Concept Maps as an Assessment Tool in a Web Based Course

B.T. Arneson
J.J. Lagowski

Chemistry/Biochemistry Department
The University of Texas at Austin
Austin, TX 78712

Assessment

“ … the greatest impediment to progress regarding the chemistry curriculum is our lack of ability to measure whether we have accomplished increased student learning of the kind we really want.”

- J. Moore, FIPSE Lecture, *J. Chem. Ed.* 1989

Web Based Courses

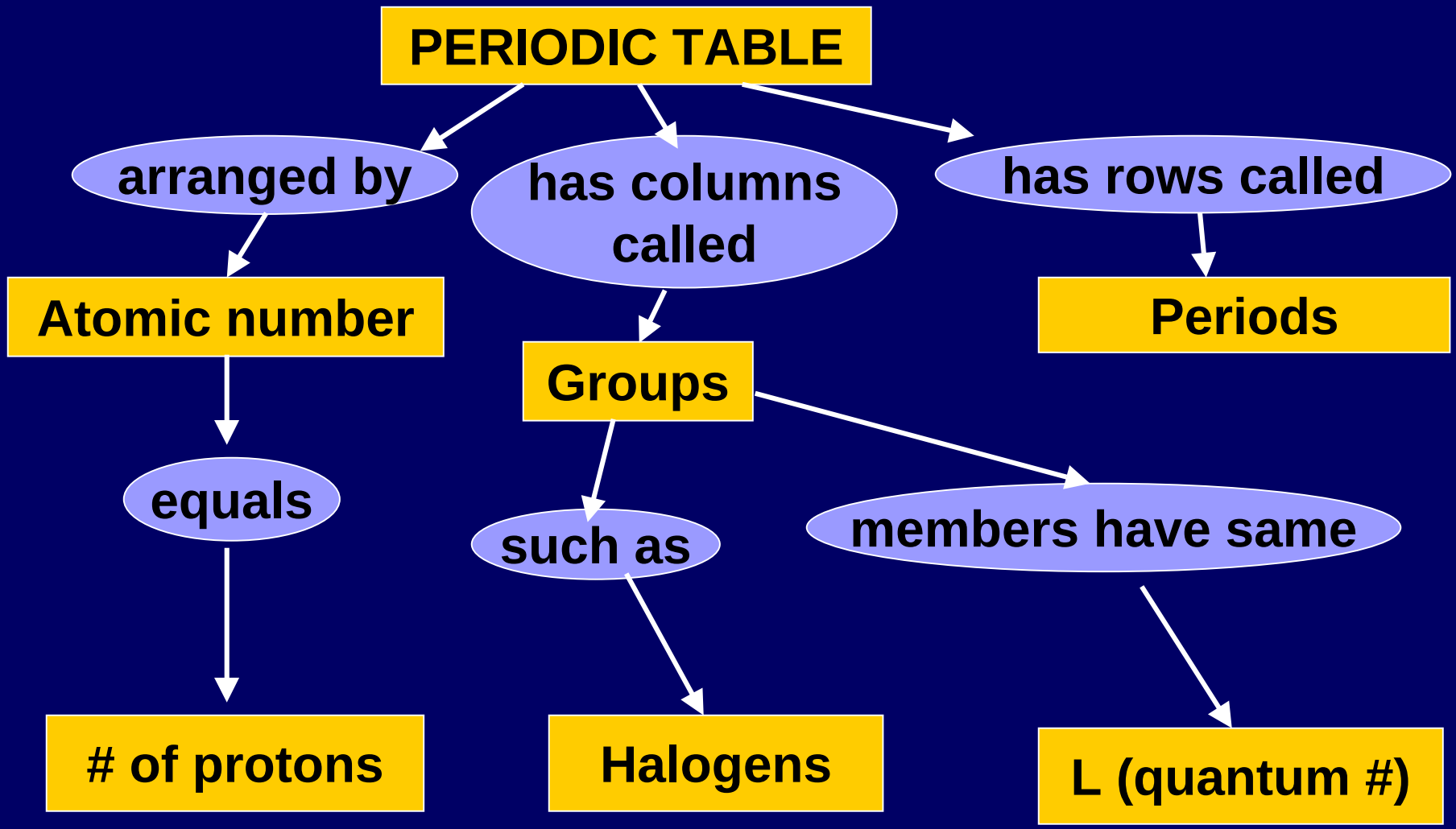
- Concerns about valid assessment
- Proposed Solution:
  Create a open book exam

