

**Long-term
game-based
learning for
communicative
proficiency**

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aleloTM



Alelo's mission: developing technology-based learning solutions that produce effective communicators worldwide across languages and cultures

We deliver learning systems that transition advanced learning technologies into practice

We draw lessons from practice to inform learning technology research

A Spectrum of Learning Products

alelo[™]

Tactical Iraqi (ADF, UKMOD, USMC, US Army)

Tactical Pashto (ADF, UKMOD, USMC, US Army)

Tactical Dari (US Army, ADF)

Tactical French

Mission to Iraq

Dynamic English (w/ Voice of America, in progress)

Wele Web-Based Cultural Trainers for Horn of Africa (JFCOM)

Encounters: Global Chinese Language and Culture (w/ Yale University and CIPG)

ALTS Mission Rehearsal System (w/ Bohemia Interactive & Total Immersion Software)

Tactical Bahasa Indonesia (in progress)

Rez World (Cherokee pilot, w/ Thornton Media)

Tactical[™]
LANGUAGE
& CULTURE
Training System



alelo[™]
TECHNOLOGY
3 October 2008

Example: Beijing Report on Encounters



[Click here](#)

A true lifelong learning companion would interact with learners over a period of $\sim 2.5 \times 10^9$ seconds

We need to understand the dynamics of interaction across time scales from seconds to gigaseconds

Learners are now learning with Alelo systems for $\sim 10^7$ seconds

- We are beginning to observe large-scale dynamics that will be important for ILLCs

A Two-Loop Interaction Model

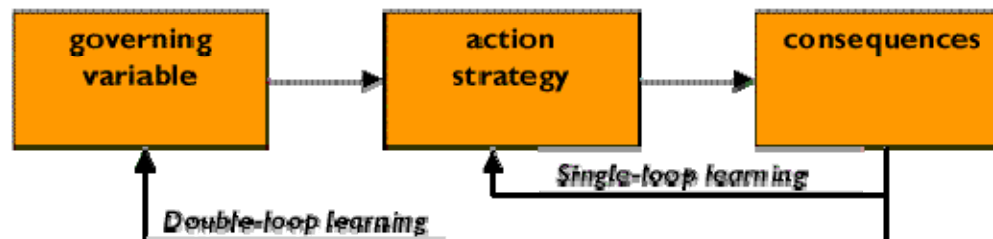


We can identify at least two loops of interaction at different time scales

VanLehn proposed a two-loop interaction model for ITSs

- Not a good fit for our learning environments and learning problems

Instead our work is inspired by the Argyris/Schön (1978) two-loop model



We embed learning opportunities in the learning environment

- E.g.: Jiang Ling / Zhang Ling confusion
- Schön: move-testing experiments, virtual worlds

We removed the virtual tutor from the game environment to avoid interfering with the learner's interaction with the environment

We use a virtual tutor:

- When the environment provides insufficient feedback
- To promote reflection
- To offer guidance of what to do next
- Contrast with Schön's reflection-in-action

Tutor Feedback in Tactical Iraqi™ (Wang)

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The image displays four screenshots from the game **Tactical Iraqi™**, illustrating the integration of a language tutor.

- Top Left:** A screenshot of the game's main menu overlaid on a scene of soldiers. The menu includes buttons for **SKILL BUILDER**, **ARCADE GAME**, **MISSION GAME**, **ABOUT**, **PROGRESS**, and **QUIT**.
- Top Right:** A screenshot of the **Skill Builder** interface titled "Say and reply to hello". It provides instructions for listening and recording phrases. The phrases shown are:
 - as-salaamu 9aleykum. (Hello (Lit: Peace be upon you.))
 - wa 9aleykum is-salaam. (Hello to you as well (Lit: And upon you be peace.))
 The interface also includes a **Feedback** section and navigation buttons like **Menu**, **Pronunciation Help**, **Restart Mic**, **Prev**, and **Next**.
- Bottom Left:** A 3D mission scene showing a soldier in a desert environment. A red arrow points to a man in a blue shirt. A small icon in the top left corner indicates "recognizing" with a red 'R'.
- Bottom Right:** A 3D mission scene showing a soldier in a stone-walled area. A feedback message at the bottom reads: "Direction followed correctly: Points +100" and "ruuH li-giddaam". The bottom status bar shows controls for Pause, Help, Hint, Trans., Closer, Glasses, Hat, Run, and Crouch, along with a score of 300.

