

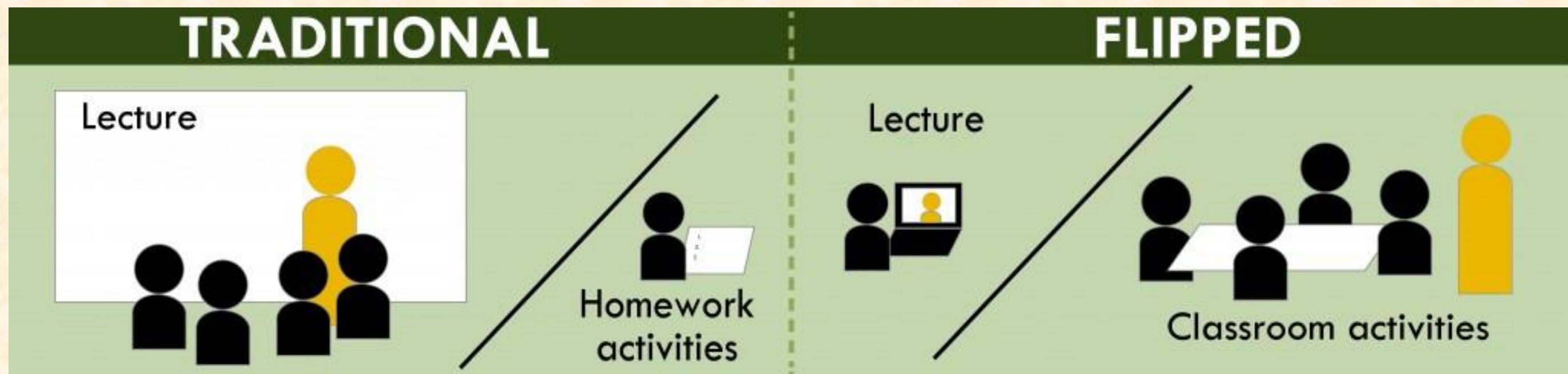
A Flipped Classroom Model in Large Engineering Classes



Rania Al-Hammoud April 2016

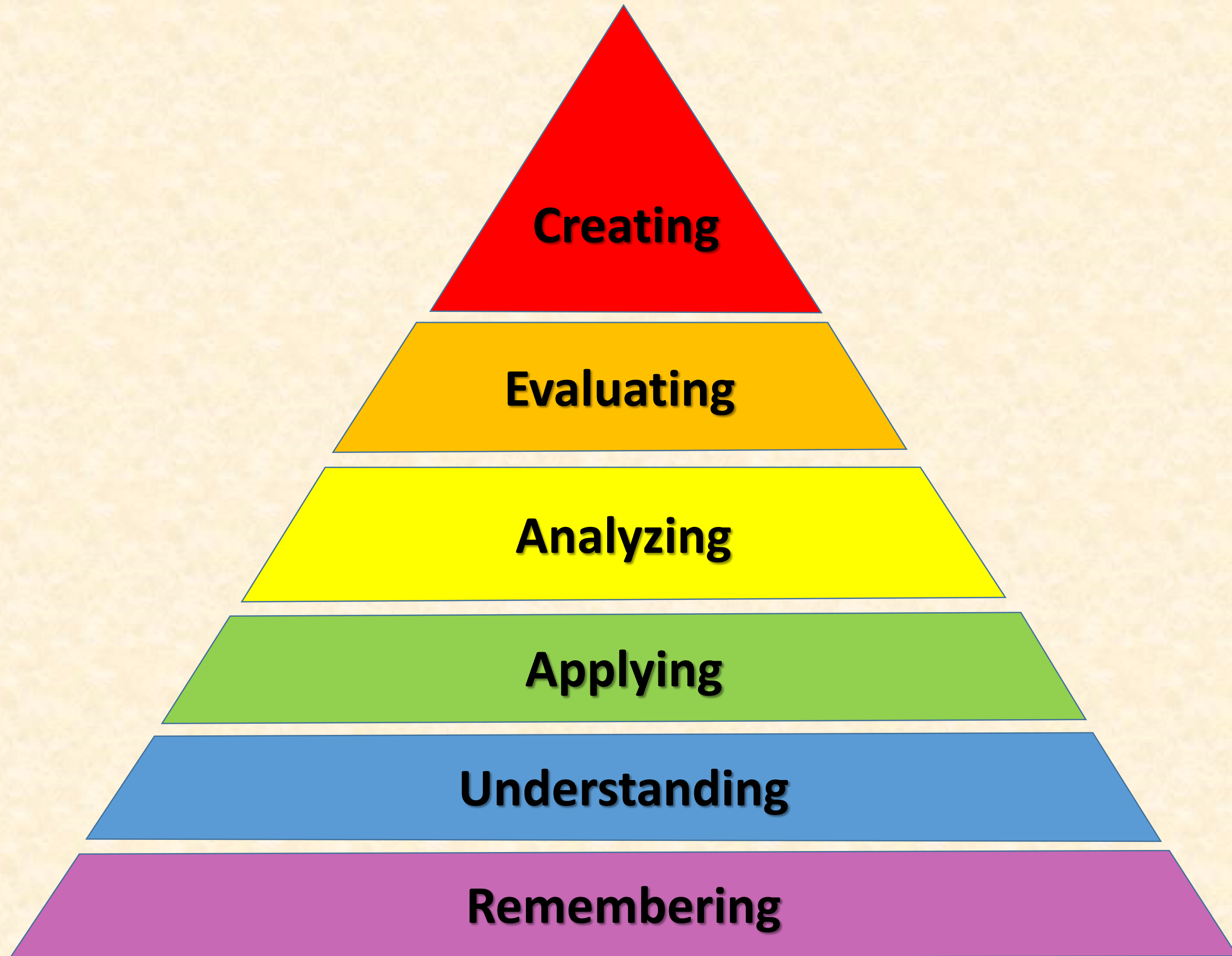
Flipped Classroom Model

- **What is a Flipped Classroom model of teaching?**
 - Instructional strategy that maximizes one-to-one interaction between instructors and students
 - Leverages technology to provide additional supporting instructional material



- **Outcomes of implementing the Flipped classroom model?**
 - Classroom activities
 - Accommodating students questions
 - Mastery of learning
 - Self-pacing
 - Immediate feedback with classroom activities
 - Increased attention, understanding and retention

