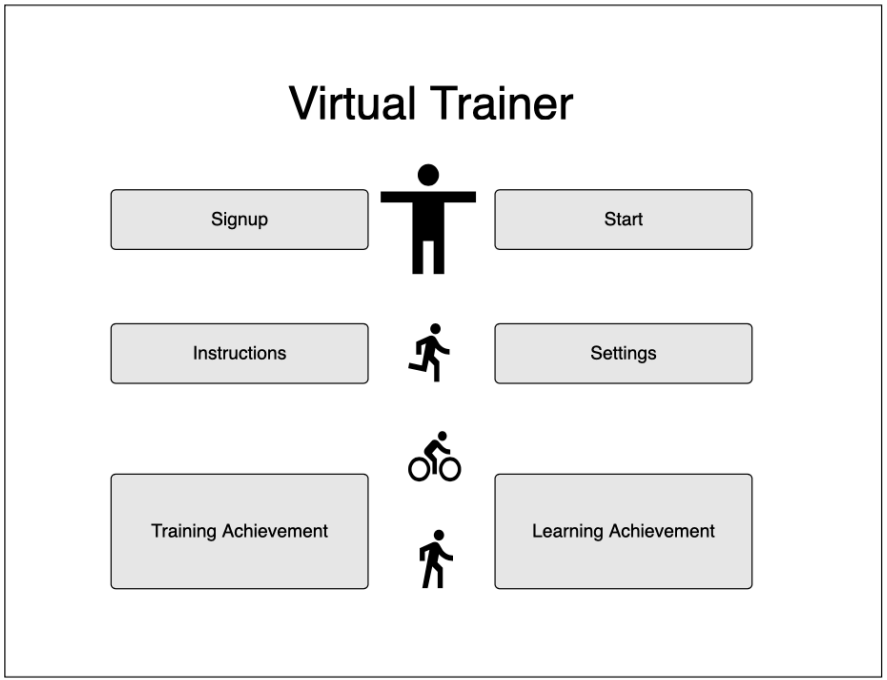
Computer Science Education Research

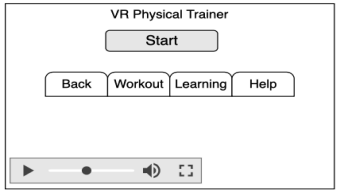
- **Development** and/or **evaluating** new interactive tools to support teaching and learning programming, algorithm & data structures
- **Learning analytics & Big Data**

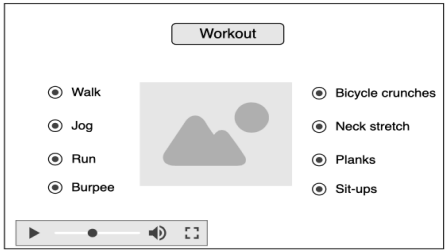


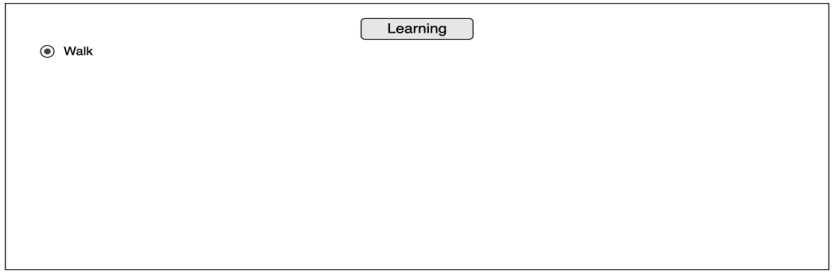
Mockup of VR Physical Education and Exercise

