In-Video Tutors, Q&A Agents, and Intelligent Textbooks for Online Learning at Scale

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In-Video Tutors and Q&A Agents

Statement of the Problem

While students find that learning with videos is valuable and enjoyable, a lack of interactivity while watching videos has become a barrier to their learning. They wish for opportunities to interact with instructors and peers, such as asking questions and getting feedback in real time (Ou & Goetzel, 2019).

Making Videos Interactive: Strategies

- **In-Video Questions:** Embed quiz questions within videos to enable students to interact with content (e.g., Kaltura).
- **In-Video Discussions**: Allow students to ask questions at specific moments of a video and respond to each other's questions (e.g., Annoto, Perusall).

Making Videos Interactive: Challenges

- Quiz question types are very limited and feedback is pre-defined and often time-consuming for instructors to develop.
- Instructors may find it challenging to monitor and facilitate in-video discussions, especially in large classes.
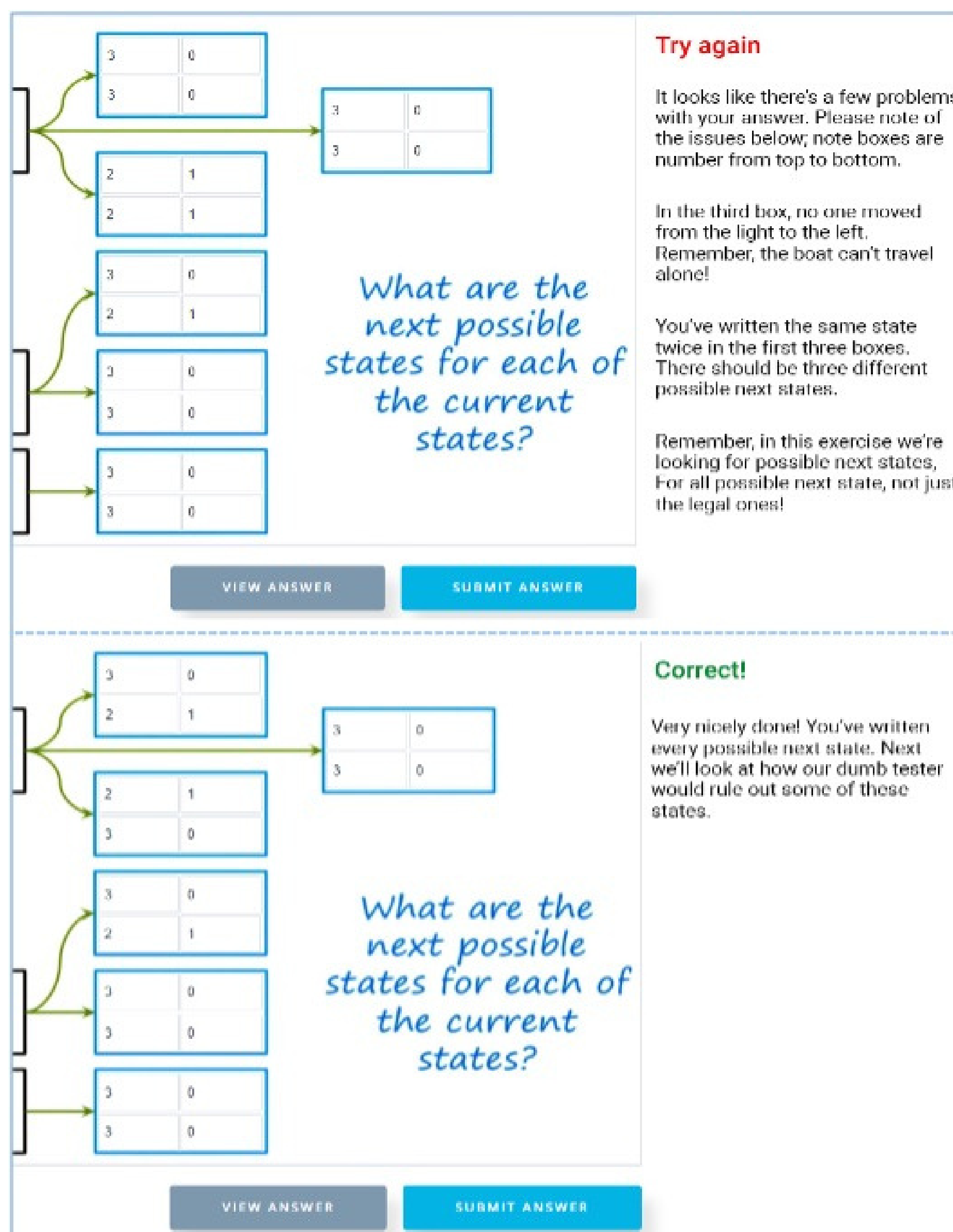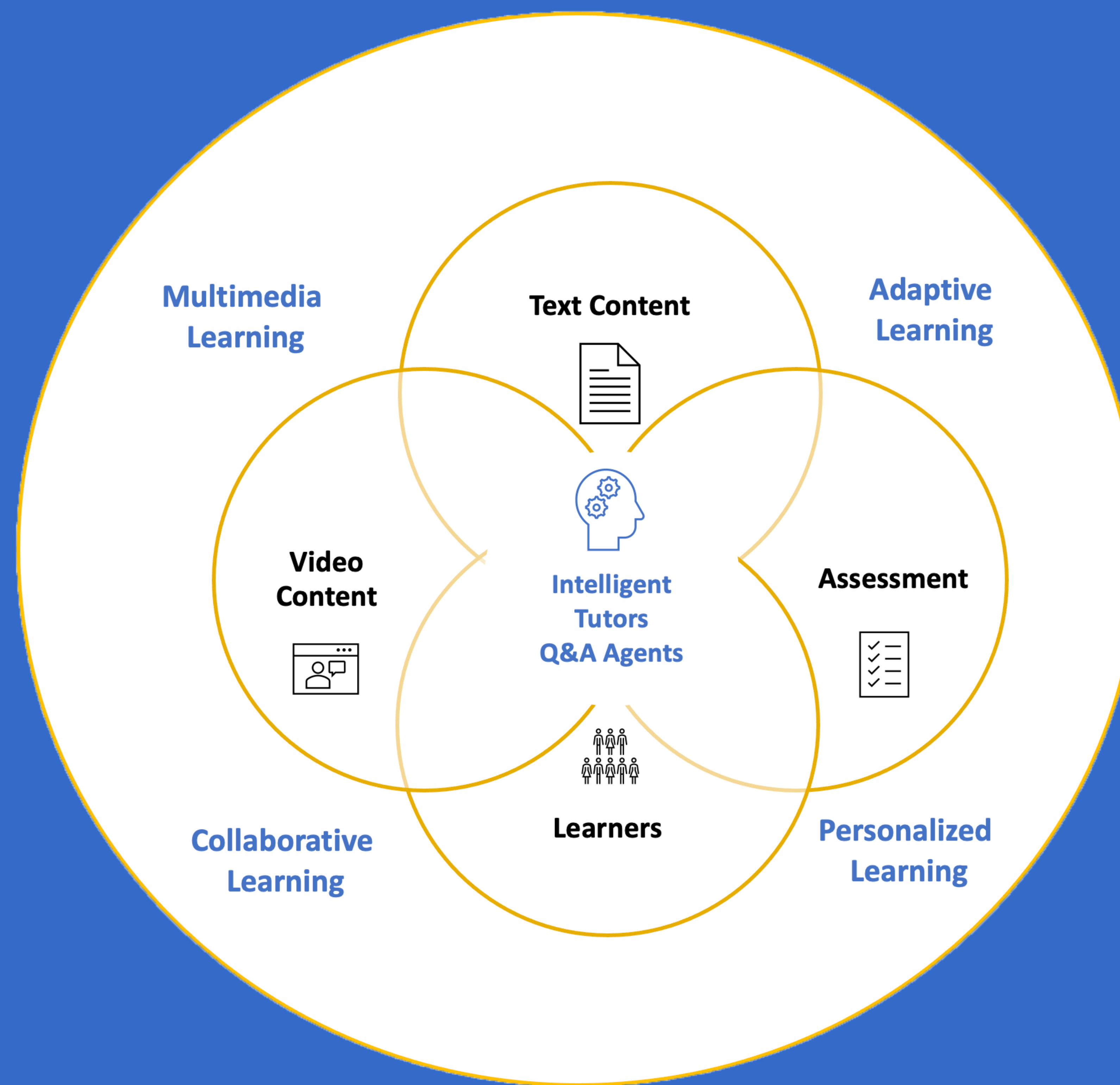
What We Have Done: KBAI In-Video Tutors

Figure 1: *An example of in-video tutors from CS-7637 Knowledge-Based Artificial Intelligence (KBAI) offered at Georgia Tech (Goel & Joyner, 2017; Ou, Joyner, and Goel, 2019)*

