1. John knows how to change gear when driving, but he has difficulties explaining it to someone else. How can we understand that he knows something but cannot explain it?
2. A student in a programming class is familiar with iterative functions. The teacher presents a new function, *factorial (n),* which is recursive. The student reads the function and tells the teacher that this is a loop. Would Piaget describe this as assimilation or accommodation?
3. A simulation for learning physics displays a list of the experiments done by learners, the value of the parameters and the results. How would this tool facilitate discovery learning?.
4. Is the role of metacognition more important in a course based mastery learning or in a course based on inquiry learning ? Explain your answer.
5. When students learn in pairs, it occurs that one learner does most of the work while the other does not contribute significantly. How can the designer reduce the risk that this happens? Illustrate your approach with an example
6. Two students are facing difficulties while solving equations. John makes many errors when manipulating the terms of the equation. Nathalie faces metacognitive difficulties. To which students should this environment provide immediate versus delayed feedback?
7. When two students solve equations together, does their collaboration increase or decrease metacognitive difficulties?
8. For which learning objectives would you use a collaborative learning approach and why would this method be more effective?

Identifying different categories of butterflies.

Identifying the bug in a piece of code

Identifying the best itinerary for a trip

Identifying if a signature is correct or not

1. For which learning objectives would you use collaborative learning? Why?

Comparing the accuracy of several machine learning algorithms

Computing the standard deviation of a distribution

Predicting the evolution of exchange rates Euro / Swiss Franc

Detecting vocabulary mistakes in a document translated from English to French

1. A school teacher teaches the notion of adverb, i.e. a word that modifies the meaning of a verb, an adjective or another adverb (generally, extremely, carefully, often). Some words sound like adverbs but are not: ally, rally, belly, …. The teacher asks students to classify words. Which kind of errors would indicate that the learner is in a state of overgeneralization or undergeneralization?
2. How could a machine learning professor apply Vygotsky’s concept of ‘zone of proximal development’ to his class?
3. You want to teach the notions of sinus and cosine, what would be intrinsic and extrinsic motivation activities to start the lesson.
4. You want to teach how winds flow from high to low pressure. What could be an advance organizer ?
5. You want to teach about interest rates. How you exploit intrinsic and extrinsic motivation?
6. Design an orchestration graph that includes at least 3 activities located at least on 2 planes. This graph should include one of the following edges: advance organizer, ZPD or alternate. You may choose the topic, but it cannot be about standard deviation. If you have no idea, think about fractions, planets, cell division, Pythagoras, Napoleon, volcanos, grammar, foreign languages,…. You may not reuse a graph from the book or from the slides. Define the operators if you have any.
7. Design an orchestration graph that includes at least 3 activities located at least on 2 planes. This graph should include one of the following edges: motivation, induction or data collection. You may choose the topic, but it cannot be about standard deviation. If you have no idea, think about fractions, planets, cell division, Pythagoras, Napoleon, volcanos, grammar, foreign languages,…. You may not reuse a graph from the book or from the slides. Define the operators if you have any.
8. Design an orchestration graph that includes at least 3 activities located at least on 2 planes. This graph should include one of the following edges: transfer, ZPD or data collection. You may choose the topic, but it cannot be about standard deviation. If you have no idea, think about fractions, planets, cell division, Pythagoras, Napoleon, volcanos, grammar, foreign languages,…. You may not reuse a graph from the book or from the slides. Define the operators if you have any.
9. Design an orchestration graph that includes at least 3 activities located at least on 2 planes. This graph should include two operators: distribution and aggregation. You may choose the topic, but it cannot be about standard deviation. If you have no idea, think about fractions, planets, cell division, Pythagoras, Napoleon, volcanos, grammar, foreign languages,…. You may not reuse a graph from the book or from the slides. Define the operators if you have any.
10. Design an orchestration graph that includes at least 3 activities located at least on 2 planes. This graph should include a group formation operator. You may choose the topic, but it cannot be about standard deviation. If you have no idea, think about fractions, planets, cell division, Pythagoras, Napoleon, volcanos, grammar, foreign languages,…. You may not reuse a graph from the book or from the slides.
11. Design an orchestration graph that implements adaptive instruction. You may choose the topic, but it cannot be about standard deviation. If you have no idea, think about fractions, planets, cell division, Pythagoras, Napoleon, volcanos, grammar, foreign languages,…. You may not reuse a graph from the book or from the slides.
12. Design an experiment that compares the effectiveness of extrinsic versus intrinsic motivation on learning outcomes. Verify if the effect depends upon the contents to be learned. What would be the independent, controlled, intermediate and dependent variables? Describe a potential interaction effect.
13. Design an experiment that measures the effectiveness of advance organizers on learning outcomes in a MOOC. Verify if the effect varies with the level of prior knowledge of the participants. What would be the independent, controlled, intermediate and dependent variables? Describe a potential interaction effect.
14. Design an experiment that measures the effectiveness of multiple representations on learning outcomes. Verify if the effect varies with the level of prior knowledge of the participants. What would be the independent, controlled, intermediate and dependent variables? Describe a potential interaction effect.
15. Design an experiment that compares the effectiveness of inductive versus deductive methods in learning environments. Describe the two methods. Verify if the effect varies with the level of anxiety of students. What would be the independent, controlled, intermediate and dependent variables? Describe a potential interaction effect.
16. Design an experiment that compares the effectiveness of intrinsic versus extrinsic motivation on the students’ participation in online forums. Describe the two methods. Verify if the effect varies with the level of anxiety of students. What would be the independent, controlled, intermediate and dependent variables? Describe a potential interaction effect.
17. Design an experiment that examine if a collaboration script could reduce the frequency of ‘free rider’ phenomenon in team learning. Which script would you use ? Verify if the effect varies with the number of students in the team. What would be the independent, controlled, intermediate and dependent variables? Describe a potential interaction effect.