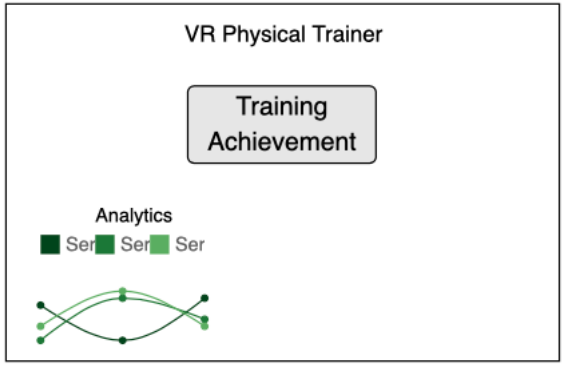


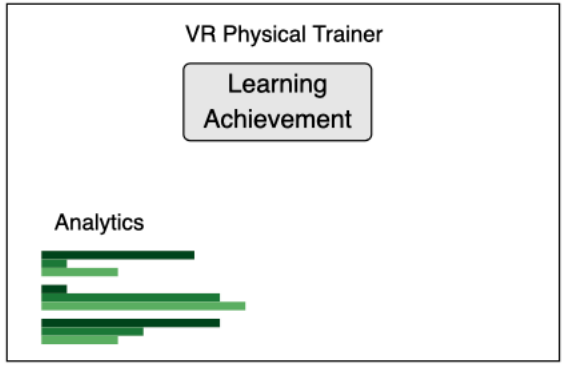



VR Physical Trainer
Start
Back
Workout
Learning
Help


Workout
Walk
Jog
Run
Burpee
Bicycle crunches
Neck stretch
Planks
Sit-ups


Learning
Walk


VR Physical Trainer
Training Achievement
Analytics
Ser
Ser
Ser


VR Physical Trainer
Learning Achievement
Analytics

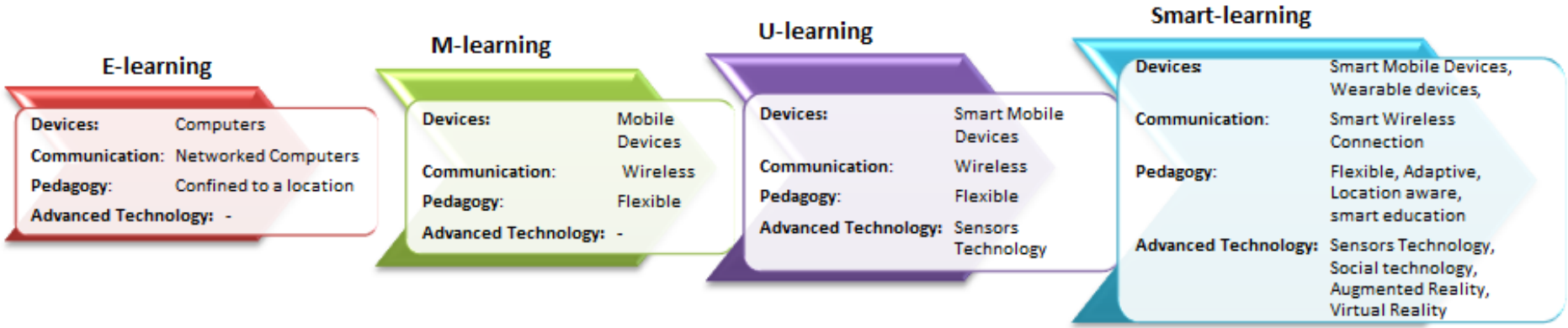
PART I:

Short introduction & characteristic features of

Smart Learning Environments

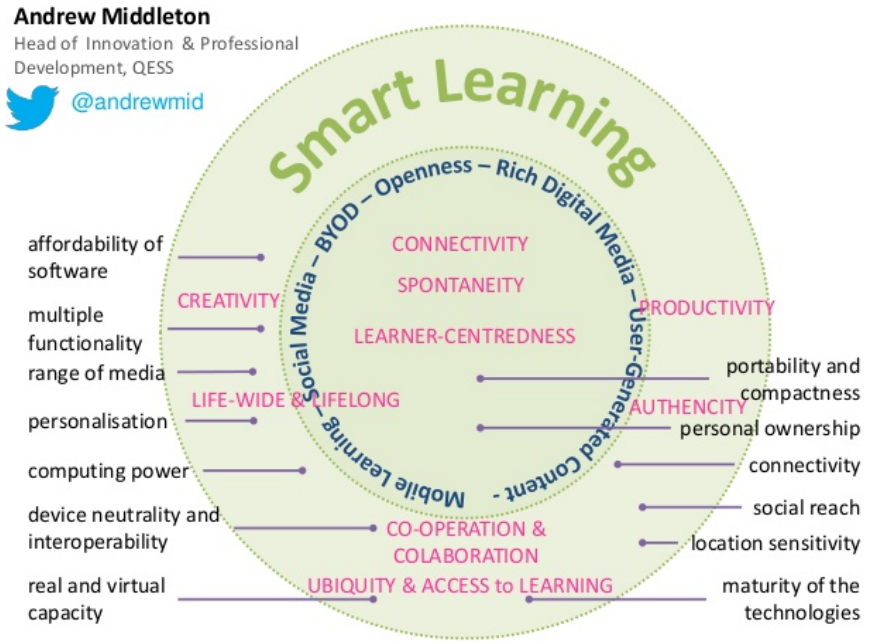
Background

The transitional flow of technology-enhanced learning environment



Background

- Smart Learning an emerging area alongside other related emerging areas:
- Smart technology
- Smart education
- Smart-e-learning
- Smart classrooms
- Smart universities
- Smart society



Smart Learning Environments

Definition

- SLEs are physical environments that are improved to promote better and faster learning by enriching the environment with context-aware and adaptive digital devices that, together with the existing constituents of the physical environment, provide the situations, events, interventions and observations needed to stimulate a person to learn to know and deal with situations (identification), to socialize with the group, to create artefacts, and to practice and reflect.

