PREPARING THE UNDERPREPARED STEM STUDENTS FOR SUCCESS

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WHO ARE UNDERPREPARED STUDENTS?

- These are students that lack basic skills in at least one of the three areas of reading, writing, or mathematics (Tritelli, 2003).

- The American Association of Colleges and Universities (AAC&U) reports that 53% of students entering our colleges and universities are underprepared (Tritelli, 2003).

INTRODUCTION

- Many higher education institutions report record breaking enrollments as “75% of high school graduates get some postsecondary education within two years of receiving their diploma (Ramaley et al., 2002).
- Today, older adults enroll in record numbers as learning has become a life-long endeavor.
- As enrollment numbers increase, so do the number of underprepared students.

▸ How do we identify underprepared "STEM" students in our classrooms?

Unprepared STEM students can be identified through any of the following assessments:

- Placement Test
- In-Class Practice Problems
- First Quiz
- First Homework Assignment
- First Test

WHAT ARE COLLEGES/UNIVERSITIES DOING TO ARREST THE SITUATION OF UNDERPREPARED STUDENTS?

Some colleges/universities have the following measures in place to help increase the success rate of underprepared students.

It Includes:

- Developmental and college preparatory courses that will help lay the foundation for college level work
- Academic advising
- Tutoring services.

WHAT ARE WE DOING AS INSTRUCTORS TO INCREASE THE SUCCESS RATE OF UNDERPREPARED STUDENTS?

It Includes:

- Increase relevance
- Group work
- Real-life based project assignment
- Some flip classroom.

1. Increase Relevance

Common Questions from Students

What am I “gonna” use this for?

What’s this have to do with my career?

- Dictionary Definition-(Relevant): Bearing upon or connected with the matter in hand (http://dictionary.reference.com/browse/relevant).

- Whatever is relevant is important and worth knowing.

- Relevance is important to teaching and learning because it is directly related to students' engagement and motivation (Frymier & Schulman, 1995; Martin & Dowson, 2009)

EXAMPLE

Find the median of the data below:

20, 15, 12, 27, 13, 19, 13, 21.

EXAMPLE

One of the goals of medical research is to develop treatments that reduce the time spent in recovery. Eight patients undergo a new surgical procedure, and the number of days spent in recovery for each is as follows:

20, 15, 12, 27, 13, 19, 13, 21.

Find the median time spent in recovery.

EXAMPLE

Compute the mean of the data below:

117, 116, 121, 118, 113, 116, 112, 111.

EXAMPLE

A chemical engineer wishes to analyze temperature measurements from eight mixing tanks. Below are the temperature measurements from each of the tanks: **117, 116, 121, 118, 113, 116, 112, 111.**

Compute the mean temperature from these eight tanks.

BENEFITS OF INCREASING RELEVANCE

- It emphasize the importance that content has for the students' future.
- It explain to your student how the content fits into their plans for the future.
- It helps students to realize that the content is not just interesting but also worth knowing.

2. GROUP WORK

- In a group work, two or more students come together to analyze a problem by applying concepts and sharing ideas and opinions.
- It is normally more productive, creative, and motivated than working individually.
- I recommend solving 2 problems on a concept with the class and then assign the third problem as a group work in class. Divide the class into groups of 4 or 5 students.

Example 1-Instructor Leading Discussion of a Problem

You're an analyst for Ford. You want to find out if the average miles per gallon of Escorts is at least 32 mpg. Similar models have a standard deviation of **3.8** mpg. You take a sample of **60** Escorts & compute a sample mean of **30.7** mpg. At the **.01** level of significance, is there evidence that the miles per gallon is **less than** 32?

Example 2-Instructor Leading Discussion of a Problem

At a large company, the attitudes of workers are regularly measured with a standardized test. The scores on the test range from 0 to 100, with higher scores indicating greater satisfaction with their job. The mean score over all of the company's employees was 74, with a standard deviation of $\sigma = 8$. Some time ago, the company adopted a policy of telecommuting. Under this policy, workers could spend one day per week working from home. After the policy had been in place for some time, a random sample of 80 workers was given the test to see whether their mean level of satisfaction had changed since the policy was put into effect. The sample mean was 76. Assume the standard deviation is still $\sigma = 8$. Can we conclude that the mean level of satisfaction is different since the policy change at the $\alpha = 0.05$ level?

