

# Promoting students' learning about covalent bonding – a case study in grade 10

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## 1. Objective

The aim of this study was to investigate how grade 10 students developed understanding of covalent bonding when a methodology of 'global project' was used. Mindmaps were also used.

## 2. Sample

Eleven students, aged 15 -16 years old, grade 10.

## 3. Methodology

The study was developed in four stages as presented in the diagram.

The teaching methodology was oriented as project work and included oral discussion of ideas and results, group work, analysis of bibliography, experimental work, construction of mind maps and finally the use of a questionnaire to evaluate student's learning and appreciation of the experience.

Action/research was the methodology used by the teacher to evaluate the process of teaching and learning all along, so that changes could be incorporated if needed.

### Stage 1 – To identify students' initial conceptions

Students answered to diagnostic questions and constructed a "mind map" about the theme.



### Stage 2 – To help students to overcome their difficulties

Students, working in groups, corrected their answers consulting and analyzing bibliography suggested by the teacher. Each group presented their work to their colleagues and teacher and the discussion about their work helped students to improve their ideas.



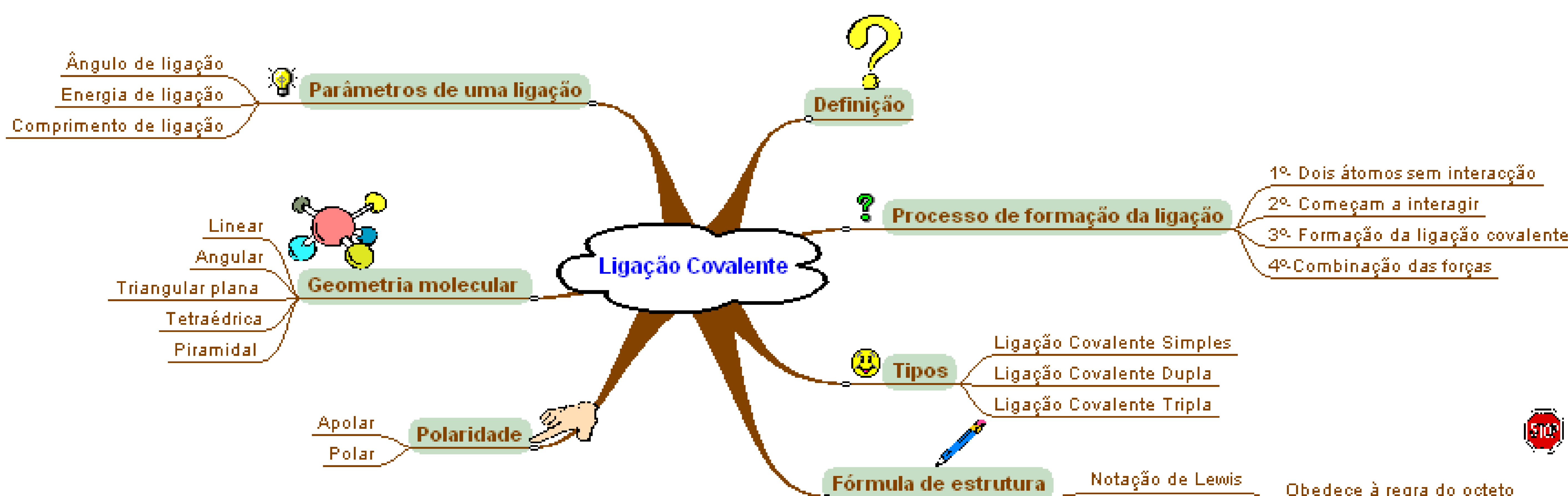
### Stage 3 – To learn about new ideas

Students analyze bibliography to answer to questions about the theme. The initial mind map was then changed to include new ideas and knowledge acquired.



### Stage 4 – To assess knowledge (three months later)

Students answered to a group of questions to assess their knowledge.



## 4. Conclusions

Results indicate that this instruction leads to enhanced conceptual development. For most of the students there was a conceptual development in several contents: chemical bonding, covalent bonding, bond parameters, molecular structure, geometry and polarity of molecules. The methodology used identifies students' initial conceptions, involves students in autonomous work to learn about new ideas, improves their knowledge and brings class discussion to the center of class work.

Confrontation of initial mind maps with final ones showed that students understanding of covalent bonding improved substantially. Students felt strongly that working in groups, debating their ideas and constructing mind maps helped them to understand and to organize new ideas.