

Personalization of Learning

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East Carolina University

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Project goals

- ▶ Transform **programming-centric** computer science education approach to a **systems-oriented and software engineering-centric** one.
- ▶ Infuse **professional skills** development process into the entire curriculum.
- ▶ Dramatically increase **retention and graduation rates**.
- ▶ Recruit significantly more students from **underrepresented groups**.
- ▶ **Personalize teaching and learning** in both formal and informal settings.
- ▶ Establish pipelines with middle schools, high schools, early college high schools, and community colleges to **bring awareness of computing and computing careers**.

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ECU RED Project team


- ▶ Dr. Maral Azizi, Senior Investigator
- ▶ Dr. Qin Ding, Co-PI, Education Researcher
- ▶ Dr. Venkat Gudivada, PI
- ▶ Dr. Nic Herndon, Co-PI, Project Manager
- ▶ Dr. Mark Hills, Co-PI, Education Researcher
- ▶ Dr. Brian Hutchins, External Evaluator
- ▶ Dr. Marjorie Ringler, Co-PI, Social Scientist
- ▶ Dr. Kamran Sartipi, Senior Investigator
- ▶ Joel Sweatte, Senior Investigator
- ▶ Dr. Nasseh Tabrizi, Senior Investigator
- ▶ Dr. Rui Wu, Senior Investigator


National Academy of Engineering – Grand Challenges for Engineering





8.5 B
by 2030


- 


Restore and Improve Urban Infrastructure
- 


Carbon Sequestration
- 


Prevent Nuclear Terror
- 


Advanced Health Informatics
- 


Provide Energy from Fusion
- 


Reverse Engineer the Brain
- 


Enhance Virtual Reality
- 

Provide Access to Clean Water
- 

Engineer the Tools of Scientific Discovery
- 

Advance Personalized Learning
- 

Engineer Better
- 

Make Solar Energy
- 

Manage Nitrogen Cycle

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Why personalize learning?

Audience feedback (a 5-minute individual/team activity).

Why personalize learning?

- ▶ It is a means to address diversity in learning.
- ▶ Availability of enabling technologies.

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- ▶ Beginning of a journey towards creating a level playing field and removing educational inequalities.

What is personalization of learning?

Audience feedback (a 5-minute individual/team activity).

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Current approaches to personalization of learning (1)

- ▶ Drastically varying views: increased student engagement in the classroom, blended classrooms, flipped classrooms, collaborative learning/interaction in the classroom, . . .
- ▶ Current **one-size-fits-all** approach to education is highly *scalable*, but not necessarily effective for all students.

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- ▶ Existing approaches are **not scalable and are very expensive**
 - Orlando, Florida area private schools, offer one-on-one time with teachers.

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- ▶ MOOCs experiments

Current approaches to personalization of learning (2)

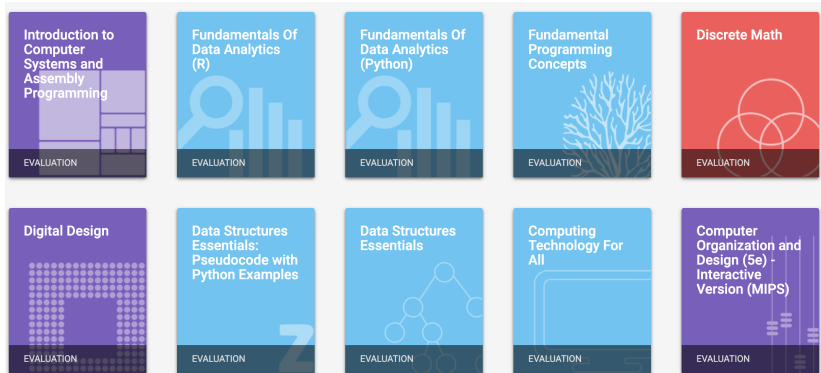


Figure 2: zyBooks

Current approaches to personalization of learning (3)