Koper, R (2014)

Smart Learning Environments

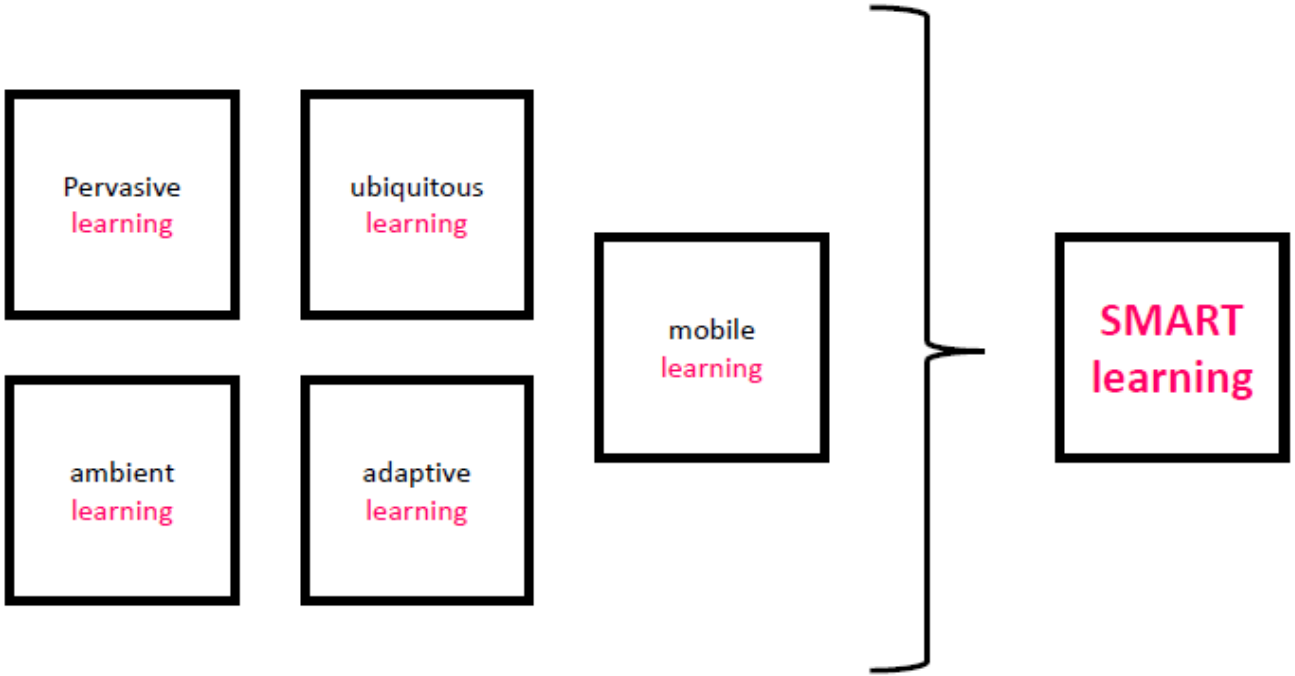
Definition

SLEs can be regarded as technology-supported learning environments that make adaptations and provide appropriate support (e.g., guidance, feedback, hints or tools) in the right places and at the right time based on individual learners' needs, which might be determined via analyzing their learning behaviors, performance and the online and realworld contexts in which they are situated.

