Post-Nice Assessment Results
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(2) Please summarize your assessment results with reference to the three specific learning goals you articulated in each of the three areas including (a) knowledge and conceptual understanding; (b) thinking and other skills; and (c) attitudes, values, dispositions and habits of mind.
(3) Do you feel that the assessment instrument(s) you used adequately measured whether or not your instructional activities were effective? Why or why not? Please also indicate how you will use these assessment results to improve your instruction.
(4) Please post your reflections on incorporating the instructional and assessment materials you developed/adapted as a result of NICE. Do you feel they were helpful and/or effective? How did your students respond to them? Will you continue to use them (both instructional and assessment materials) in the future?

Answer to question #2:

These results are from student performances during Exam I, Exam II and Final Exam. **During Exam I**, students demonstrated quantitative reasoning (QR) skill based on problem-solving scenarios. The main approach to solve these scenarios is using conversation factors (Chapter 1). **The second exam** revolved around problem solving using conversation factors but grounded in Chapter 4 content (Quantities in Chemical Reactions). As this topic is the most difficult content for students in this course, it is not clear if their QR development is masked by the lack of understanding of Chapter 4 ideas. **The final** exam questions linked to Chapter 1 and Chapter 4 documented if students develop QR skills regardless their course content understanding level.

Regarding **knowledge and conceptual understanding**, students' performance decreased during exam II but it is improved during final exam. It seems they are unable to use the conversation factor strategy in a concrete conceptual framework such as *Quantities in Chemical Reactions*. My experience teaching this course and these results show students perform better when problems

based on conversation factors are presented using daily life examples but they failed to use this strategy (**thinking**) when they have to solve a problem based on specific course content.

A language barrier could also impact student performances. Many students have difficulties understanding the problem wording. Thus, they are unable to translate problem statement into a correct conversation factor algorithm. Overall, final exam results show they develop **the habit of mind** to solve problems using this conversation factor strategy. Further efforts should be done to improve overall class performance when these strategies are related to specific content areas such as *Quantities in Chemical Reactions.*

Answer to question #3:

These assessment tools were effective to show that students partially developed QR related to conversation factors. As problems were presented with different levels of difficulties, students were able to show some level of proficiency (2 out of 5) at different levels of problem complexity.

However, students were not able to perform correctly when QR-based problems were part of course-content scenarios. This approach lacked to discriminate if students did not perform correctly because they failed to develop an appropriate habit of mind, or the intrinsic difficulty of specific course contents impeded their ability to use conversation factors correctly. Overall, these results indicate that assessment tools should be able to differentiate both situations. Therefore, problems evaluating ability to demonstrate QR on difficult course contents could be presented simultaneously with problems appraising QR-skill development only.

Answer to question #4:

This developed assignment/assessment strategies have been very useful as it uncovered areas where QR development should be improved, ways to discriminate if students' performance if obstructed by lack of content understanding and/or lack of skill development. This QR practice also helped instructor to reflect on teaching approaches used to develop this skill. Moving forward, problems assessing QR skill only should be presented along the whole term and not only during first weeks. Thus, instructor could appraise if course-content understanding enhances QR-skill development and it progresses along the term. This information could be helpful to disaggregate if students don't perform appropriately because of the QR-skill development or due to course content understanding.