Team Models in the Generalized Intelligent Framework for Tutoring: 2018 Update

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GIFTSymposium 6

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The Nation's Premier Laboratory for Land Forces

Team Modeling Update

- The Generalized Intelligent Framework for Tutoring (GIFT) has been in active development for individual learners

- An ultimate goal of GIFT is to be able to train multiple individuals or a Squad as part of a team tutor.

- Effort has begun to scale GIFT to be able to engage in team tutoring.

- Theoretical Background

- Applications of Team Tutoring in GIFT

- Workshops and Output

- Future Directions and Research Gaps

Theoretical Background

- Meta-Analysis

  - Identified specific constructs that we need to be aware of when developing team tutoring tools/methods in GIFT

  - 300 articles that met criteria

- Searched for articles with keywords paired with team/unit/group/squad or crew that included:

  - performance, competency, trust, cognition, affect, communication, intelligent tutoring, virtual human, mood, skill, knowledge, ability…

- Divided into 4 areas:

  - Team Performance

  - Team Learning

  - Team Satisfaction

  - Team Viability

From Sottilare, R.A., Burke, C.S., Salas, E., Sinatra, A.M., Johnston, J.H., & Gilbert, S.B. (2017). Designing adaptive instruction for teams: A Meta-Analysis. International Journal of Artificial Intelligence in Education.

Theoretical Background

- Behavioral Markers
  - Examples:
    - Trust Marker: "Frequency which team members remind each other to follow through on their tasks (reverse coded)"
    - Task Cohesion Marker: "Members are actively working together and pitch in to reach team goals"
    - Team Communication Markers: "Team member communication is concise", "Team member communication is timely"
    - Team Collective Efficacy Marker: "Team members expressed confidence that they could efficiently resolve conflicts regarding which tasks to prioritize and complete the task and begin working toward this goal"

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- Future work:

  - Operationalizing the behavioral markers so they can be assessed in real-time during an ITS

  - Removing the human coder from the requirement

  - Implementing approaches so that authors can select the markers that they want to measure, and how they want to assess them
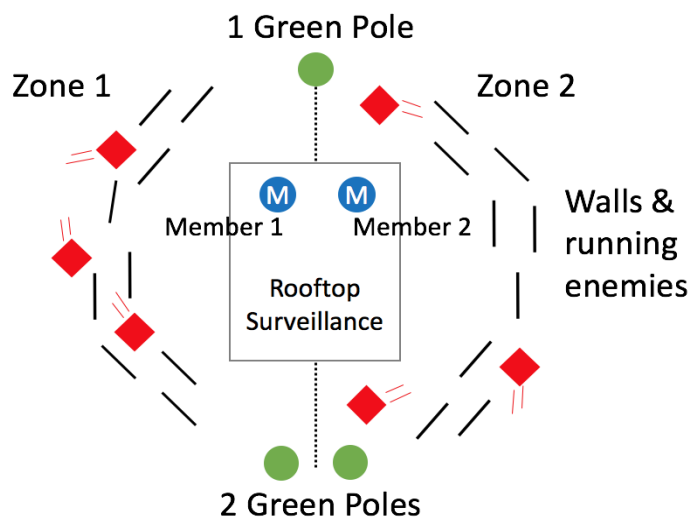
- Surveillance Tutor
  - Work with Iowa State University
- Demonstrated assessing and tutoring both two and three player teams
- Challenges:
  - GIFT tracking, assessing, and providing feedback to both individuals and teams
  - Communication between computers; synchronizing the scenario
  - Extracting team data in a meaningful way