Hwang, GJ (2008)

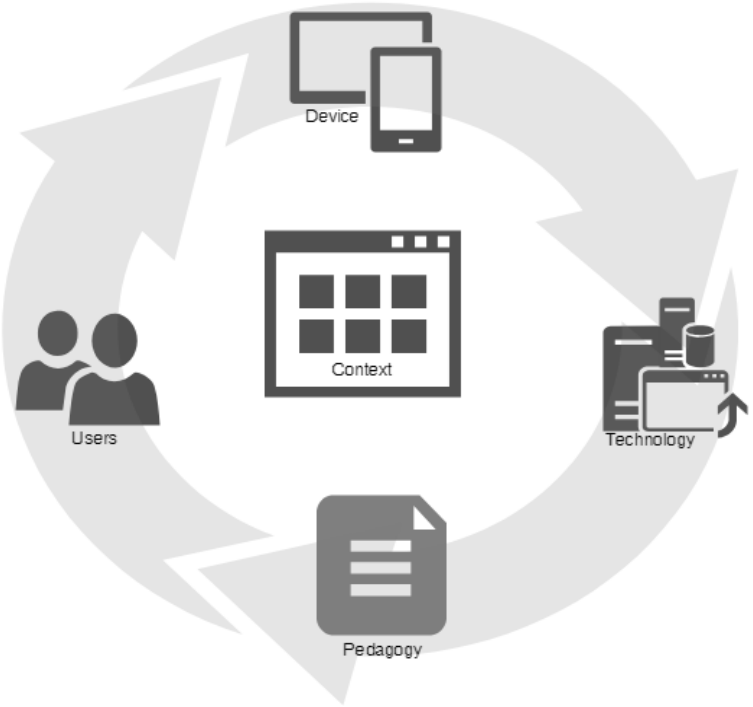
Smart Learning Environments

Learning Technologies



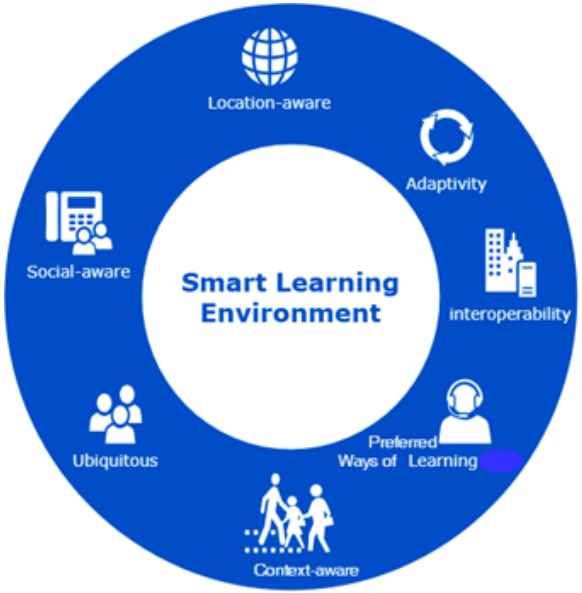
Components of SLE

- *The* ***context*** of the learner, device, technology and learning contents plays a vital role in determining the state that the solution should assume at any instance.
- *The* ***types of devices*** used to engage learning is important, as not all devices have the prerequisite features to enable smart learning. For example, smartphones, tablets and other wearable devices are useful options whereas old generation computer systems such as the mainframe, desktop computers and other premised-based computers do not have the required technology to enable smart learning.
- ***Technology*** needs to address the design architecture, system communication flow, input and output processes and connection and storage facilities of all the technical aspects of the learning environment.
- ***Pedagogy*** is the entire goal of developing an SLE; it includes the anticipated learning theory, strategy, method, outcome and feedback to make the learner aware of the progress made after an instance of learning. Pedagogy, as conceptualised in this study, is connected with the learning theories, since pedagogical principles are basically concerned with the fundamental theories of learning.