The screenshot shows the McGraw-Hill Connect interface for the course SENG 5005 - Discrete Structures and Algorithmic Foundations, Fall 2019. The top navigation bar includes a home icon, 'Library', 'Performance', and 'My courses'. The main content area is divided into 'Messages' (no assignments to grade) and 'Assignments' (with an 'Add Assignment' button). A table lists three assignments: 'Assignment 01: Propositional Logic', 'Assignment 02: Predicate Logic', and 'Assignment 03: Nested Quantifiers', each with a due date and visibility icon. A right-hand sidebar shows 'Section info' for instructor Venkat Gudivada and an 'eBook' titled 'Discrete Math and Its Applications (SmartBook)' by Kenneth Rosen.

connect SENG 5005 - Discrete Structures and Algorithmic Foundations
2019 Fall MW 17:00 - 18:40

Library Performance « My courses

section overview Instructor view Student view

Messages no assignments to grade

Assignments + Add Assignment

Title	Shared	Info	Start-due	Show/hide
Assignment 01: Propositional Logic		08/28/19-09/01/19		
Assignment 02: Predicate Logic		08/29/19-09/04/19		
Assignment 03: Nested Quantifiers		08/30/19-09/08/19		

Section info

Instructor **VENKAT GUDIVADA**
Add your photo, email address, office hours

Sections and colleagues

eBook
Discrete Math and Its Applications (SmartBook)
Kenneth Rosen, 8e
Rosen, 8e, Discrete Math (eBook)

Figure 3: McGraw-Hill Connect system

ISPeL approach to personalization (1)

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- ▶ Inclusive pedagogy

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- ▶ Retrieval practice

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- ▶ User modeling

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- ▶ Ontology-driven

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- ▶ Automated question generation
- ▶ Automated question answering via chatbots
- ▶ Pre-tests, post-tests, and practice questions

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Why personalize learning?

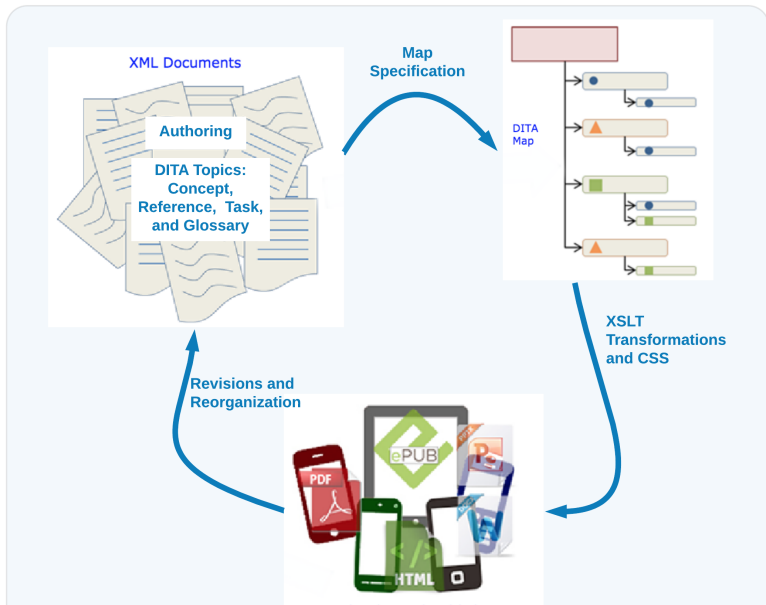
Approaches to personalization of learning

ISPeL design

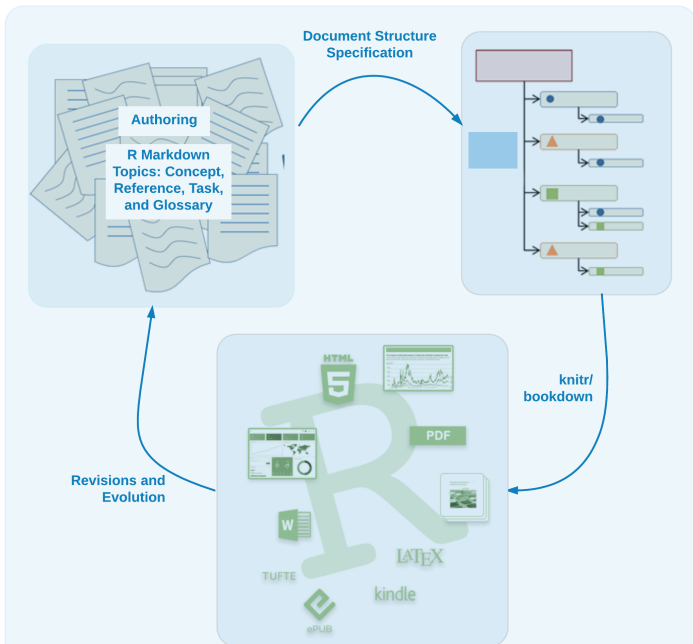
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ISPeL design – version 1