• Surveillance Tutor

Study 1: 2 learners (spotters)
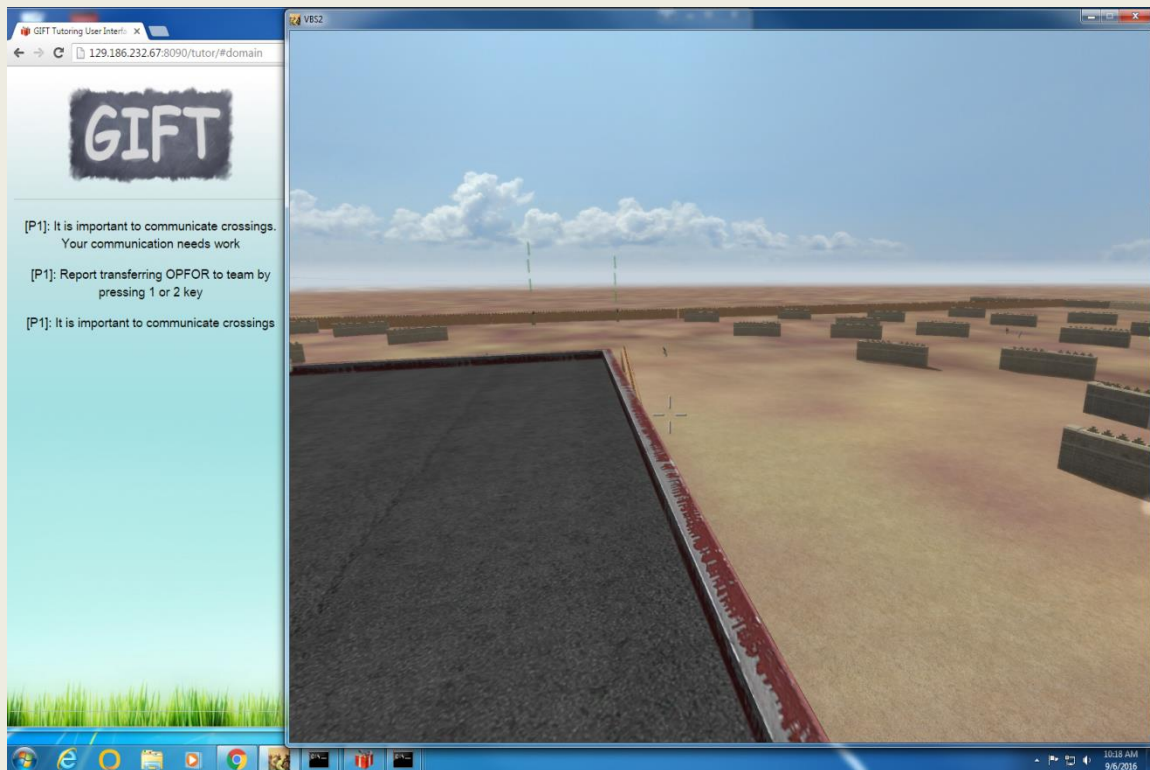Study 2: 3 learners (2 spotters, 1 sniper)

1 Green Pole

Zone 1   Zone 2

M M
Member 1   Member 2

Walls & running enemies

Rooftop Surveillance

2 Green Poles

Assessments for spotters:

Identify (Individual)
Transfer (Individual)
Acknowledge (Individual)
Transfer-Acknowledge (Team)

[P1]: It is important to communicate crossings. Your communication needs work

[P1]: Report transferring OPFOR to team by pressing 1 or 2 key

[P1]: It is important to communicate crossings

Study 1:

- 2 spotters
  - 3 DKFs
    - one overall team DKF
    - two individual spotter DKFs which are duplicates

Study 2:

- 2 spotters and 1 sniper
  - 4 DKFs
    - one overall team DKF
    - two individual spotter DKFs which are duplicates
    - one individual sniper DKF

Examples of Evaluations for Surveillance Tutor

Individual Transfer Task:

Transfer Action Assessment	Transfer Performance State Assessment	Individual Feedback to Members
Above-Expectation: N/A (task was binary)	Above-Expectation: Transfer occurred when OPFOR is at zone boundary	Good alerts about crossings.
At-Expectation: Transfer is announced for a crossing OPFOR.	At-Expectation: Transfer occurred shortly before OPFOR arrives at zone boundary	It is important to communicate crossings.
Below-Expectation: Transfer is not announced for a crossing OPFOR.	Below-Expectation: OPFOR passes into other team member's zone without a transfer occurring.	1st: Make sure your partner always knows when an OPFOR is about to cross. 2nd+: It is important report crossing OPFOR.