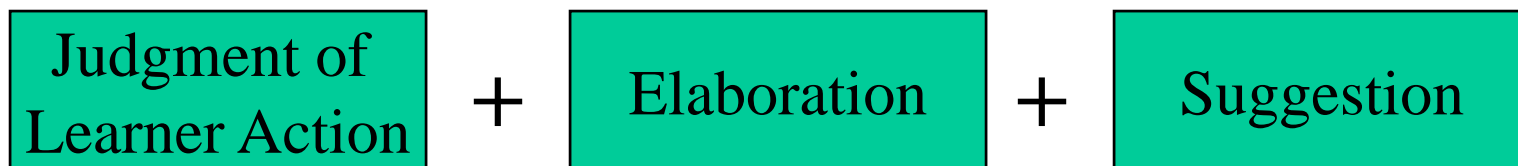
Vocabulary Page

Example: Your pronunciation is incorrect. It sounds like you said ‘as-salaamu 9aleykum (Hello)’. Try again.



Utterance Formation Page

Example: Incorrect. ‘li sh-sharaf’ is used to formally accept an invitation, and not to respond to a new acquaintance. Try again.



Feedback from Agent



Skill Builder *Say and reply to hello* QUIT

Listen to each word or phrase, practice it and record it.

Note: "9" represents a special Arabic sound that we do not have in English. For more explanations and examples, use Pronunciation Help.

Formal greetings can be used to start a conversation at any time in any situation. Here is a very common formal greeting.

as-salaamu 9aleykum.  Hello (literally "Peace be upon you.")

The standard reply is:

Feedback

 This utterance needs a little bit more work. The speech recognizer thinks you said: 'u' How about we listen to the tutor's speech again?

Menu Pronunciation Help Restart Mic Prev Next

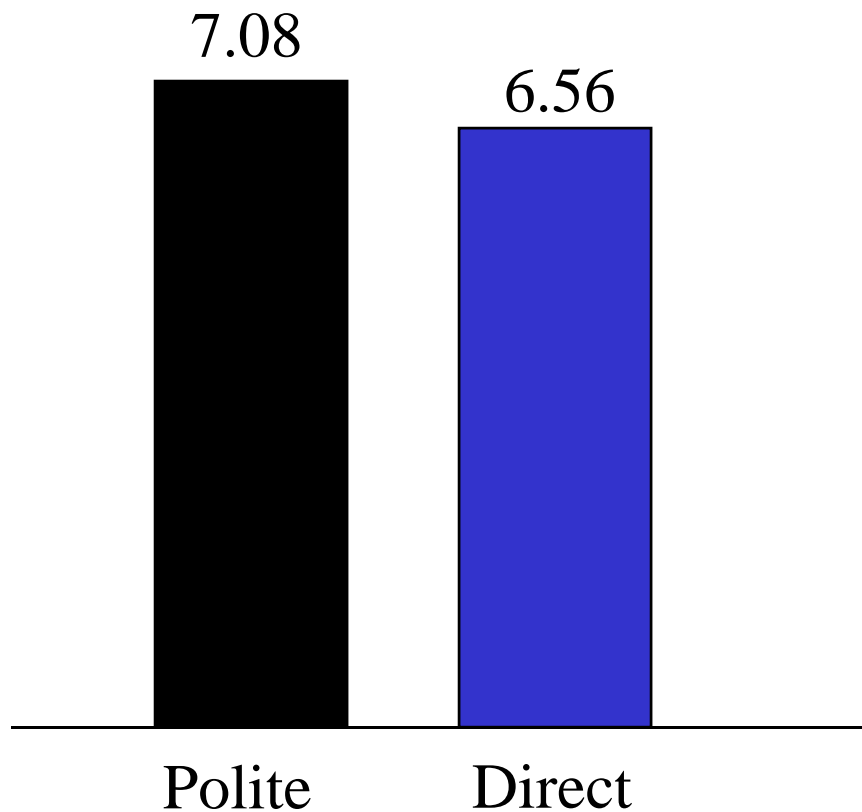
61 people recruited from Craig's List participated in the study (59% women, 41% men)

Two sessions of 90 minutes each in two consecutive days total 120 min training

Two groups: Polite (n=31) vs. Direct (n=30)

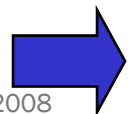
- Polite: "This utterance needs a little bit more work. The speech recognizer thinks you said 'u'. How about we listen to the tutor's speech again?"
- Direct: "Incorrect. The speech recognizer thinks you said 'u'. Try again."

