International Mathematics Education Conference

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How Can I Design My Lessons to Make Mathematics More Accessible for Language Minority Students

English language learning student population (in U.S.)

- Roughly 4.6 million English language learning (ELL) students were served by K-12 schools in 2000-01 (Kindler).
- By 2030, language minority students are expected to comprise 40% of the school-aged population.
  - **Kindler, A.L. Survey of the states, limited English proficient students and available educational programs and services: 1999-2000 summary report.**

NCES 1999-2000
Schools and Staffing Survey

- Out of the estimated 2,984,781 public school teachers, 41.2% teach English language learners.
- 12.5% of teachers have received eight or more hours of related training.

National Center for Educational Statistics 1999-2000 Schools and Staffing Survey

Why are these issues so important?

"For me, they shouldn't have put me in basic math. I should have been in algebra. But there is more English vocabulary in algebra, so they said I couldn't take it until I learned more English. I felt I was spending time with things I already knew, but then that's required of Latin immigrants…"

11th grade Mexican student, immigrated at age 14.

ELLs need to acquire “everyday” English, mathematical English, and new mathematics content, all at the same time.

Dr. Carl Lager, 2003

Imagine

What if we could ensure student results which demonstrated high levels of academic achievement and English language development, and as a bonus, students achieved high levels of proficiency in another language.

To effectively meet the needs of our ELL students, we need to:

- Identify the language and mathematics objectives for students at the various English Language Development (ELD) levels.
- Select what strategies should be used with the students.
- Don’t water down the curriculum

Into

Generates student interest

Identifya nd connect students' prior knowledge to lesson

Note students' misconception s

Note students' preconc ep tio ns

Provide a context for thelesson

Create experie nce s for th e stu d ents to bu ild link s tot he lesson

Thro ugh

Stud en ts exp lore co nce pt s

Stud en ts con struct un de rs ta n din g of new co nce pt s

Stud en ts ge tco ntent thro ug h co mp reh en sible inp u t

Stud en ts int eract wi th ea cho th er

Stud en ts ref lec t on new co nce pt s an d inform at io n

Stud en ts ar tic u lat e w ha t the ykn ow

Beyo nd

Stud en ts appl y co n ce pt s to ne w sit uat ion s

Stud en ts ex te nd thei r th in kin gab out the co n ce pt in d iver gent way s

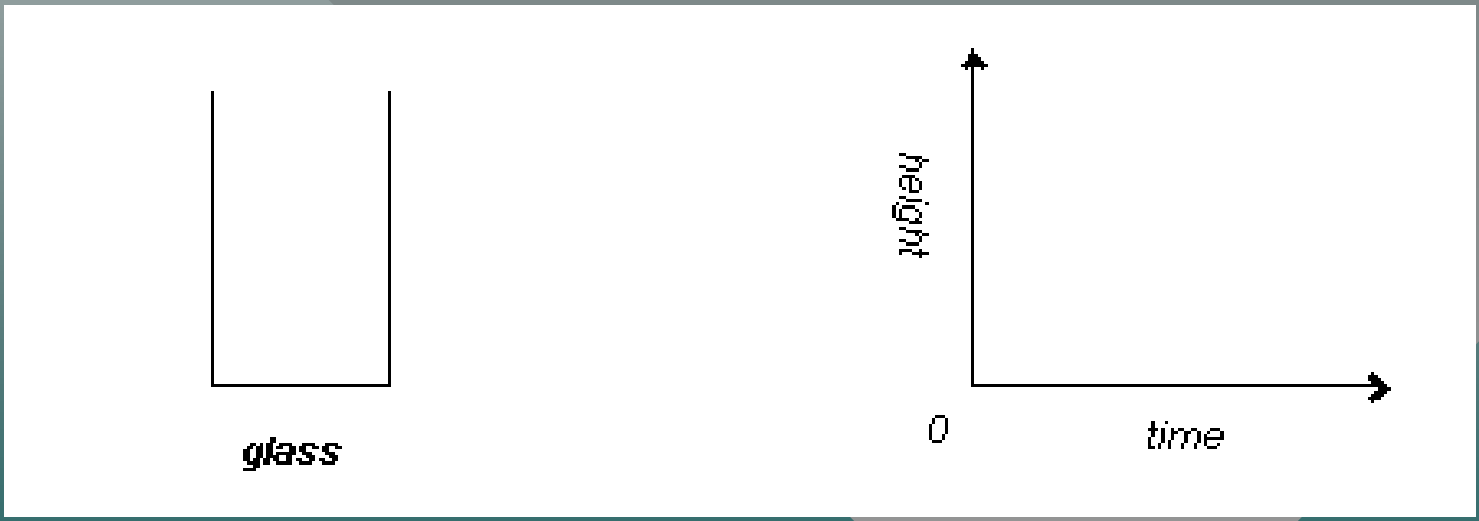
Stud en ts elab or at e on th eir un de rs ta n din g