Team Transfer-Acknowledge Task:

Transfer-Acknowledge Team Action Assessment	Transfer-Acknowledge Team Performance State Assessment	Team Feedback to All Members
Above-Expectation: N/A (task was binary)	Above-Expectation: acknowledge time – transfer time <= 1 second	Successful handoffs!
At-Expectation: For the last transfer from either member, there was an acknowledge from the other member.	At-Expectation: acknowledge time – transfer time <= 2 seconds and > 1 second	It is important to alert each other about crossings and acknowledge them.
Below-Expectation: For the last transfer, there was no acknowledge.	Below-Expectation: acknowledge time – transfer time > 2 seconds	1st: Your team communication needs to improve. 2nd: Team, please keep up the communication. 3rd+: Work on communication.

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Applications: Search and Rescue Tutor

- Search and Rescue Tutor
  - Work with Aptima
- Demonstrate assessment and after action review for a nine-person team (Squad)
- Challenges:
  - GIFT tracking, assessing, and providing feedback for a team of nine
  - Communication between computers; synchronizing the scenario
  - Operationalizing behavioral markers
 - Creating a military-relevant scenario with appropriate measures

- Search and Rescue Scenario in Virtual Battlespace 3
- Initially, assessment and after action review at the team level
  - One Team DKF
- Additional information during presentation titled "Scenarios for Training Teamwork Skills in Virtual Environments with GIFT"
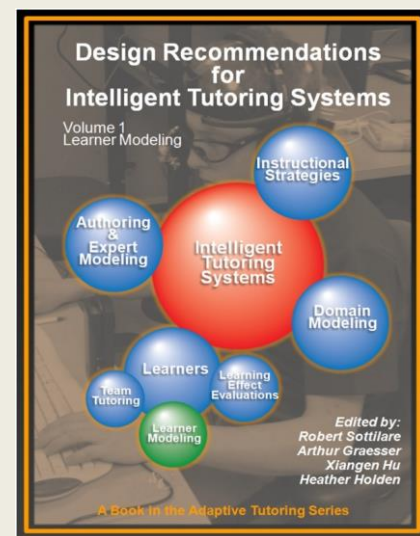
- Building Intelligent Tutoring Systems for Teams: What Matters

  - March 2016, Orlando, FL

  - Output: Book Titled "Building Intelligent Tutoring Systems for Teams: What Matters (Volume 19)"

    - Expected Publication: September 20th, 2018

Workshops and Output
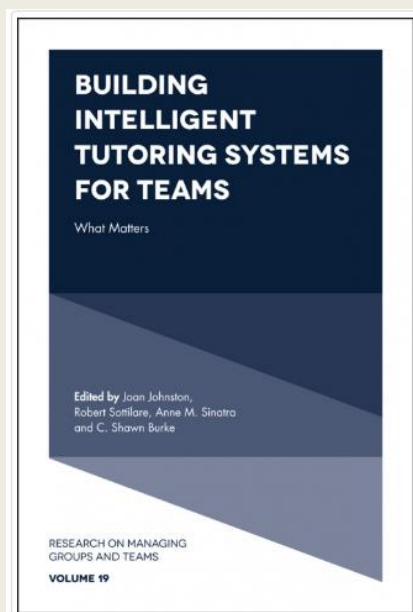
- Team Modeling and Team Taskwork Expert Workshop
  - June 2017
  - Held at the Iowa State University campus
  - Focus was on Team Taskwork, with presentations in many different domains and topic areas
  - Output: Book in the "Design Recommendations in Intelligent Tutoring Systems" series (Vol. 6)
    - Expected Publication: Summer 2018

Design Recommendations for Intelligent Tutoring Systems

Volume 1
Learner Modeling

Edited by:
Robert Sottilare
Arthur Graesser
Xiangen Hu
Heather Holden

A Book in the Adaptive Tutoring Series

Workshops and Output

- Assessment and Intervention during Team Tutoring Workshop
  - AIED 2018 Conference Workshop (London Festival of Learning)
  - June 30th, 2018 in London, UK
  - Papers on:
    - Team Tasks
    - Team Communications
    - Considerations for Team Tutoring
    - Theoretical Implications
  - Intended Output: Online Workshop Proceedings
    - Expected Publication: June 2018