Overall Quiz Score

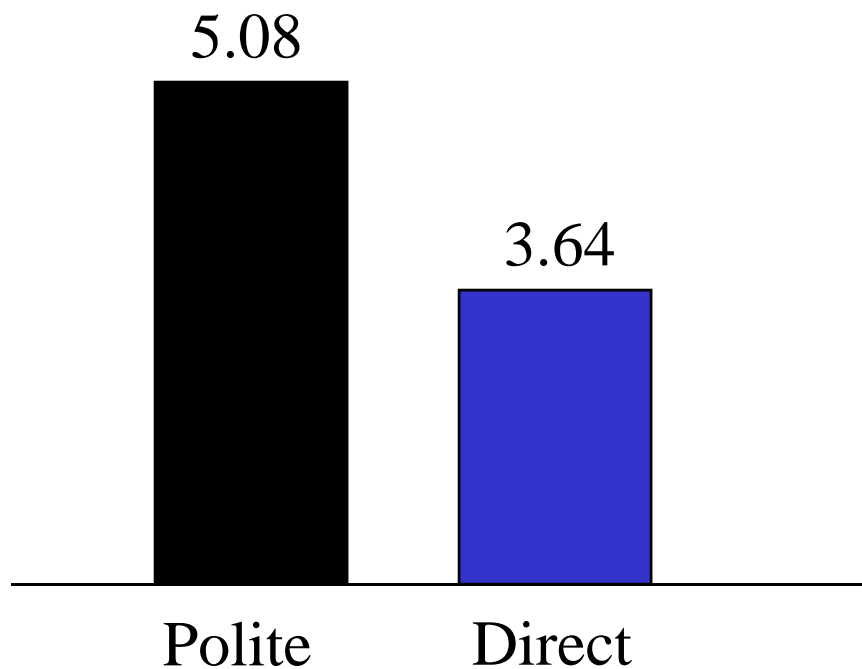


Participants in Polite group did not differ significantly ($p=0.626$) than those in Direct group on overall quiz questions.

However...



Utterance Formation
Quiz Question Score



Students in Polite group performed significantly ($p=0.037$) better than students in Direct group on Utterance Formation quiz questions.

Self-Efficacy Outcomes



Self-efficacy Change

.848



.366



Polite

Direct

For the participants in the Polite group, their self-efficacy increased significantly more ($p=0.045$) than those in Direct group.

Advantages of game-based learning:

- learner control
- self-directed learning
- learner motivation

Disadvantages

- potential for unproductive activities

Role of tutor advice model: detect unproductive learner activities and give advice to guide learners in a more productive direction (Outer loop in Argyris / Schön model)