ISPeL design – version 2



ISPeL design – version 3

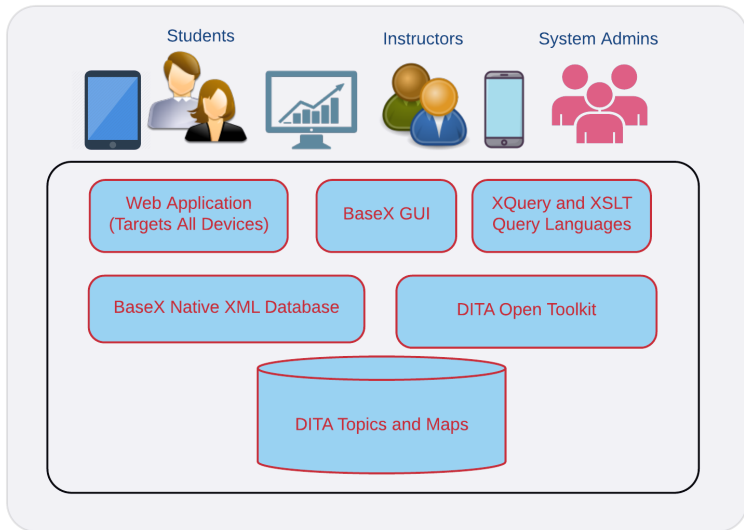
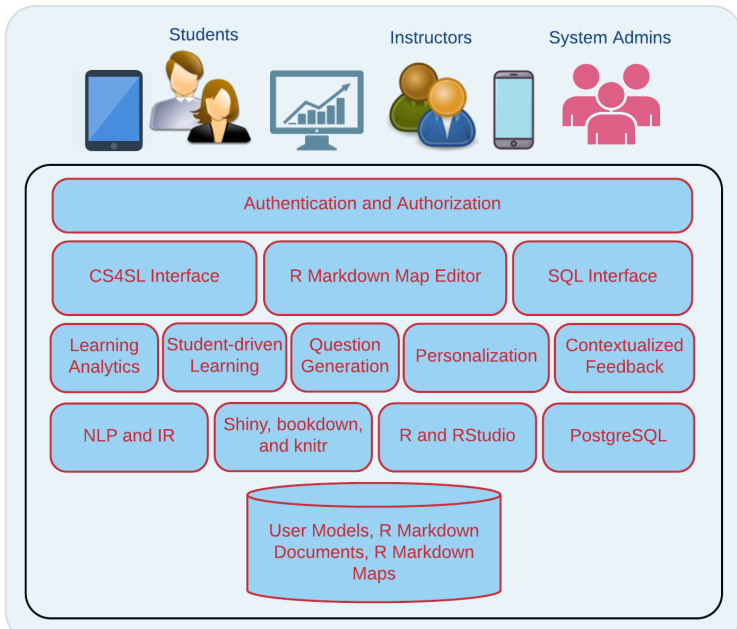


Figure 6: ADCyL delivery system

ISPeL design – version 4



JupyterLab as a Data Science platform

- ▶ JupyterLab as a platform for reproducible research
- ▶ JupyterLab as a medium for interactive and exploratory learning

JupyterLab as a Data Science platform

- ▶ JupyterLab as a platform for reproducible research
- ▶ JupyterLab as a medium for interactive and exploratory learning
- ▶ **Plotly.js** (an open source JavaScript library) for creating graphs and dashboards

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Figure 8: JupyterLab demo

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- ▶ Interactive System for Personalized Learning (ISPeL)

Questions?



Figure 9: Questions?