Blooms Taxonomy



Problems with the Flipped Classroom

- Relies on student preparation and trust
- Unable to track students' attempts of understanding course material
- Lack of immediate feedback to students' self understanding
- Possibility of student getting bored from repetition and being left behind
- Requires significant software and hardware resources
- There is significant work on the front-end

- **Using LEARN to create an Interactive Flipped Classroom Online Module**

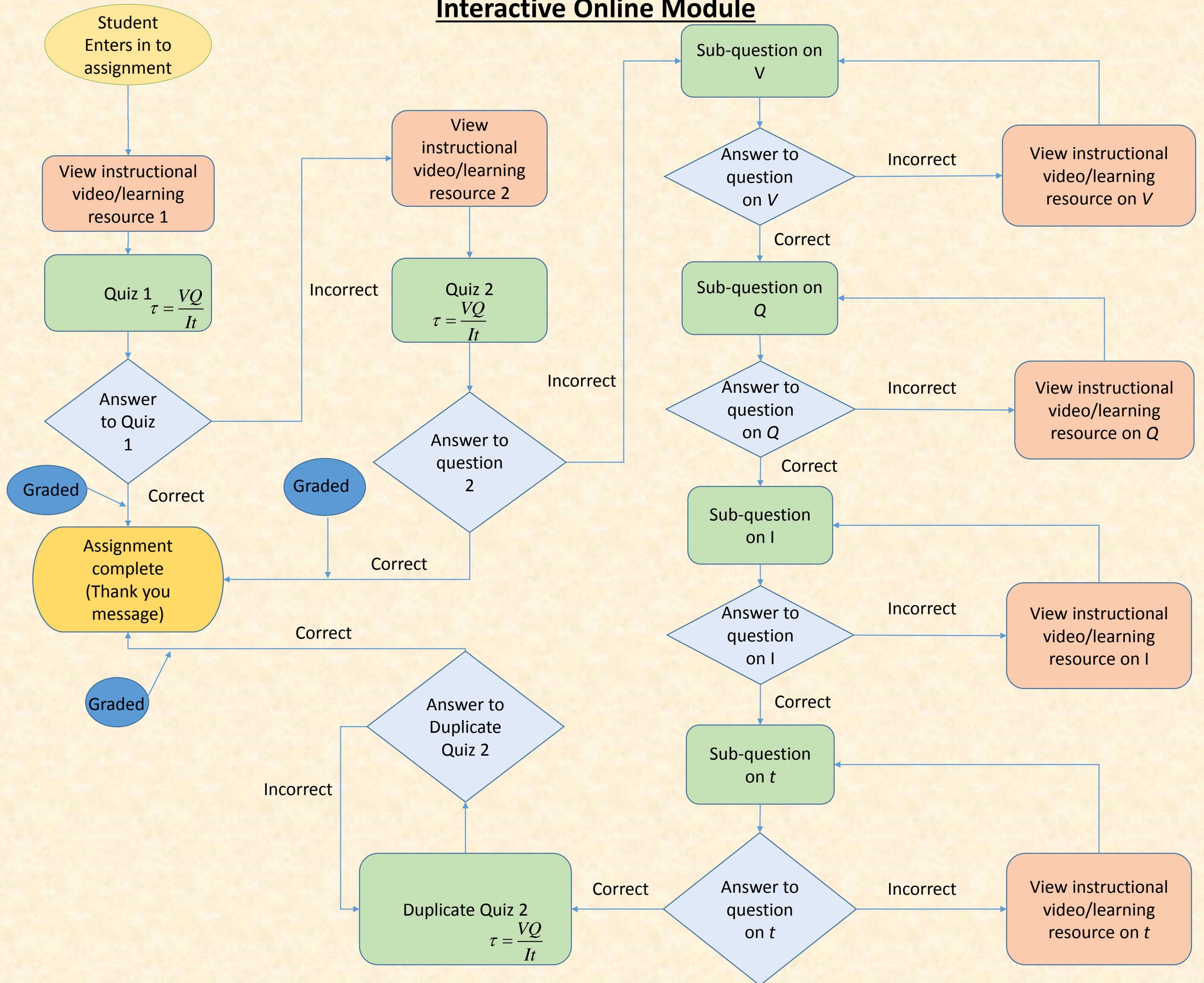
**Students watch/read course related learning resources
(videos, web links, images, etc)**

+

**Attempts questions that are related
to the learning resource**

- Students need to attempt quiz sequence prior to attending class
- Made up of several quizzes (Quiz 1, Quiz 2, Quiz 3, etc)
- A grade is administered only if quiz sequence was completed successfully

Interactive Online Module



What it looks like on LEARN

Students view: The quiz sequence unravels with the answers the student provides.

The Shear Formula ▼ Print

🕒 Due October 26 at 11:59 PM 🕒 Starts Oct 23, 2015 12:00 PM

Welcome, please start with Video 1 to begin this module.

Download Send to Binder

85 % 17 of 20 topics complete

📺 **Video 1 (Introduction)** ▼ ✓

Please watch Video 1 before proceeding to [Video 2](#).

Video 1 will introduce the Shear Formula Module.

📺 **Video 2 (Derivation of the Shear Formula)** ▼ ✓

Please watch Video 2 before proceeding to [Video 3](#).

Video 2 will present the derivation of the Shear Formula.

📺 **Video 3 (Application to Rectangular Beam Sections)** ▼ ✓

Once you have completely viewed Videos 1,2, and 3, please proceed to the first assessment: [Quiz 1](#)

? **Quiz 1** ✓

🕒 Ends Oct 27, 2015 5:37 PM

Quiz 1 will cover material on the application of the Shear Formula on rectangular beams.

If you received less than 100% on Quiz 1, please fully review the material in [Video 3 Review](#) then proceed to the next assessment: [Quiz 1 v2](#).

If you received 100% on Quiz 1, please proceed to [Video 4](#).