Smart Learning Environments

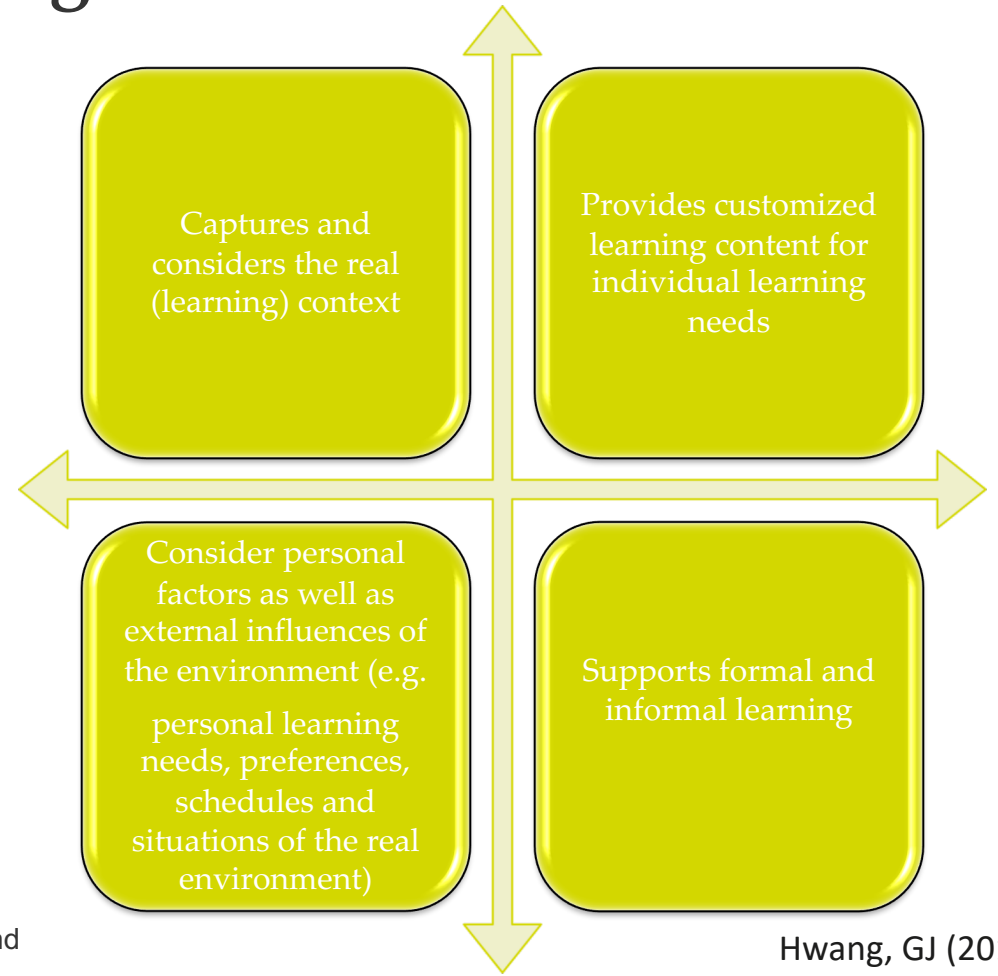
10 key features of SLE



Zhu et al. (2016)

Smart Learning Environments

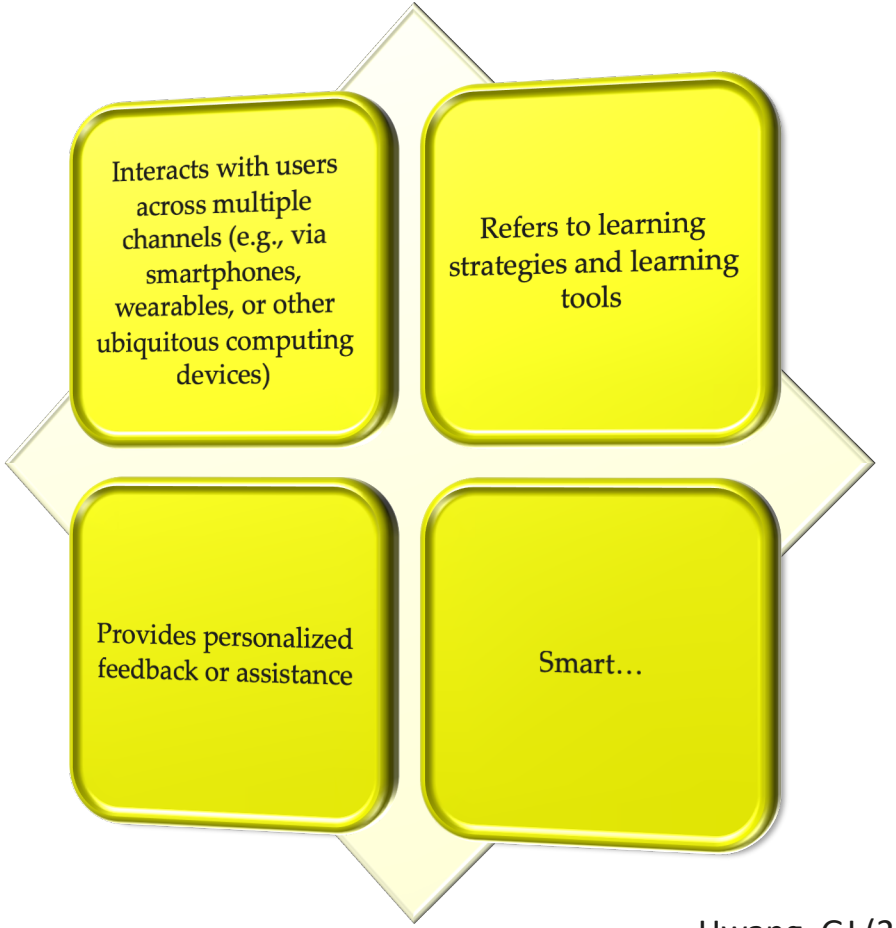
Characteristics



Hwang, GJ (2014)