Stud en ts de v elo pa n app re ciation of th e co n ce pt

Stud en ts thi nkab out thei r th in kin g (m eta co gn it ion)

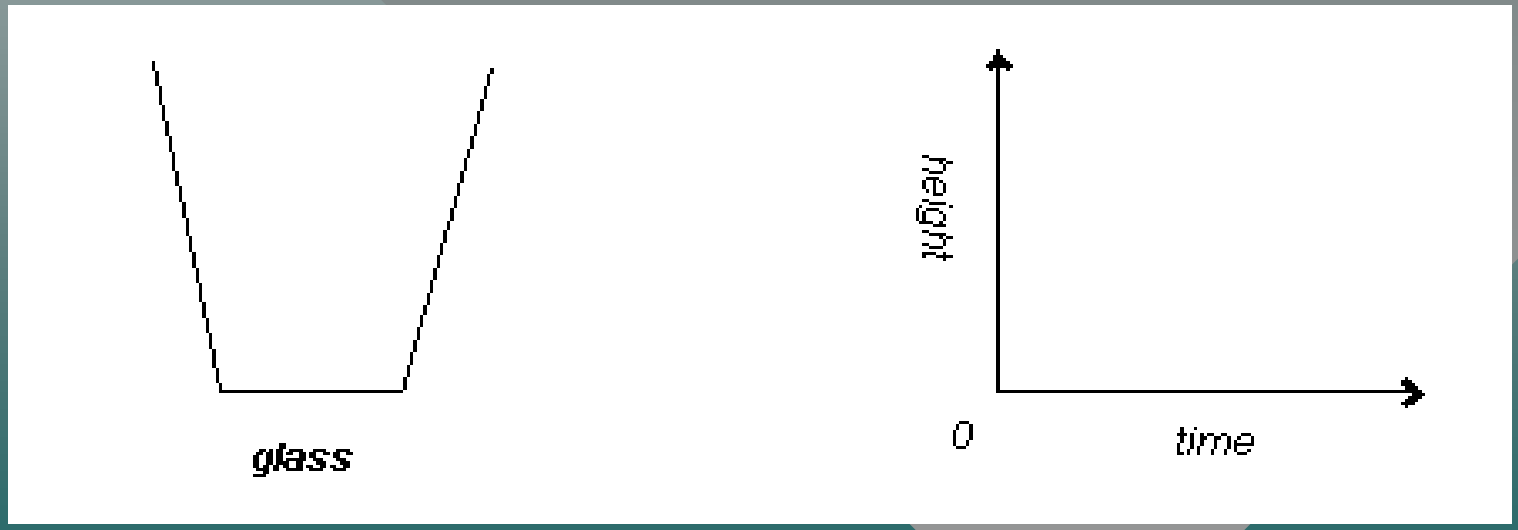
Suppose you have a large glass in the shape of a right circular cylinder. You open the faucet a little bit, don’t adjust it, and let the water flow at a constant rate. Now place the glass under the faucet because you want to know how the water level rises in the glass as time goes by.