LEARN Flipped Classroom Prep Sequence

In an effort to overcome obstacles presented by the traditional Flipped Classroom Model

- Created an interactive online module, administered via LEARN.
- The interactive module is available to students through their LEARN account

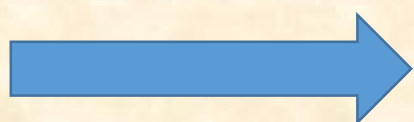
<u>Problems with traditional Flipped Classroom Model</u>	<u>Addressed by Flipped Classroom Prep Sequence on LEARN</u>
It relies on preparation and trust	<ul style="list-style-type: none">• Allocating a % of overall grade when module is completed.
Unable to track a students' attempts of understanding course material	<ul style="list-style-type: none">• LEARN records the no. attempts, scores, etc. for each student• Results available to instructor for immediate viewing
Lack of immediate feedback to students' self understanding	<ul style="list-style-type: none">• Students can immediately view their scores.• Allows students to identify mistakes and how to correct them
Possibility of students getting bored from repetition or being left behind	<ul style="list-style-type: none">• Class activities will be at a higher level of understanding• Prep sequence material available to them anytime• Can take their own time to review material
Requires significant software and hardware resources	<ul style="list-style-type: none">• Uses the already existing LEARN resource.• Videos can be recorded by Instructors/TA's and uploaded from any location.• Automatic grading and recording in to student grade books
There is significant work on the front-end	<ul style="list-style-type: none">• Can use existing template as an example• Requires only customized questions, videos, etc

Assessment Techniques

- Pre-classroom online quizzes
- Post-classroom online quizzes (higher level problems)
- Feedback surveys
- Comparison of Quiz grades with material covered through flipped vs. traditional method from 3 years before
- Online review quizzes
- Comparison of class participation

Assessment Techniques

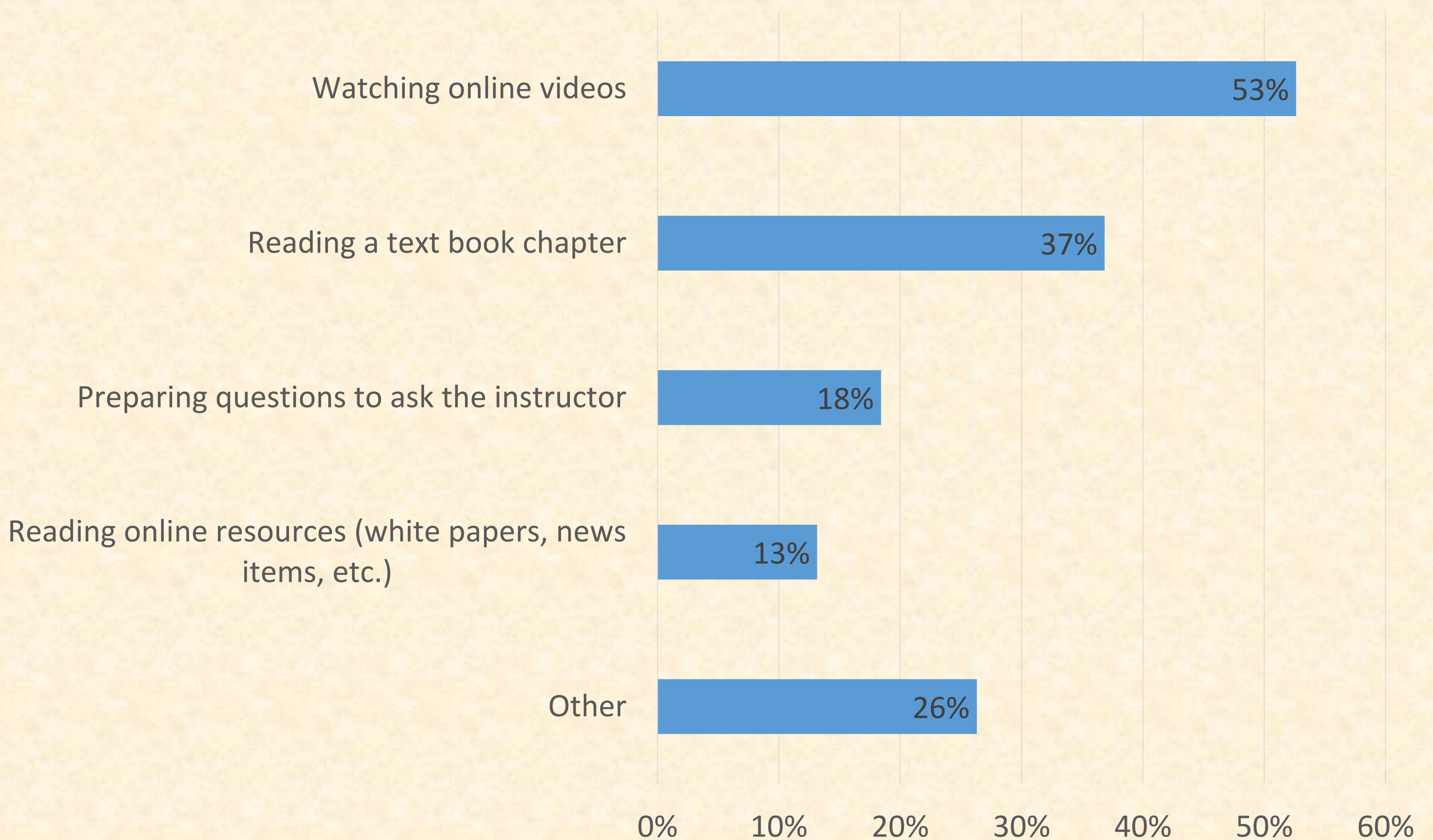
- Pre-classroom online quizzes
 - **Shear Formula** - **62** Students achieved the correct answer on their 1st attempt
- Post-classroom online quizzes (higher level problems)
 - **Shear Formula Assessment(Post Lecture)** – **106** Students achieved the correct answer on their 1st attempt