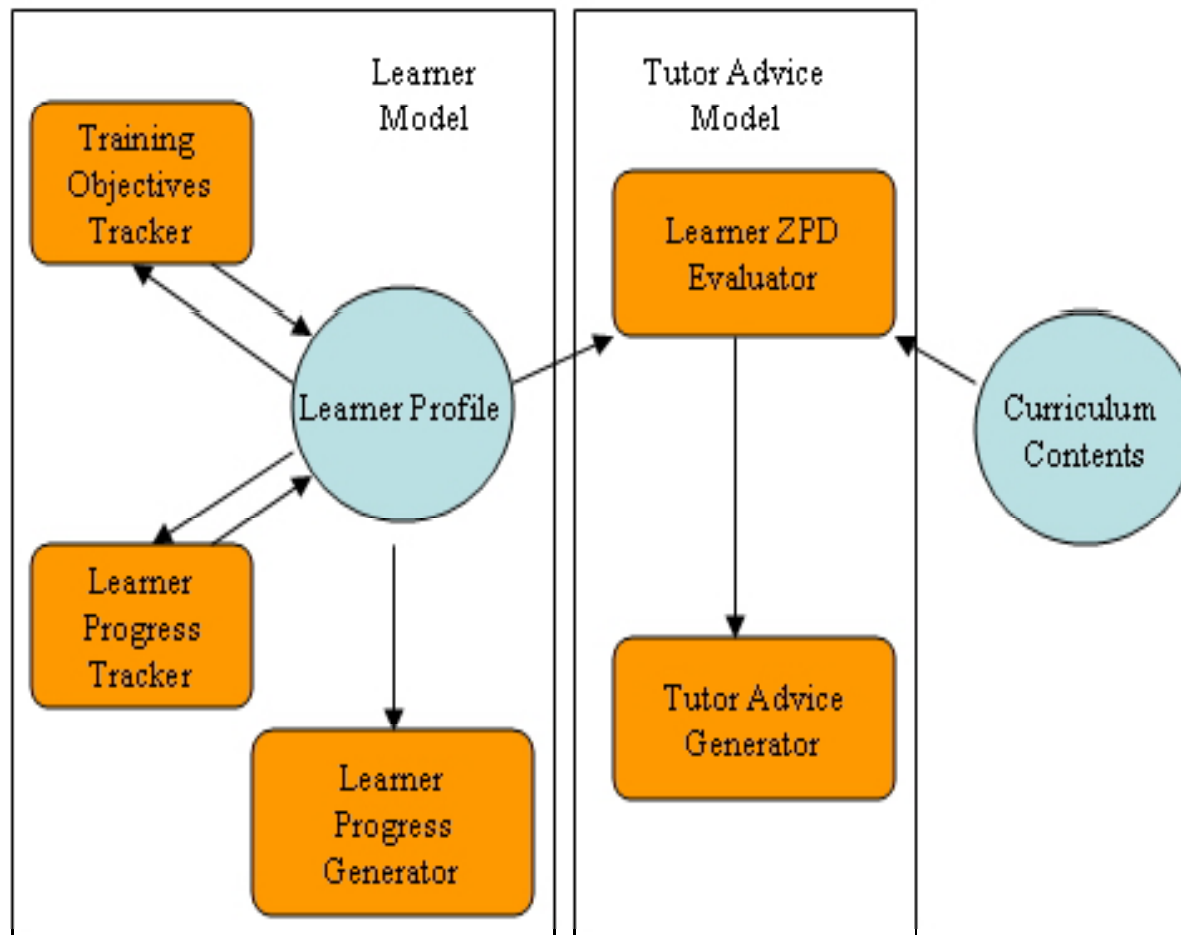
The Retrospect Pattern: An Example from a Training Log



<i>Task #</i>	<i>Curriculum Unit</i>	<i>Description</i>	<i>Productivity</i>
1	Lesson1	Complete all exercises and skip the quiz	P
2	Active Dialog1	Complete without hints	P
3	Scen1	Fail to complete the scene with a few attempts	PU → AU
4	Scen1	Fail to complete the scene using a lot of hints	AU
5	Scen1	Fail to complete the scene with a few attempts	AU
6	Lesson1	Complete the quiz left from Task #1	P
7	Lesson2	Complete a part of the exercise pages and skip the quiz	P
8	Scen1	Complete the scene with a moderate use of hints	P
9	Scene2	Fail to complete the scene using a lot of hints	PU

- * P: productive learning behavior;
- * AU: actual unproductive learning behavior;
- * PU: potential unproductive learning behavior;