What We Have Done: Q&A Agents

- **Jill Watson** is a Q&A agent that answers questions related to course syllabus and schedule.
- **AskJill,** evolved from Jill Watson, is an artificial intelligence explanation agent that can answer questions about the domain, operation, and functionality of other AI systems (Goel, Nandan, Gregori, An, & Rugaber, 2022)

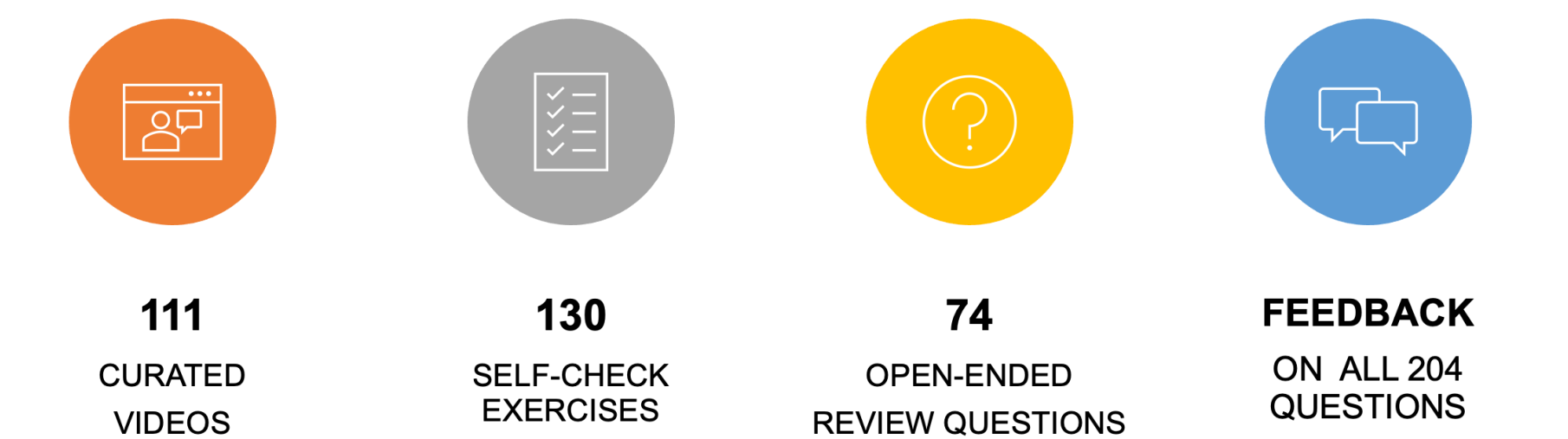## Intelligent Textbooks

Statement of the Problem

Open online textbooks have made education more affordable. While students like free textbooks, they do not like reading a static and text-heavy online textbook. They wish for online textbooks that have (Ou & Urmanbetava, 2020):

- better content presentation
- more visuals
- more practices with feedback
- more interactivity

What We Have Done:
ECON-2105 Online Textbook Transformation

- Transform content presentation with six multimedia learning principles (see Figure 2).
- Integrate active learning by providing frequent self-assessment exercises with feedback on both correct and incorrect answer choices of the exercises.

111 CURATED VIDEOS	**130** SELF-CHECK EXERCISES	**74** OPEN-ENDED REVIEW QUESTIONS	**FEEDBACK** ON ALL 204 QUESTIONS

Multimedia Principle	Use both words and pictures to present content
Coherence Principle	Avoid using extraneous visuals
Spatial Contiguity Principle	Place words near corresponding graphics
Segmenting Principle	Break a continuous lesson into bite-size segments
Signaling Principle	Highlight main ideas and organizations of the material.
Pre-Training Principle	Ensure that learners know the names and characteristics of key concepts

Figure 2: *Multimedia learning principles for content presentation of online textbook (Ou & Urmanbetava, 2020)*

What We Envision

- **In-video tutors** will provide personalized feedback on a variety of quiz questions embedded within videos.
- **Q&A agents** will generate question prompts for discussions on the video and respond to students' questions.
- **Interactive textbooks will become intelligent textbooks** where intelligent tutors and Q&A agents will engage students and enrich their learning experiences by integrating multimedia learning, adaptive learning, personalized learning, and collaborative learning.

References

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Multimedia Learning — Text Content — Adaptive Learning
Video Content — Intelligent Tutors Q&A Agents — Assessment
Collaborative Learning — Learners — Personalized Learning

Georgia Tech.

AI-ALOE National AI Institute for Adult Learning & Online Education