An increase from 52 % to 90%

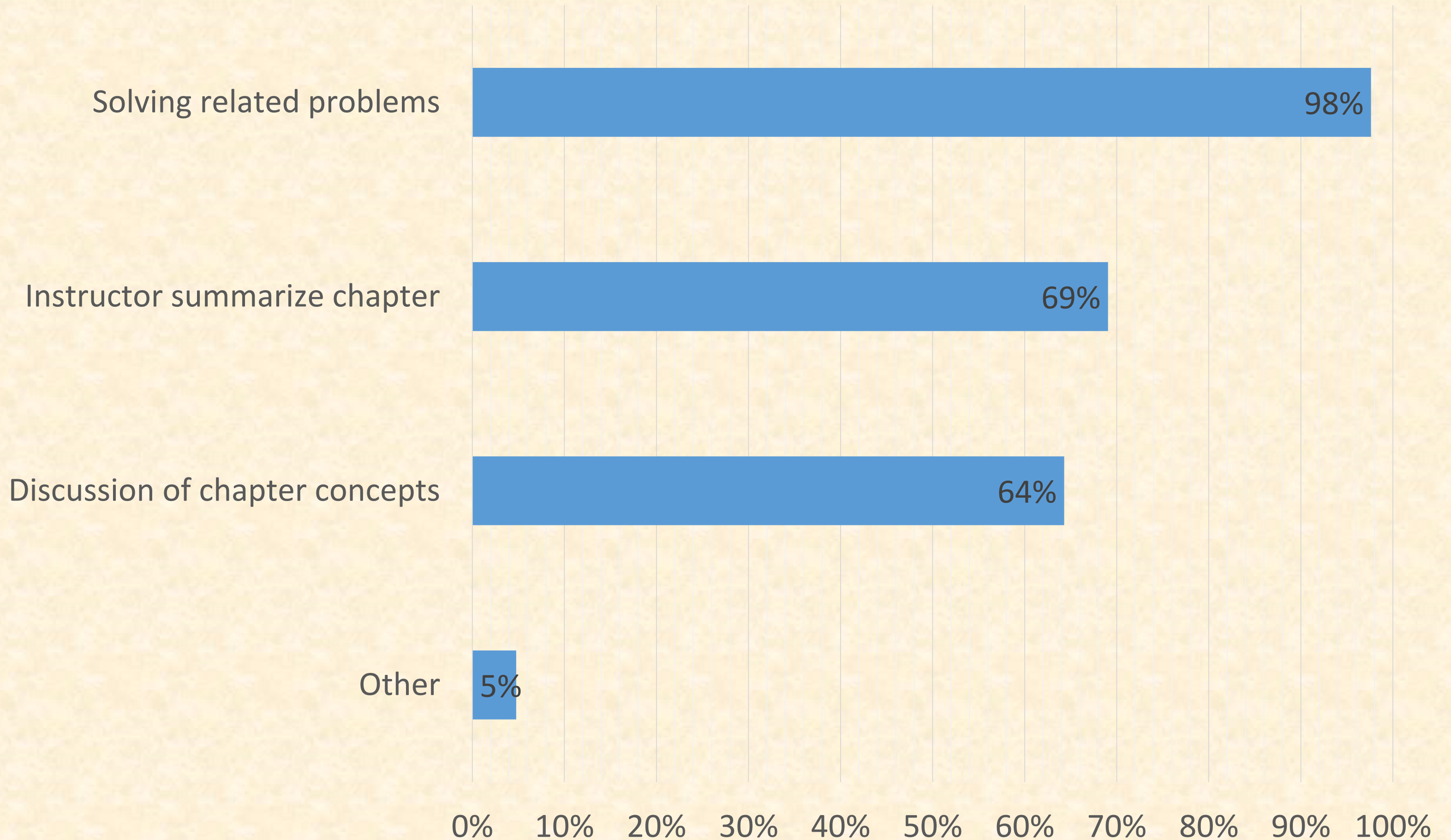
Assessment Technique: Feedback surveys

I prepare for a class by?



Feedback surveys

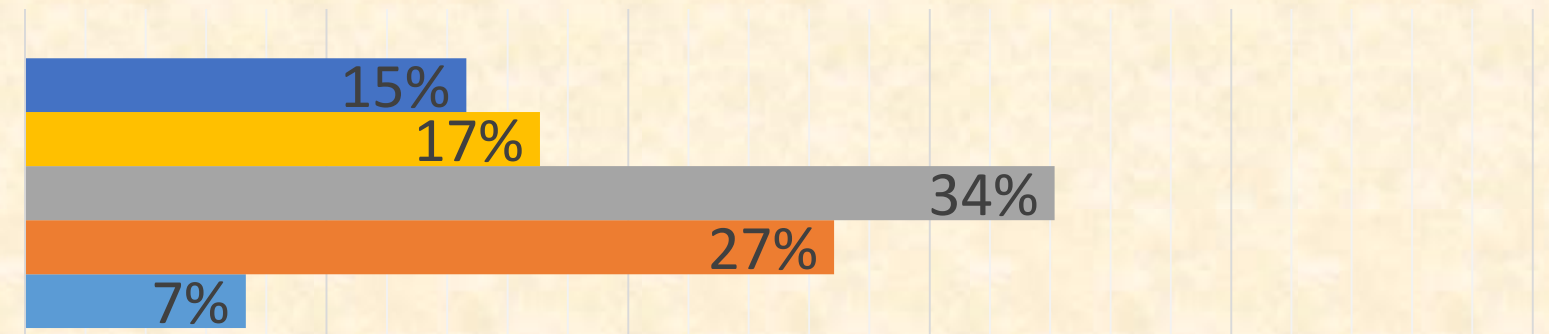
After I prepare for a lesson I would like to see the following happen in the classroom?



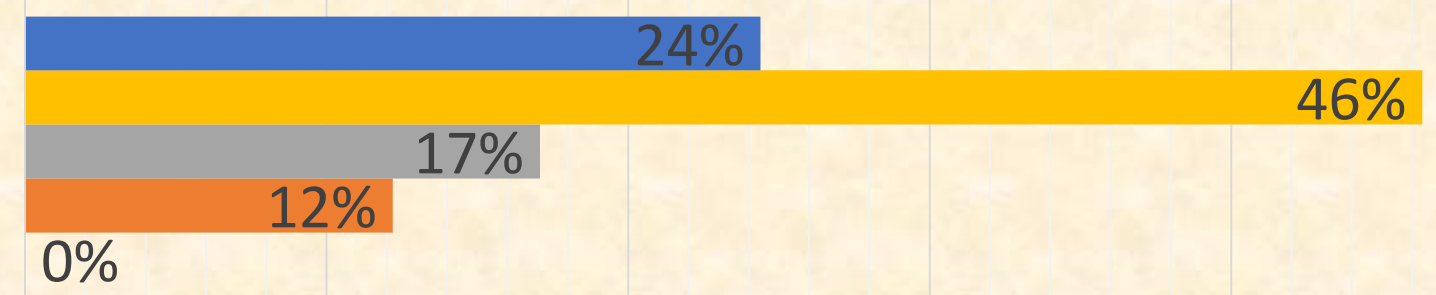
Feedback surveys

■ Strongly... ■ Agree ■ Neither Agree nor Disagree ■ Disagree ■ Strongly Disagree