Pedagogy Layer

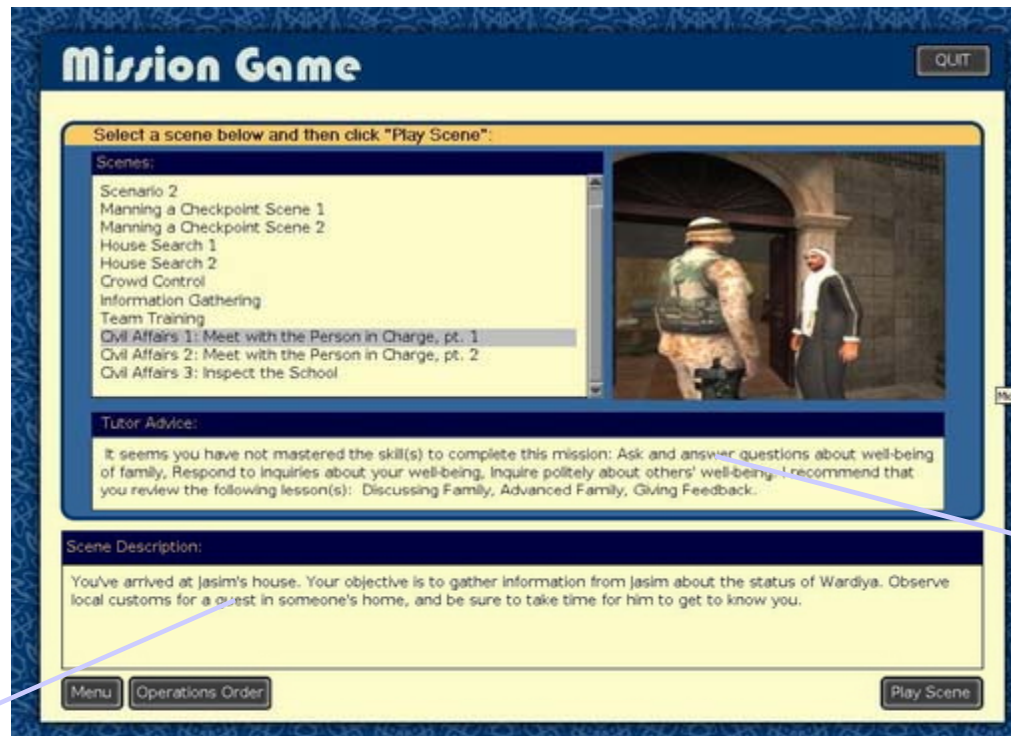


Tutor Advice Category



Advice Type Advice Contents	Pre-quiz advice	Post-quiz advice	Pre-game advice	Post-game advice
Suggest delay taking the task	✓		✓	
Give References	✓	✓	✓	✓
Encourage more practice	✓	✓		✓
Suggest Avoid unproductive activities				✓
Suggest Hint Use				✓

Tutor Advice: An Example



Briefing

Tutor advice

It seems you have not mastered the skill(s) to complete this mission: Ask and answer questions about well-being of family, Respond to inquiries about your well-being, inquire politely about other's well-being. I recommend that you review the following lesson(s): Discussing Family, Advanced Family, Giving Feedback.

Most intelligent **learning environments** presume that the **learning objectives** are given (McCalla)

However over longer time scales learning goals can change

Case in point: Proficiency 1 Tactical Iraqi

The original Tactical Iraqi was designed for rapid acquisition of “survival” language skills

The Marine Corps offers bonus pay for intermediate language proficiency

We adapted TLTS curricula to support learners in gaining language proficiency

Issue: learners may not decide to go for bonus pay until after they start training

System selects structure and content of curriculum based on learning objectives - which learner can change

Dimensions of variation:

- Program of instruction (sequence of lessons)
- Breadth of instruction and exercises (to promote transfer)
- Depth of instruction (use of written language)
- Difficulty of exercises (to promote mastery)
- Amount of scaffolding (to promote mastery)

Problem: there can be long delays between language study and language use

How do we help lifelong language learners quickly recover their skills?

Strategies:

- Give learners resources for just-in-time review (iPod Companion)
- Provide learners with instruction tailored for language skill recovery

Work in progress (funded by ONR)

Method:

- give learners diagnostic exercises that helps to determine what they have learned and what they have unlearned
- construct tailored program of instruction designed to promote skill recovery

Relies on an “unlearner model”: modeling how people unlearn language skills over time

Elements of the Model of Unlearning



Model informed by psychological research, as well as data collected from long-term users of Tactical Iraqi & Dari

Procedural skill is acquired after declarative knowledge and decays before declarative knowledge

Production skills decay before recognition skills

- Results in loss of fluency, production speed

Durability of knowledge and skill depends upon the range of contexts in which they were learned

Similarities in phonology, semantics, and context can cause interference which accelerates skill decay

Improves on classical forgetting curves

- Which underlie common rote memorization techniques

Focus instruction on:

- Topics where learner shows signs of knowledge decay
- Topics that are susceptible to decay, based on analysis of original training curriculum

If learner retained declarative knowledge but has lost fluency, provide exercises that focus on regaining proficiency

- May involve adapting exercises to a higher fluency standard than was originally trained



For more information and downloads:

<http://www.alelo.com>