Smart Learning Environments

Characteristics



Hwang, GJ (2014)

Smart Learning Environments

Aims/Purpose

Support educational aspects such as:

- Collaboration & Exchange
- Reflection and Evaluation (for example, through learning analytics)
- Personalization
- Intrinsic and extrinsic motivation
- Educational innovations
- Self-directed learning in the course of lifelong learning

Smart Learning Environments

Developments

Ubiquitous learning formats generate mixed forms of learning to be located between formal and informal learning settings, between self-organized and social learning, between different learning times and places of learning, and between analogue and digital learning formats.

Such learning scenarios are made possible by using the most modern, mobile, wireless Information technologies, creating a HYBRID interaction between physical and digital learning environments.

The system recognizes the needs of the learner and has an accompanying and advisory role.

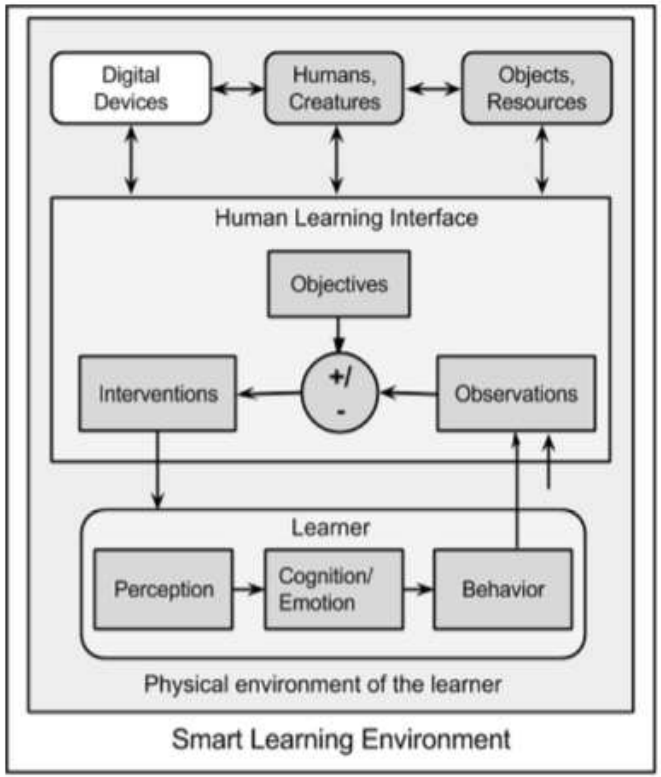
Smart Learning Environments

Summary

When designing an SLE, the environment must

- Provide the right inputs and monitor the outputs
- Stimulate or facilitate learning processes
- Intervention - provides the input for the senses
- Observations - monitor the behavior and physical state of the person, and monitor changes in the physical environment
- Control the learning towards certain learning objectives
- Possible to specify goals and compare the observations with the goal to redirect the interventions

Koper, R. (2014)



Koper, R. (2014)