Assessment and Web Based Courses

- **Our approach:**

  Use concept maps for assessment of student understanding in our web based general chemistry course.

Example of a Concept Map



Traditional Concept Maps

- Drawn on paper
- Evaluated by hand

Definition of the Project

- Create a program that will allow students to create a concept map on a computer and submit it over the web.
- Validate an electronic scoring system.

Mapping Over the Internet

- Draw a concept map on the computer
- Submit concept map over the web
- Grade concept map electronically
- Display feedback to student

Definition of a Concept Map

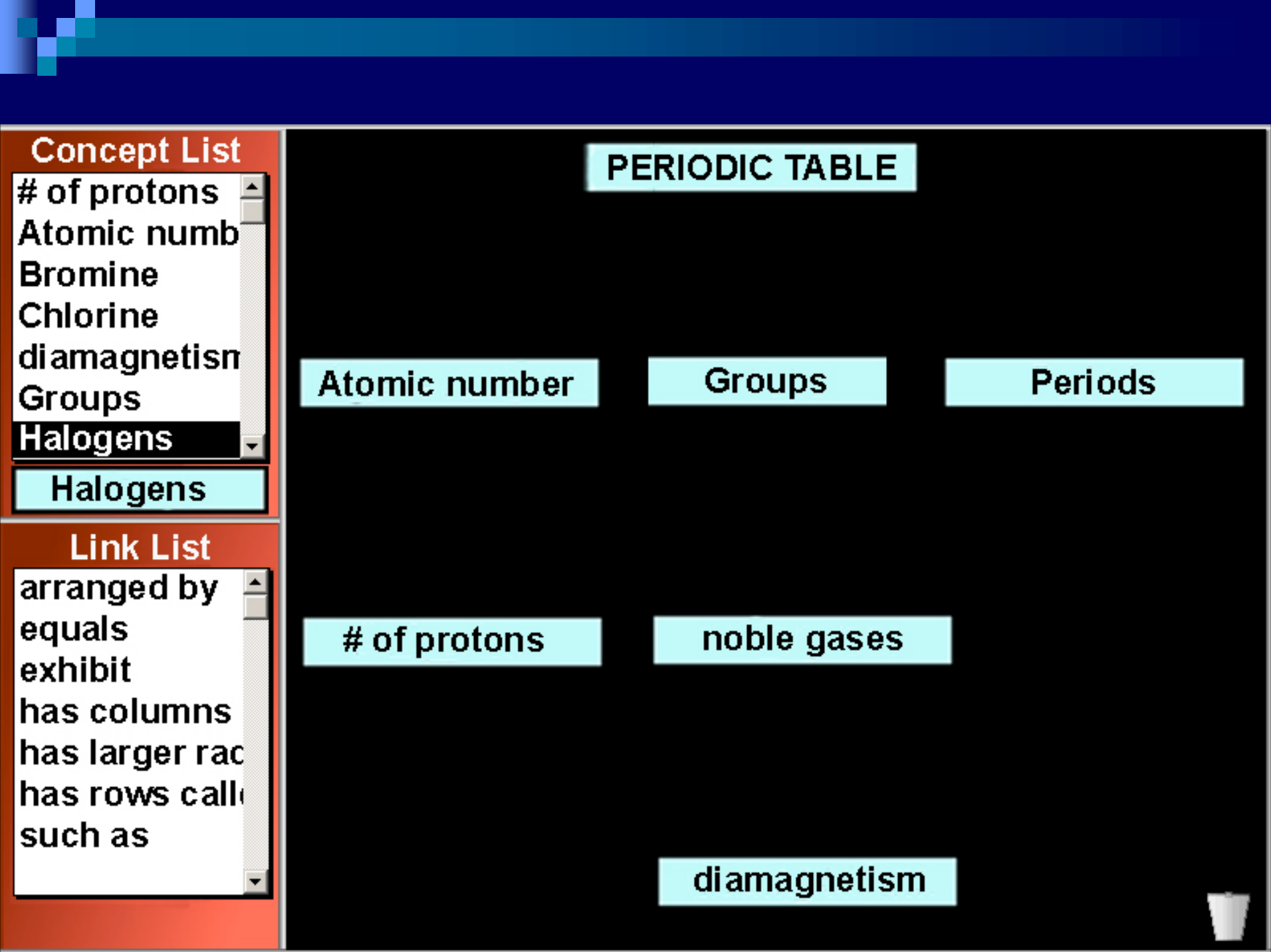
- List of Concepts
  - Can be used only once
- List of Linking words
  - Can be used multiple times
- Concepts connected by a linking word and a directional arrow to create a “proposition”