EXAMPLE 3 - GROUP WORK

The mean height of adult men in the U.S. is 69.7 inches, with a standard deviation of 3 inches. A sociologist believes that taller men may be more likely to be promoted to positions of leadership, so the mean height μ of male business executives may be greater than the mean height of the entire male population. A simple random sample of 100 male business executives has a mean height of 69.9 in. Assume that the standard deviation of male executive heights is $\sigma = 3$ inches. Can we conclude that male business executives are taller on the average than the general male population at the $\alpha = 0.05$ level?

BENEFITS OF GROUP WORK

- Positive group work experience have been shown to contribute to student learning, retention and overall college success (Austin, 1997; Tinto, 1998; National Survey of Student Engagements, 2006).
- Refine understanding through discussion and explanation.
- Develop stronger communications skills.
- Pool knowledge and skills.
- Give and receive feedback on performance.
- Develop new approaches to resolving differences.

3. REAL-LIFE BASED PROJECT ASSIGNMENT

- Project-based learning or real-life based project is an innovative approach to learning that teaches a multitude of strategies critical to success (Bell, 2010).
- It make students drive their own learning through inquiry, as well as work collaboratively to research and create projects that reflects their knowledge (Bell, 2010).

ILLUSTRATION

- "An Applied Problem in an Introductory Statistics Course", *Proceedings of the American Statistical Section on Statistical Education* (Jobe, 1988).

BENEFITS OF REAL-WORLD BASED PROJECTS

- Real-life based projects motivate students and encourages them to be more active.
- It inspire students to obtain a deeper knowledge of the subject matter.
- With real-life based projects, students are more likely to retain the knowledge gained more than through the traditional textbook-centered learning (Railsback, 2002).
- Real-life based projects make students develop confidence and self-direction.

4. SOME FLIPPED CLASSROOM

- A flipped classroom is a form of blended learning where the lecture is moved outside the classroom with the help of technology and learning activities are moved inside the classroom (Kiat & Kwong, 2014).

- Classroom becomes a place to work through problems, advance concepts, and engage in collaborative learning (Tucker, 2012)
- Students work through problems and engage in active collaborative learning in the classroom(Kiat & Kwong, 2014).

FLIPPED CLASSROOM ASSIGNMENT

Assuming we want to flip the following sampling methods:

- Stratified Random Sampling
- Simple Random Sampling
- Cluster Sampling
- Systematic Sampling
- Convenience Sampling
- Judgment Sampling.

PROCESS

- Post the video/lecture online.
- Divide the class into 6 groups.
- Students watch videos individually and then group meet outside of class to discuss the content of the video/lecture before the day of the class.
- On the day of class, one particular sampling method will be assign to a group to demonstrate to the class how well they understood the concepts laid out in the lecture/video. Illustrative examples are required.
- Each presenting group will answer one question from the other groups.

BENEFITS OF THE FLIPPED CLASSROOM

- A flipped classroom allows students to learn on their own time and at their own pace.
- Students can view or listen to lectures multiple times.
- It allows face-to-face class time to be better utilized to enhance interaction, and collaboration.
- More class time is devoted to application of concept.

CONCLUSIONS

- Increasing relevance emphasize the importance that content has for the students' future.
- Positive group work experience have been shown to contribute to student learning, retention and overall college success(Austin, 1997; Tinto, 1998; National Survey of Student Engagements, 2006).
- With real-life based projects, students are more likely to retain the knowledge gained more than through the traditional textbook-centered learning (Railsback, 2002).
- Flipped classroom allows face-to-face class time to be better utilized to enhance interaction, and collaboration.

THANK YOU!!!

QUESTIONS?

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