Conclusions and Recommendations

- Progress is being made with Team Tutoring in GIFT
- There are still many research gaps and challenges
  - Team Tutor authoring
  - Real-time communication and content analysis
  - Operationalizing behavioral markers; generalized strategies

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Acknowledgements

References

Gilbert, S.B., Slavina, A., Dorneich, M., Sinatra, A.M., Bonner, D., Johnston, J., Holub, J., MacAllister, A. & Winer, E. (2017). Creating a team tutor using GIFT. Journal of Artificial Intelligence in Education.

McCormack, R., Kilcullen, T., Sinatra, A.M., Brown, T., & Beaubian, J. (in press). Scenarios for Training Teamwork Skills in Virtual Environments with GIFT. In Proceedings of the 6th Annual Generalized Intelligent Framework for Tutoring (GIFT) Users Symposium (GIFTSym6).

Sottilare, R.A., Burke, C.S., Salas, E., Sinatra, A.M., Johnston, J.H., & Gilbert, S.B. (2017). Designing adaptive instruction for teams: A Meta-Analysis. International Journal of Artificial Intelligence in Education.
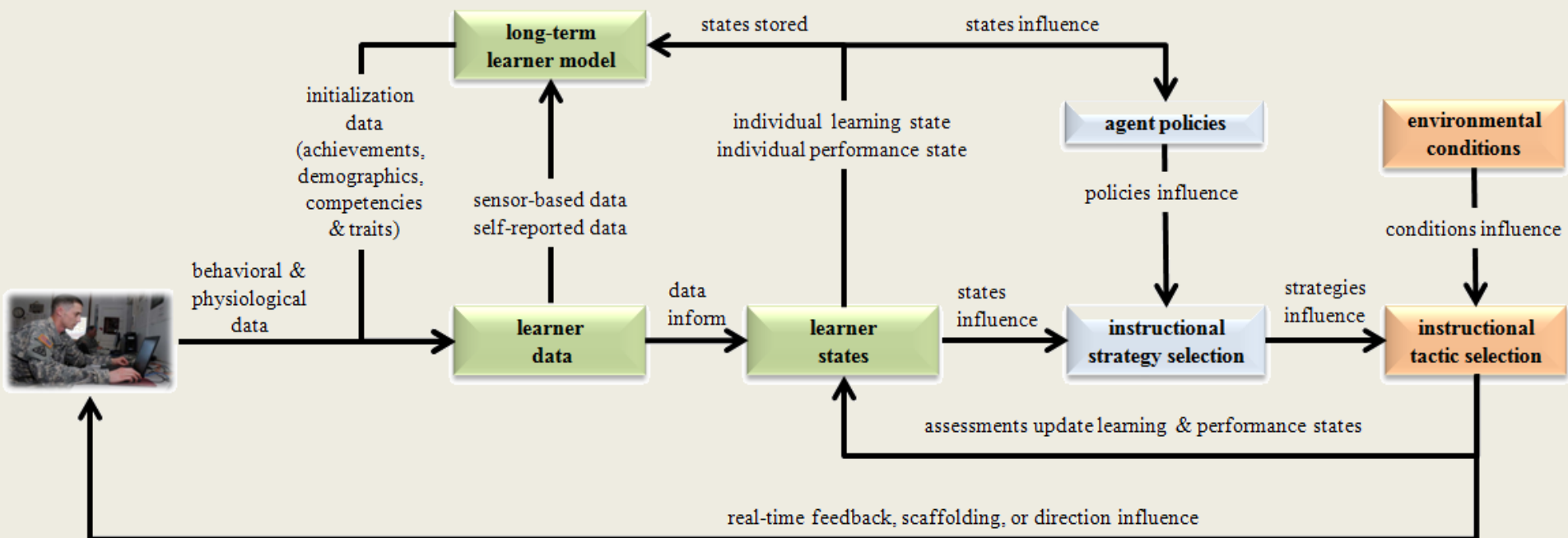
Questions?

