A Jigsaw Lesson for First-Order Logic Translations Using Identity

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Introduction

This workshop, relevant to courses in formal symbolic logic, discusses and models a jigsaw lesson for teaching translation into first-order logic using the identity particle.

Jigsaw lessons are cooperative-learning exercises which require interdependence among group members.

Workshop attendees will participate in a jigsaw lesson the content of which focuses on original translations from English to first-order logic (using ‘only’, ‘except’, ‘at least’, ‘at most’, and superlatives).

Take-home:

- teaching techniques: the jigsaw and a method for assigning groups
- new exercises for your logic classes/exams

The Jigsaw

- Developed in the 1970s for elementary schools
  - Elliot Aronson (psychology) in Austin, Texas
  - Poor performance and low self-esteem of African-American children in the wake of school desegregation
- Widely adapted
  - Initially used long-term in classes: the jigsaw classroom
  - May be used for individual lessons
  - Ideal for small, content-delivery tasks
- Benefits
  - Active engagement for all students
  - Independence and responsibility
  - Social benefits
- Requirements
  - instructor preparation
  - student trust (that the moving parts will resolve appropriately)
  - predictable attendance
  - three to five distinct topics, roughly equal in difficulty

The Jigsaw Structure

one task with three-five different parts

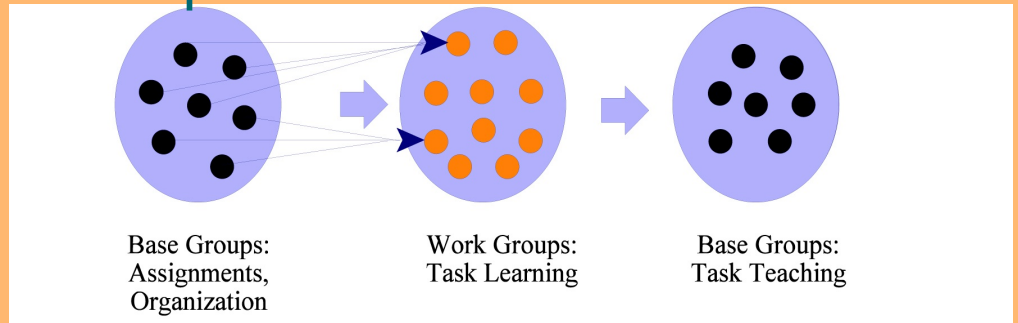

Figure 1: The three steps of the jigsaw lesson. Each member of each base group attends a work group with a different topic, and then returns to his/her original base group.

- Two distinct groups
  - base group
  - work group
- Three stages
  - Students start in base groups (five minutes).
  - Each student moves to a distinct work group to master a task (ten minutes).
  - Students return to their base groups to teach the other base group members what they have learned (25 minutes).
- At the end of the lesson, each student in each base group has had the opportunity to learn each of the parts of the complete project.

The Logic Jigsaw

- Five tasks, so five-membered base groups
  1. Sentences using ‘only’
  2. Sentences using ‘except’
  3. Superlatives
  4. ‘At most’ sentences
  5. ‘At least’ sentences
- In each base group, each person chooses a different topic.
- Each work group focuses on one topic.
- The size of the work groups depends on the size of the class, not the number of topics.
- All groups are best kept small (three-five).

Worksheets

- Distributed to work groups
- Five sample English sentences and corresponding regimentations in first-order logic
- Three additional English sentences with no corresponding regimentations
- In the work groups, students learn from the samples and regiment the additional sentences.
- Each student learns his/her small task well enough to teach it to the other members of the base group later.
- Return to base groups, teaching each other
  - take enough worksheets

Group Assignments

- I like random group assignments.
- Counting-off for base groups
- In small classes, work groups can assemble themselves by topic.
- >17: two work groups/ some topics
- >24: two work groups/ all topics
- I have a neat trick for assigning groups.

Let’s Do It

- Base groups (5 minutes)
- Work groups (10 minutes)
- Base groups (25 minutes)

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A (Sort-Of) Logical Puzzle Interlude

A: Is that your grade on the top of that paper?

B: Yeah.

A: Is that out of 100?

B: Uh-huh. My professor gives us some really tough quizzes. That's the fourth one.

A: What are your other grades?

B: Put it this way: the product of my first three quizzes is 2450, while their sum is twice the grade you just saw.

A: Hmm... That doesn't quite answer the question.

B: You're right. I forgot to mention that the product of my two lowest grades is less than my highest grade.

A: Ah, that clears it up.

- What were B's four grades?