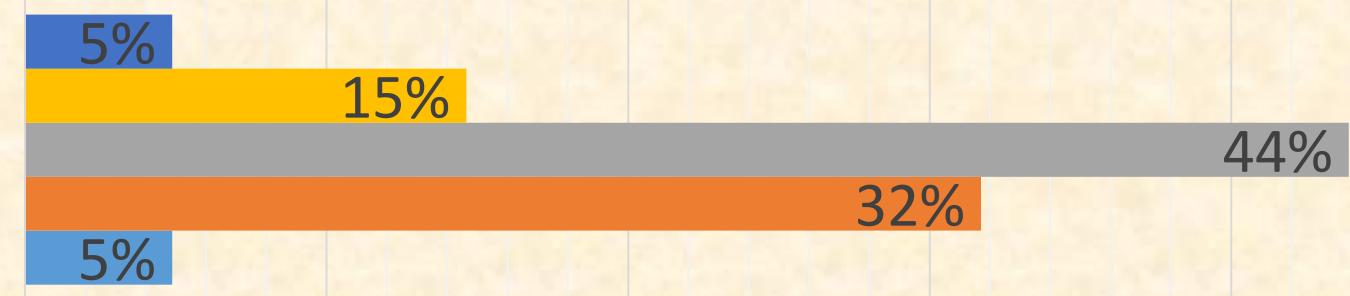
The instruction of shear stress using the flipped classroom model was more engaging than the other concepts instructed through the traditional method.



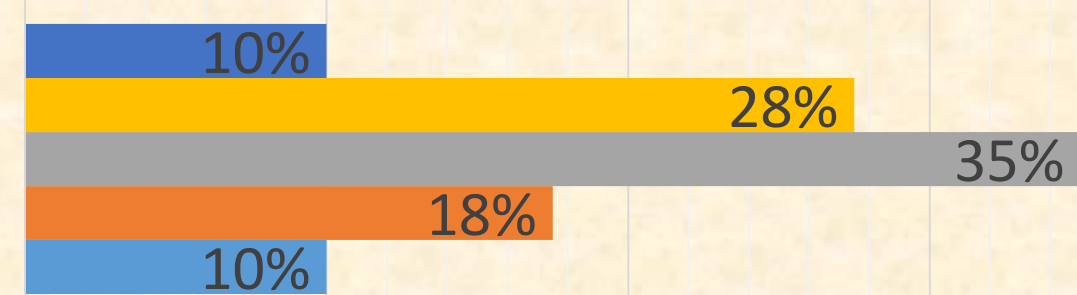
I liked going through “shear stress” resources (videos, documents, etc.) at my own pace



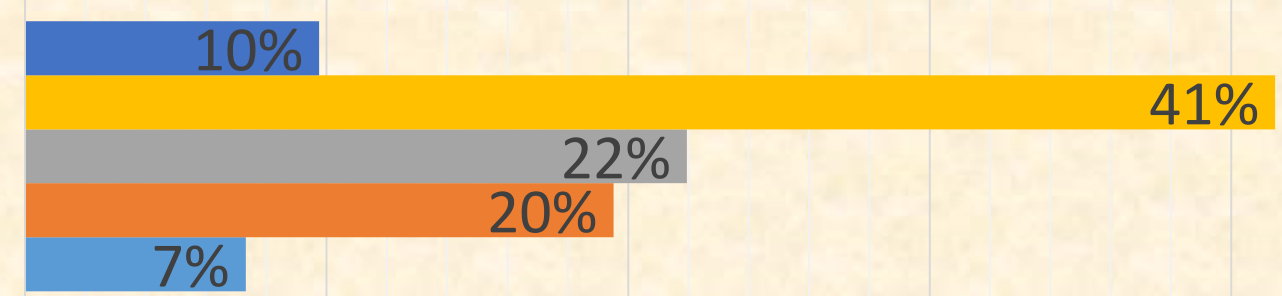
The instructional videos are too long



I liked watching the “shear stress” lesson on video



I view online course material on a regular basis

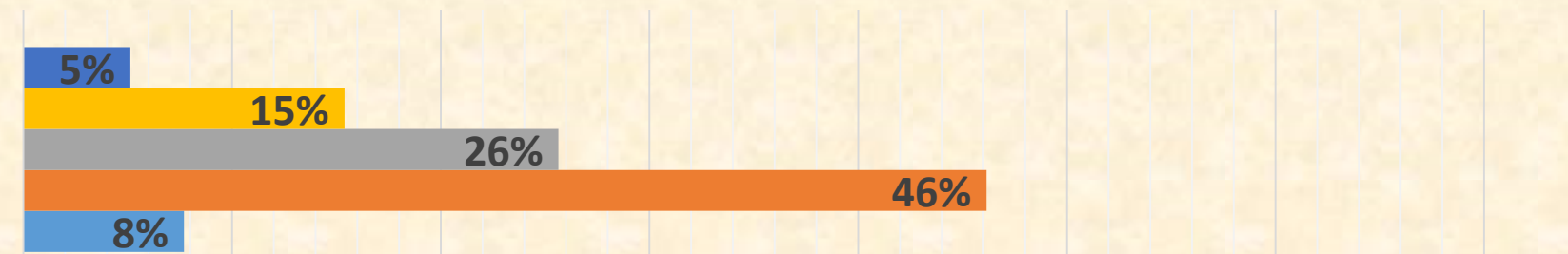


0% 10% 20% 30% 40% 50%

Feedback surveys

■ Strongly...
 ■ Agree
 ■ Neither Agree nor Disagree
 ■ Disagree
 ■ Strongly Disagree

The online resources were confusing



The lesson resources do not contain helpful information to prepare for “shear stress” problems



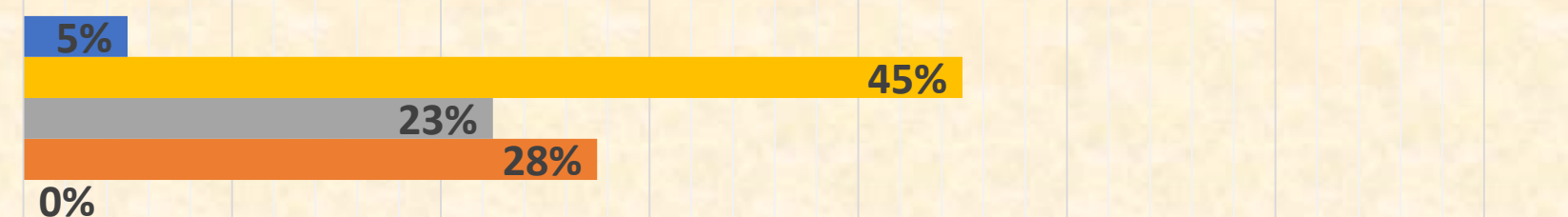
I am more comfortable to participate in class activities related to “shear stress” compared to other material in this course