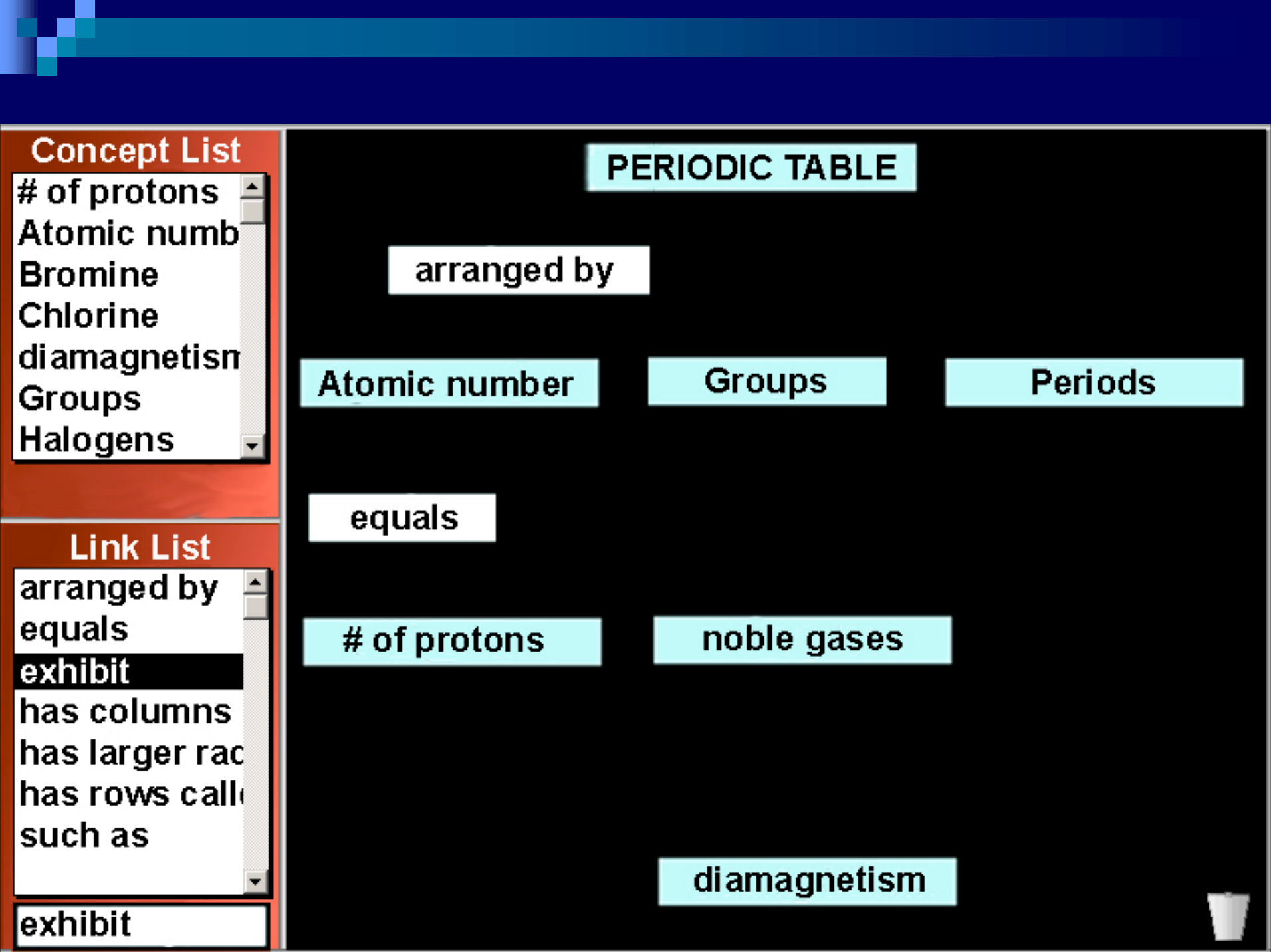
Grading of a Concept Map

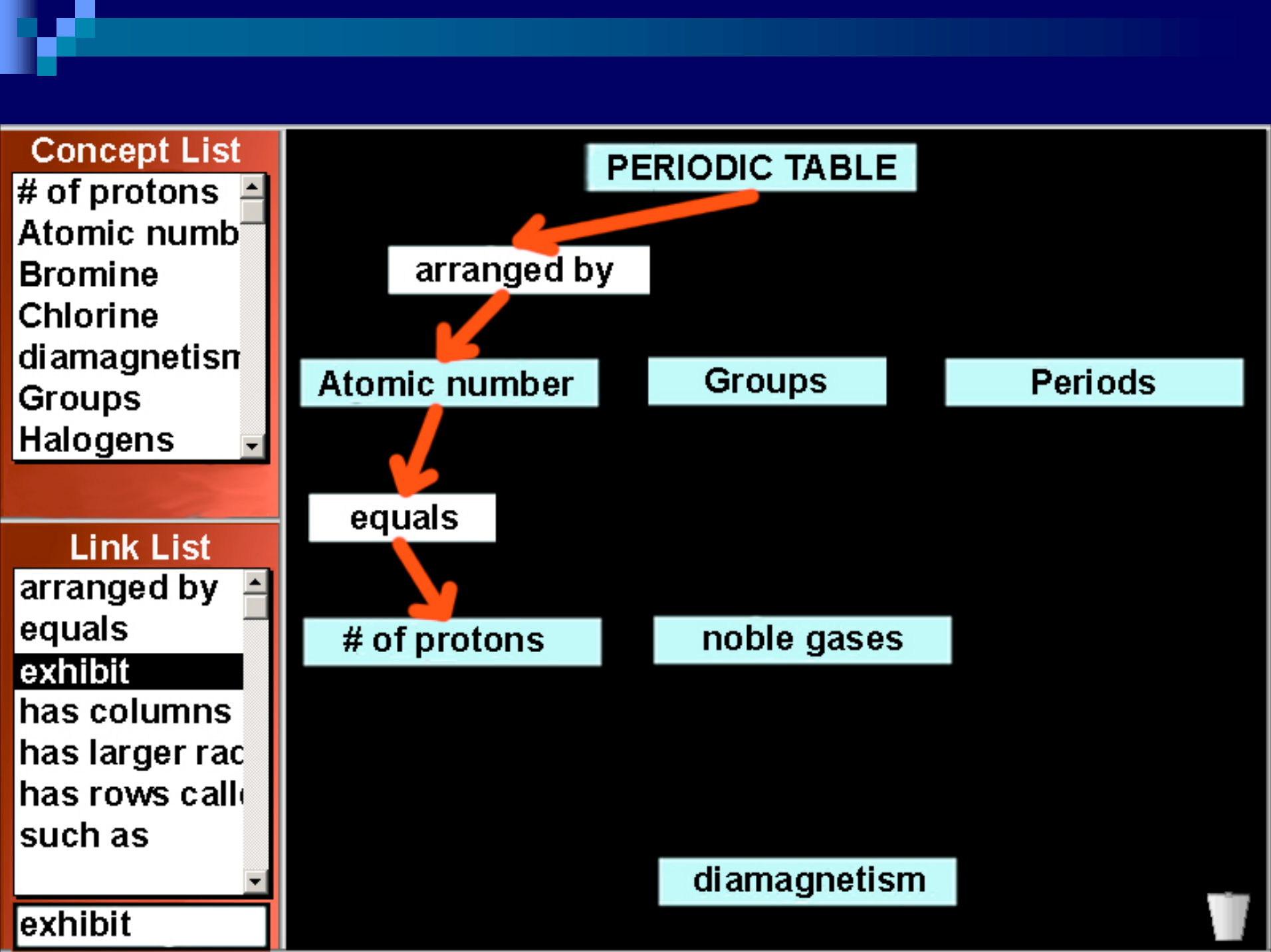
- Instructor creates the master map
- Instructor assigns point values to individual propositions
- Evaluate student propositions

