

1

User-Defined Environment

Sector

Object

Arena

Item



2

CIE-based Agent Modeling



Behavior: Questioning
Emotion: Encouragement
Content: How Mr. Zhu vividly portrayed the beauty of spring through delicate descriptions?
Feedback: Liu Li, great improvement—keep up your active participation.



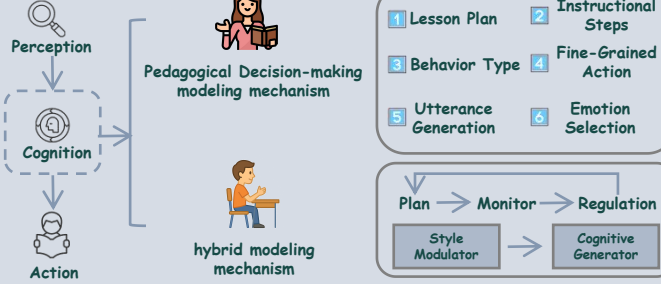
Age: 13
Gender: Female
Personality: High Neuroticism
Class Role: Academic Student
Learning Motivation: High
Class Behavior: Often hesitant but gradually contributes well-structured summaries and personal reflections during class.
Cognitive Style: Field-dependent
Thinking Tendency: Reflective

Metacognition Theory

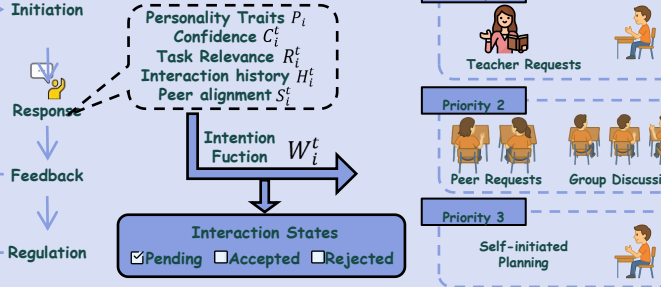
Teacher-led Classroom Discourse IRF Model

Learning Engagement

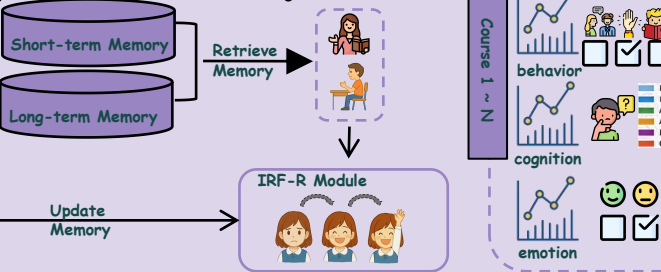
a Cognition Engine



b Interaction Core

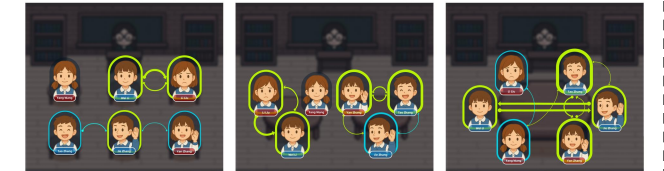
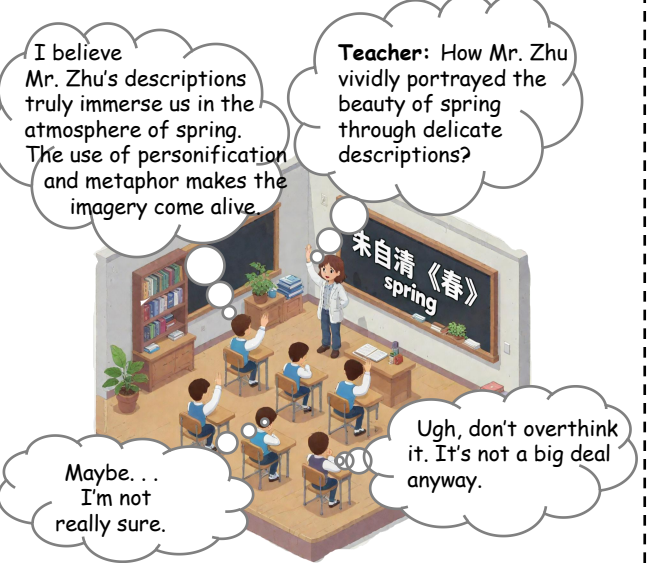


c Evolution Layer



3

Interaction and Evolution Experiments



Experiment I: Cognition-Driven Instructional Alignment



Experiment II: Group Interaction Analysis and Role Differentiation



Experiment III: Cross-Session Evolution and Long-term Development