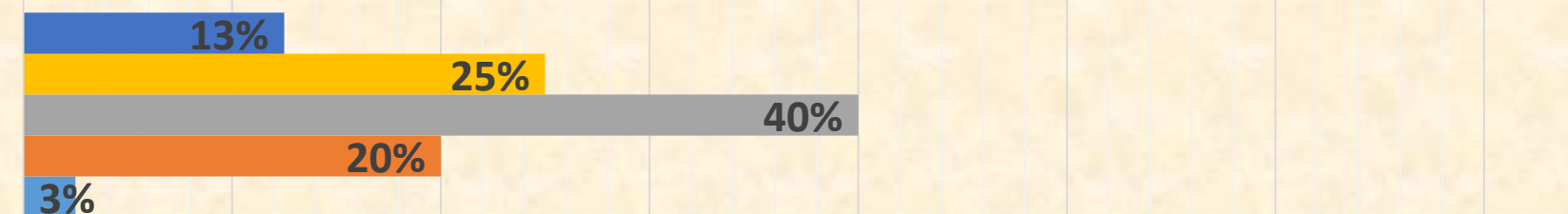
I find it helpful to have the time to solve “shear stress” problems during lecture time



I am more motivated to learn course material in the flipped classroom when learning about “shear stress”



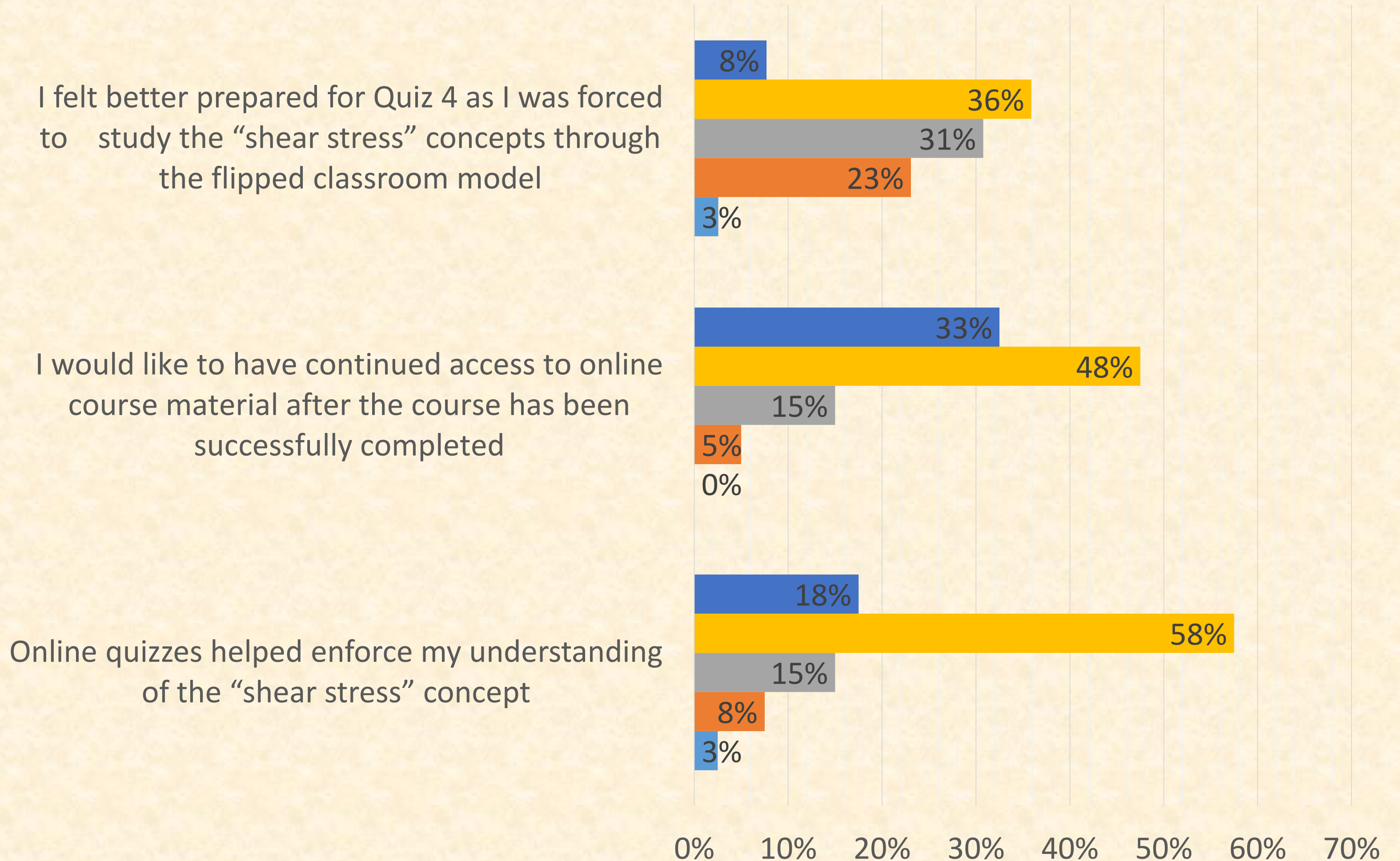
I would have preferred to receive traditional in-class instruction for the “shear stress” concept