Smart Learning Environments

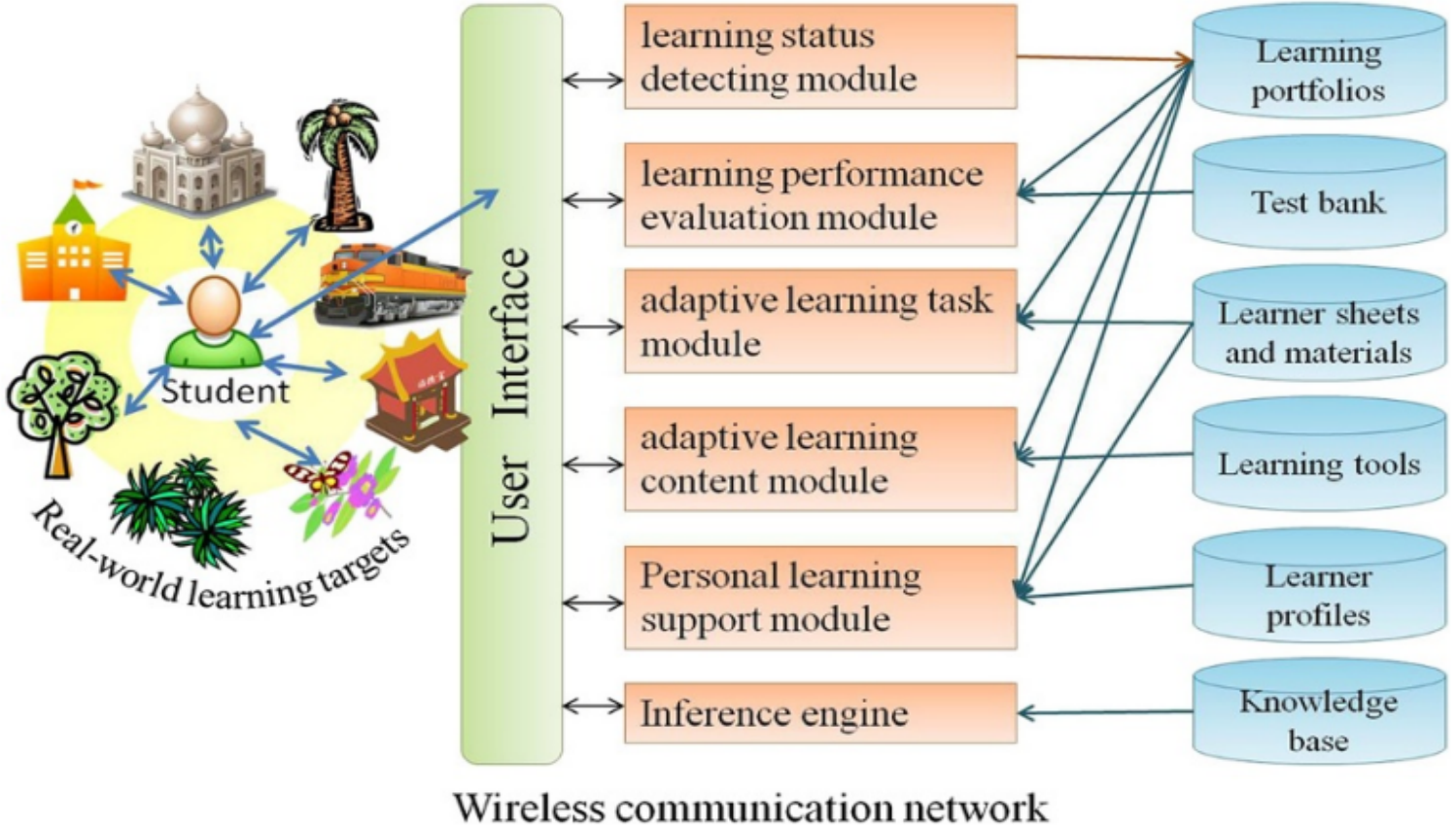
Summary

- Researchers: are striving to merge pedagogy and technology in order to create "smart learning"
- Pedagogy: methods, learning paradigms, assessment paradigms, social factors
- Technology: emerging technologies, innovative uses of mature technologies, adoption, usability, standards, and emerging/new technological paradigms (Blockchain, VR/AR/MR, open educational resources, cloud computing, etc.)
- **Fusion** of pedagogy and technology: transformation of curriculum, transformation of teaching behavior, transformation of administration, best practices of infusion, piloting of new ideas

Design guidelines for SLE (Results from Finland)

The SLE Components	Design Features	Design Guidelines
Context	• Learning environment (location) • Learner's preferences and scenarios	Consider the learner's location at any instance (students can learn computer programming while on a bus, in the lab, in the class, at cafeteria, etc.). For example, a student's response to an interview question in our earlier analysis was thus: 'I like learning in an environment that is not noisy, like in the library or …' Users can specify the learning module and style by quickly responding to a few survey questions. Other learning scenarios are equally important.
Users	• Personalised learning • Adaptive interface • Responsive design to screen resolution	Prominent and common features of the smart learning system among students and teachers, the learning experience should be personalised, and feedback needs to be given to the learner at different stages of learning. The system should have logs for users and to track their performance. The system has to have the ability to adapt to the user's context, which can be determined, specified or implied. Screen resolution should be responsive (adjustable to devices' screen resolution) without losing tabs, menus or features.
Devices	• Mobile devices with smart features and sensors	In conjunction with the results of the study that indicate that the majority of the students and all the teachers own smartphones, it is important to design an SLE that is compatible with devices such as smartphones, tablets, PDAs and wearable devices. The features of these devices allow the acquisition of context/contents of the users through camera, GPS, RFID or speaker.
Technology	• Network Communication • Server • Databases • Web services • Front- and back-end technologies	The Internet, wireless connections and cloud technology are needed to ensure a seamless flow of communication between the system and the users. However, due to limited resources, some students wished to have an offline system to subscribe to the Internet.
Pedagogy	• Learning content • Task scheduling • Performance evaluation • Feedback mechanism • Supporting tips and guide • Motivation to learn more	According to our quantitative results and a student who preferred an SLE with a grading or credit rewarding mechanism to stimulate learning, it would be appealing to learners if quiz-like features were integrated into the design. Learning analytics are required to measure learners' performance, especially in a programming task. For any correct or incorrect attempt, users should receive feedback. In case of an incorrect attempt, detailed analysis should be provided for quick correction. Learning guide, tips and other support tools will be helpful to both novice and amateur computer programmers. The system should also allow for inputting, editing and updating contents.