On the axes, make a graph showing how the height of the water in the glass changes over time.



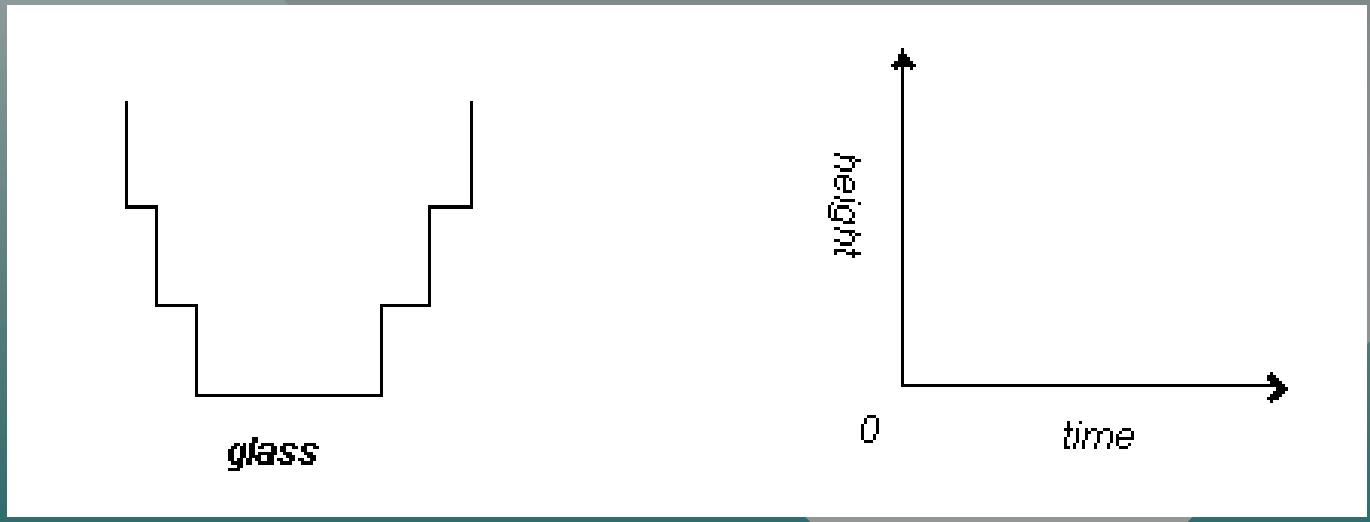
Justify the graph you just drew. What is happening to the water level in the glass? How is it changing? Why?

Now suppose you put a different glass under the faucet, whose shape is shown below. Again, draw a graph showing the water level in the glass over time



Again, justify your graph. What is happening to the water level? What is happening to the *rate* at which the water level is rising? Why is it different for this glass?

For the glass shown below, draw and explain the shape of your graph. Describe the rate of change of the height of the water in the glass.



Into	Through	Beyond

What mathematics content was addressed in this problem?

- Algebra
- Graphing
- Rate of change
- Variables

What languages issues were addressed in this problem?

- Tapping students' prior knowledge
- Vocabulary development
- Talking and reading in mathematics

Recommended actions for schools and districts

- Districts need to devote time and funds to increase the pool of qualified teachers to work with our students.
- Teachers need to reflect carefully on how their own mathematics learning experiences relate to their students' learning experiences.

Recommended actions (continued)

- Implement authentic and alternative assessments to promote student growth and development.
- School staff need to raise their expectations of language minority students.

Recommended actions (continued)

- Nurture new voices in mathematics leadership—voices that will advocate for language minority students and their families.
- Strengthen our connections between school and the community.

In California, schools are failing students of color. This condition constitutes an arsenal of social explosives…California faces no other public policy problem of more pressing importance.

(Guthrie & Kirst, 1984)

Isn’t English a Trip?

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