0% 10% 20% 30% 40% 50% 60% 70%

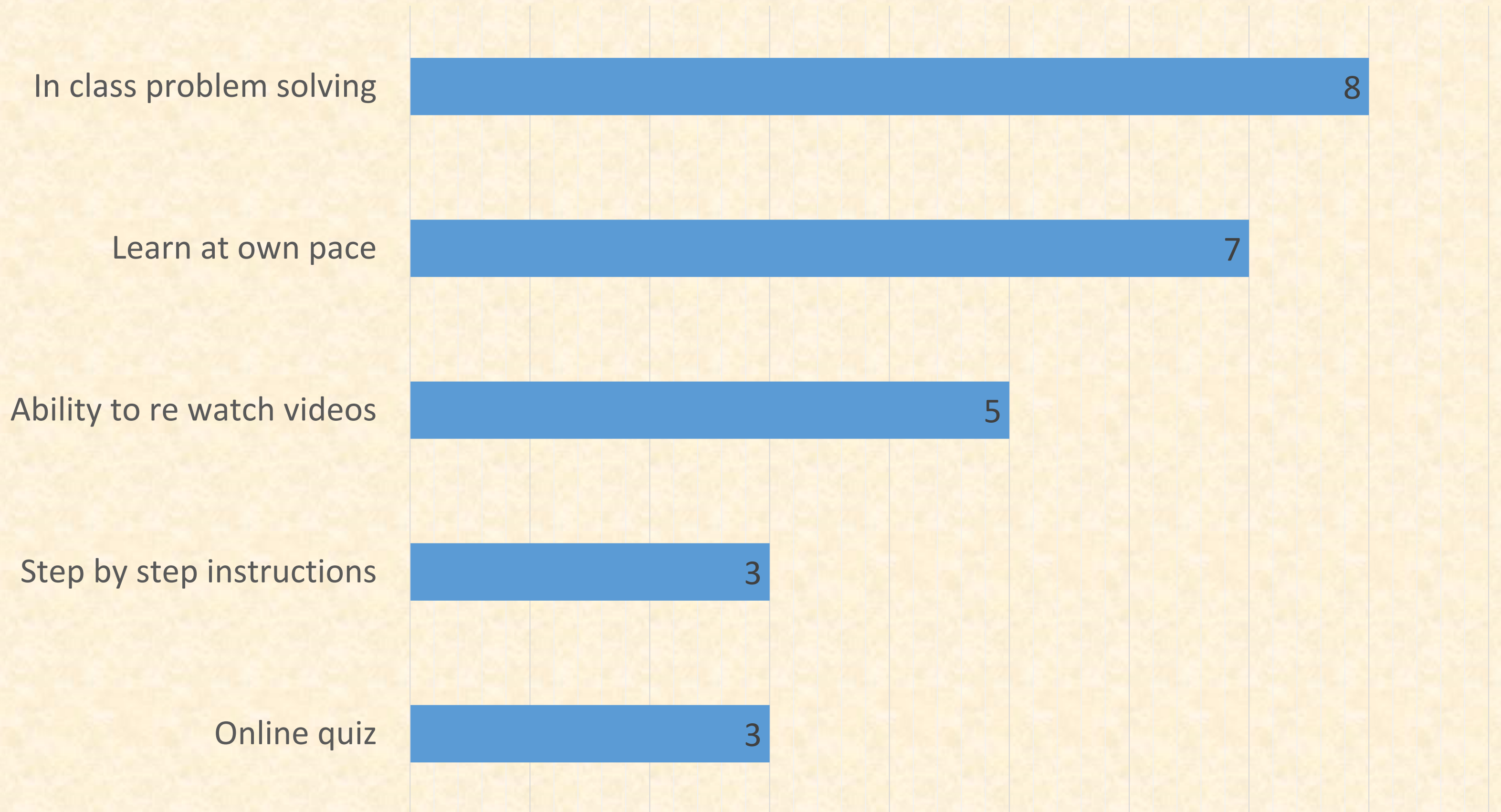
Feedback surveys

■ Strongly... ■ Agree ■ Neither Agree nor Disagree ■ Disagree ■ Strongly Disagree



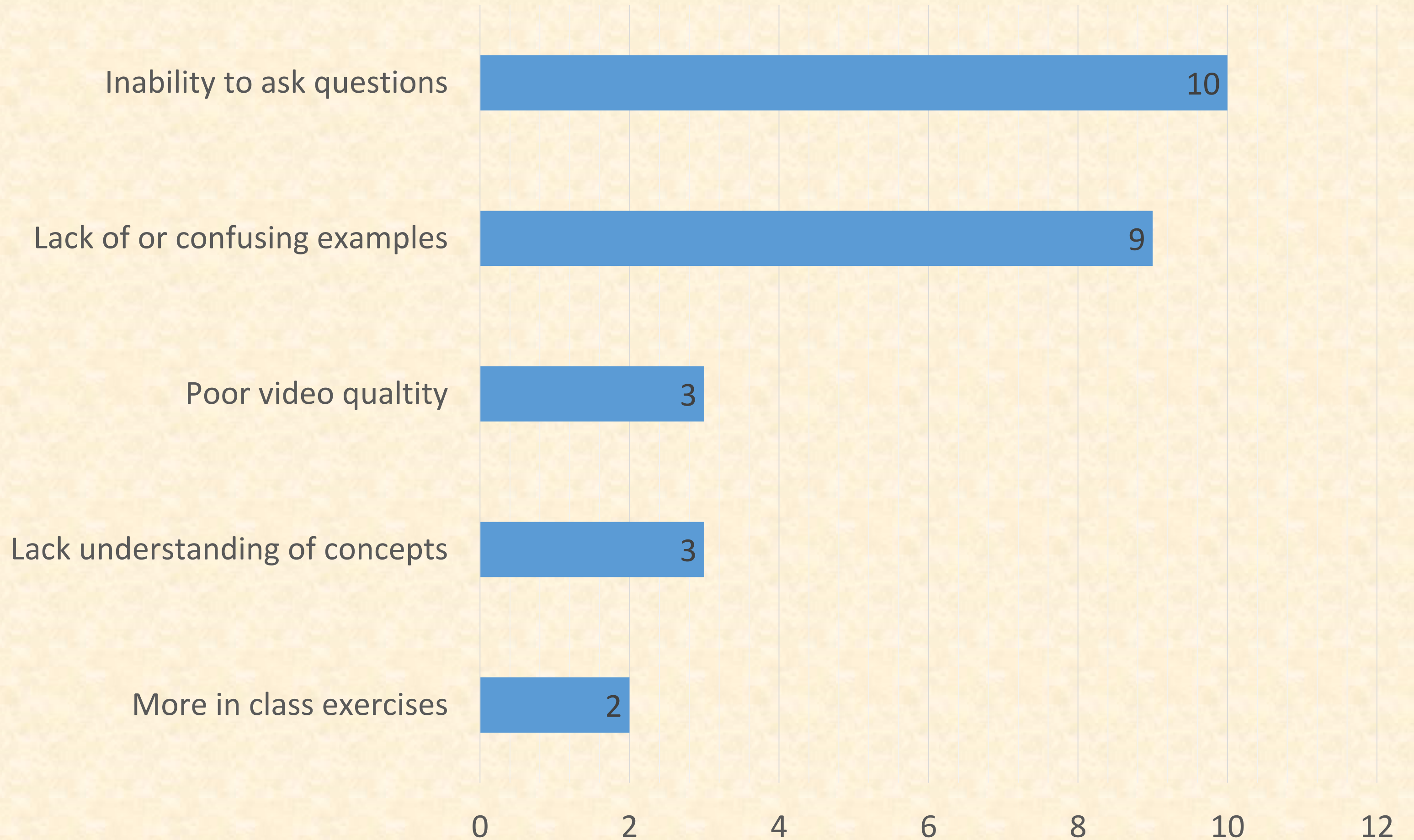
Feedback surveys

Please write in the box below what you felt was most helpful for your learning of the shear stress concept.