Framework of a smart learning environment



G.-J. Hwang, "Definition, framework and research issues of smart learning environments - a context-aware ubiquitous learning perspective," Springer Open Journal, 2014.

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- Hwang, G.-J., Tsai, CC., Yang, SJH. (2008). Criteria, strategies and research issues of context-aware ubiquitous learning. Educ. Technol. Society 11(2), 81–91.
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- Koper, R. (2014). Conditions for effective smart learning environments. Smart Learning Environments, 1(1), 1–17.
- Mumford, E. (2006). The story of socio-technical design: Reflections on its successes, failures and potential. Information Systems Journal, 16(4), 317–342.
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- Koper, R. Conditions for effective smart learning environments. Smart Learning Environments, 1:5, 2014.

PART II:

Practical Arrangements

Learning goals

- be aware of different technologies, pedagogy and themes related to the design of smart learning environments
- identify different design contexts, relevant issues, and developing appropriate research paradigm for solving the problems
- using a modeling language such as UML to model different components and scenarios of smart learning environment
- designing appropriate evaluation mechanisms in smart learning environments
- produce a prototype smart learning environment

Course Structure & Timetable

Study Module	Module dateline	Learning activities, due date
1. Smart learning, smart pedagogies, and smart instructional design.	February 10 - February 23	Study activity 1 and 2, February 23
2. Components and features of a smart learning environment.	February 24 – March 1	Study activity 3, March 1
3. Technologies, AI and design of smart learning environment.	March 2 - March 8	Study activity 4, March 8
4. Contextual design of smart learning environment & reflection.	March 8 - March 22	Study activity 5 and 6, March 22

Course mode: Online and Moodle

- **One Contact** teaching session
  – Kick-off lecture
- Each study module includes learning materials and learning activities, which are available **online** in the UEF **Moodle**
  – Moodle enrollment key is **DSLE-2020**
  – Learning activities will be submitted to Moodle

What you need to do during the course?

- Each study module includes at least one mandatory learning activity

- The course is completed via learning activities (individual, group) in Moodle

- The activities are submitted at the end of the study module

- The main task in the course is group work

– Teams of 3-5 students

– Be prepared to work with people you do not know and could be in different time zone

How to pass the course?

- Requirements for course completion

1. All learning activities have been **successfully completed** and **accepted** by the course instructor
2. Student has collected **at least 50** learning activity points from learning activities.
3. The course instructor has accepted the **prototype smart learning environment**.

- The overall sum of learning activity points in the course is **100**
  - Study Module 1: 25 learning activity points
  - Study Module 2: 20 learning activity points
  - Study Module 3: 20 learning activity points
  - Study Module 4: 35 learning activity points
- There is **no** course exam!

Grading and Grading Scheme

- Each **submitted** learning activity will be graded

– Learning activities are evaluated based on the quality of the solution.

Overall learning activity points	Grade
< 50	0 (=Fail)
50 – 59	1
60 – 69	2
70 – 79	3
80 – 89	4
> 90	5

Late submission of learning activities and plagiarism analysis

- If a learning activity is submitted after the due date, the following formula is used to deduct points
  – submission done **within one day** after the due date: -10%
  – submission done more than one day, but **less than five days** after the due date: -20%
  – submission done later than **one week** after the due date: -30%
  – submission done later than **two weeks** after the due date: no points
- Some of the learning activities will be submitted to the **TurnITin** system for plagiarism check by the teacher, against
  – Automatic detection of copied text from internet sources

Thank you!
Questions & Comments

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