Back Up Slides

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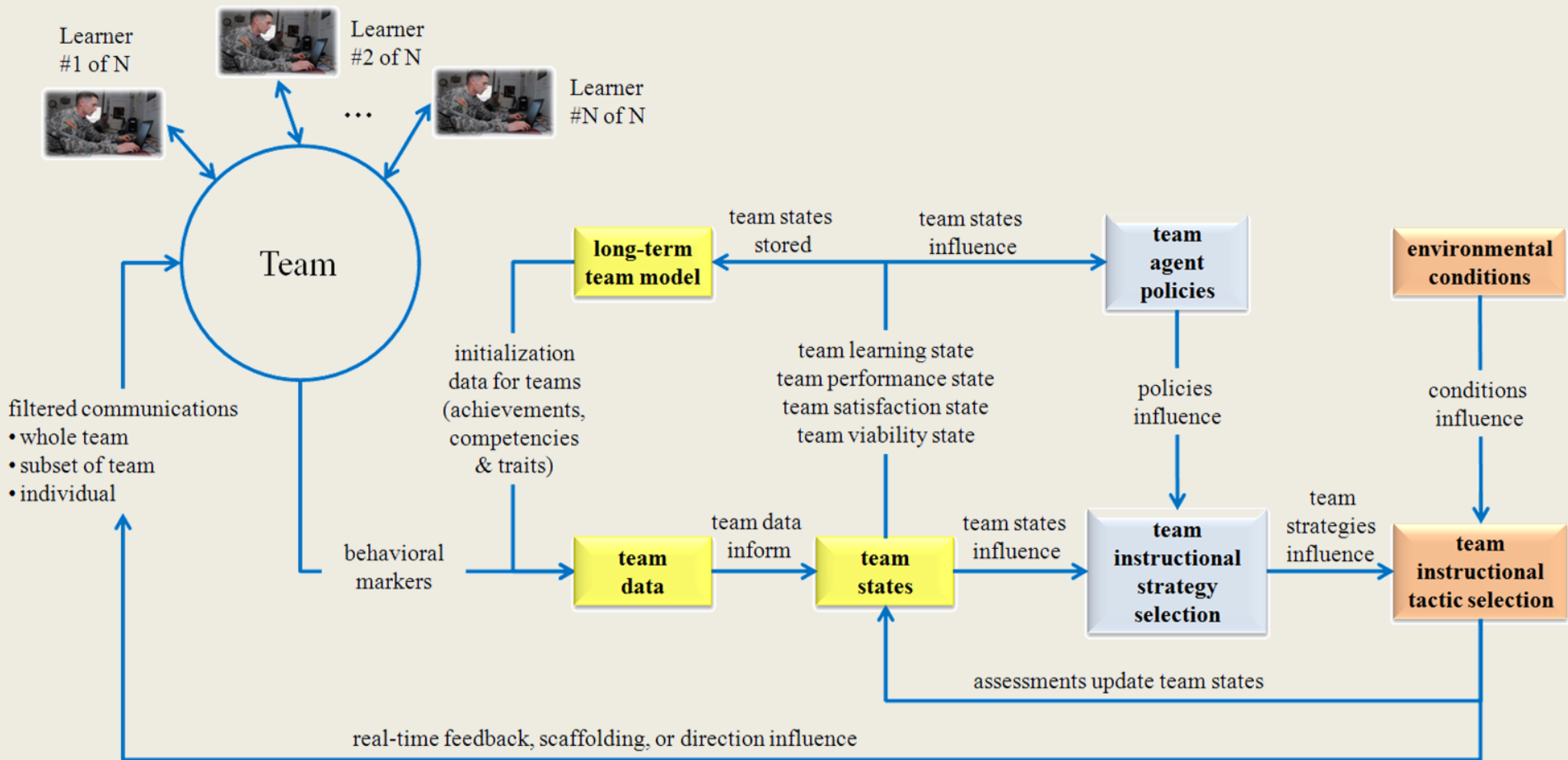
Learning Effect Model for Individuals

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