Feedback surveys

Please write in the box below what hindered your learning of the “shear stress” concept.



Assessment Technique

- Comparison of Fall 2015 with 3 previous years (aggregated results)

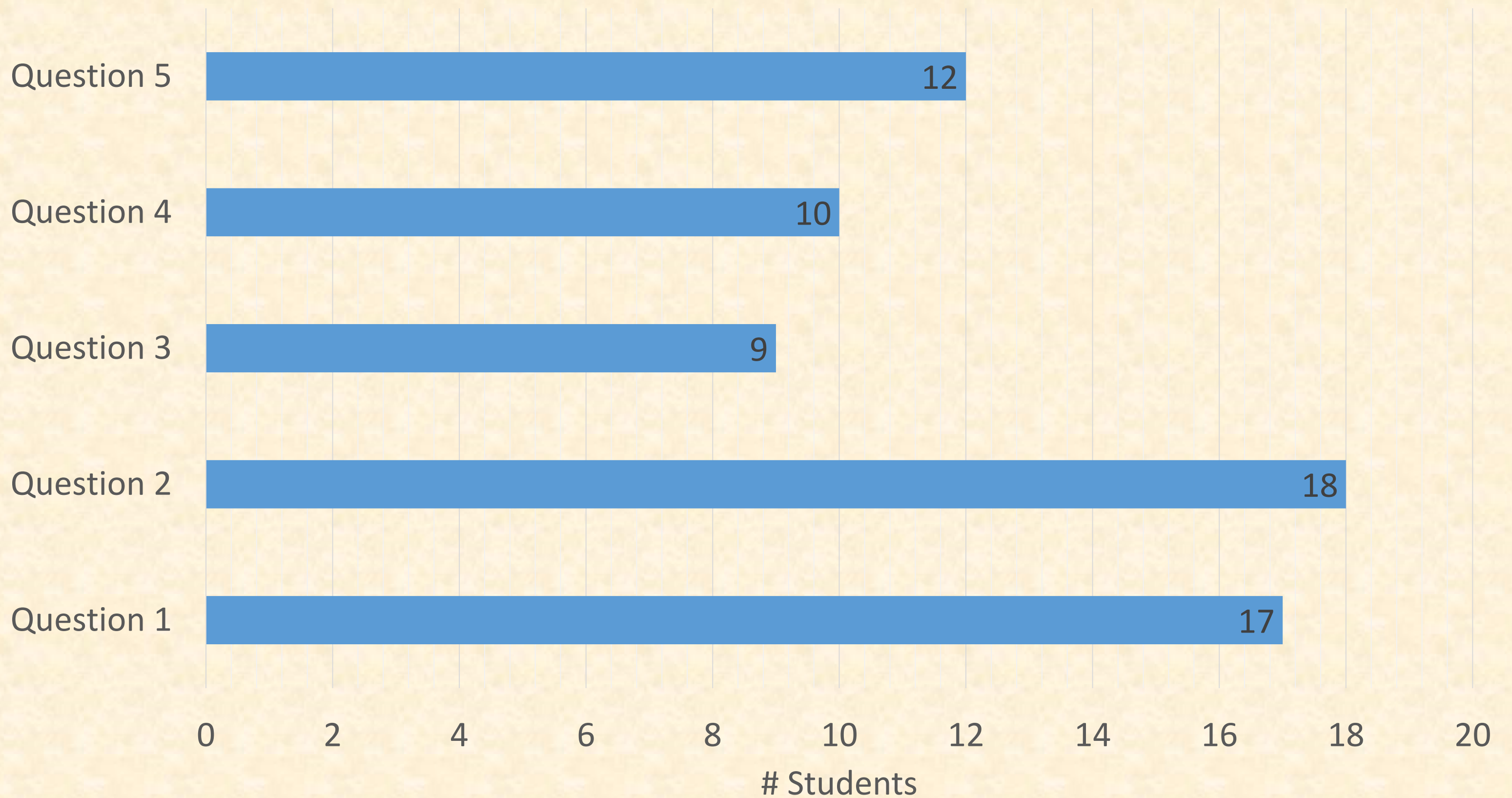
	Fall 2011	Fall 2012	Fall 2013	Fall 2015
Average	88.7	86.5	82.0	81.3
Standard deviation	10.86	12.64	18.04	14.6

Performance did not improve as expected due to factors listed in student survey

Assessment Technique

- Online Review Quiz

Students who achieved the correct answer for Q1-Q5 in their 1st attempt: Q5 is Shear Formula



Glitches with D2L online quiz and the format of the question it accepts.

Advantages of using the Interactive Flipped Classroom Module

A pilot was launched on LEARN for CIVE 204, the module focused on “Shear Stress Formula”

- Higher level analysis problems – Class participation 50% >>> 98% (after using interactive module)
- Feedback survey captured many positive comments from students
 - ✓ Can watch instructional videos at own pace and re-attempt questions
 - ✓ Large question broken down into sub questions helped identify errors
 - ✓ Successful prep prior to class lectures brought greater understanding about “shear stress” concepts
 - ✓ Loved the quizzes, forced us to prepare for class and not be behind on material. Also got direct feedback.
 - ✓ Class time was utilized for further questions and have discussions with the instructor

Setbacks of the pilot (Improvements to be done to the model)

- ✓ Had some glitches with LEARN that we had to fix while implementing it
- ✓ More examples in the video resources
- ✓ Develop a handout that will be available for the students (similar to other course content)
- ✓ Need more than one person available during the problem activity solving in class
- ✓ Inability to ask questions while watching videos
 - ✓ Add online discussion forum with real time to allow for asking questions

Acknowledgement

- **Centre for Teaching Excellence (CTE)**
 - ✓ LITE (Learning Innovation & Teaching Enhancement) seed grant of ~ \$5000
 - ✓ Guidance and support with LEARN – Samar Mohamed
- **Samanthi Sooriyabandara – Accreditation Assistant CEE Department**
 - ✓ Created the Interactive online module template on LEARN
 - ✓ Created a user guide and flowchart of interactive module
- **Eleanor Mak- Graduate Student**
 - ✓ Created the video resources and quizzes for the interactive module
- **Talodabioluwa Abikoye- Undergraduate Student**
 - ✓ Created example video resources and handout

Questions?

Thank You!