Concept Map Assessment Tool (CMAT)

- Completely web-based
- Instructor
  - creates concept / linking word list
  - creates master map
  - creates grading key
- Student
  - creates own map
  - submits map
  - receives feedback


Concept List
# of protons
Atomic numb
Bromine
Chlorine
diamagnetism
Groups
Halogens
Halogens
Link List
arranged by
equals
exhibit
has columns
has larger rac
has rows call
such as
PERIODIC TABLE
Atomic number
Groups
Periods
# of protons
noble gases
diamagnetism


Concept List
# of protons
Atomic numb
Bromine
Chlorine
diamagnetism
Groups
Halogens
Link List
arranged by
equals
exhibit
has columns
has larger rac
has rows call
such as
exhibit
PERIODIC TABLE
arranged by
Atomic number
Groups
Periods
equals
# of protons
noble gases
diamagnetism


Concept List
# of protons
Atomic numb
Bromine
Chlorine
diamagnetism
Groups
Halogens
Link List
arranged by
equals
exhibit
has columns
has larger rac
has rows call
such as
exhibit
PERIODIC TABLE
arranged by
Atomic number
Groups
Periods
equals
# of protons
noble gases
diamagnetism

What is Recorded

- PERIODIC TABLE, arranged by, Atomic number
- PERIODIC TABLE, has columns called, Groups
- PERIODIC TABLE, has rows called, Periods
- Atomic number, equals,# of protons
- Groups, such as, noble gases
- Groups, such as, Halogens
- noble gases, exhibit, diamagnetism
- Halogens, exhibit, paramagnetism

The Next Step

- Correlate :
  electronic scoring with human scoring
- Experiment with assigning point values
  - correct propositions
  - incorrect propositions

Conclusion

- We have created a program that …
  - create a concept map on a computer
  - submit a concept map over the web
  - propositions are recorded & scored
- Next step is to validate an electronic scoring scheme

Acknowledgements

- Andy Yiu
- Jessica White
- The Robert A. Welch Foundation

Thank You

- For more about the Chemical Education Group at The University of Texas at Austin, visit us at http://chemed.cm.utexas.edu

In the future …

- Use concept maps as an assessment tool
- For interventions within instructional material
- Use as pre/post test assessment
- Look at improvement in map score

What We've Learned

- **Reflects on our understanding maps**
  - **What is important**
  - **What defines understanding**

Scoring a Concept Map

- **Traditional scoring schemes**

vs.

- **Scoring using**
  "the degree of accuracy of the relationships in each proposition"

How CMAT has been used

- Review Activity before exams
- Low correlation of electronic grading to exam scores
- Human grading of maps produces a better correlation to exam scores