Computer Science Department

Department Meeting: Friday, 08/19/2020, 2:15 pm – 3:45 pm

| Faculty | Present | Absent | Excused |
|---|---|---|---|
| Dr. Deborah Johnson | | | X |
| Dr. George Kodsey | X | | |
| Professor Melinda Lyles | X | | |
| Dr. Mary Myers, Chair | X | | |
| Dr. Roger Webster | X | | |

| Staff/Guests |
|---|
| Barbara Perrine, Adjunct Professor |
| Kerry Cramer, Adjunct Professor |
| Todd Wilson, Adjunct Professor |
| Albert Nault, Academic Advisor |
| Judy Dantes, Instructional Assistant |
| Jennifer Baker, Associate Dean |

**Agenda**

I. Minutes approval 4/10/2020 Meeting
II. Computer Lab Updates
III. Tutoring for Fall
IV. TestOut Pilot
V. Curriculum Actions
VI. Canvas Updates
VII. General Education Syllabus Review - BAS
VIII. Effectiveness Plans
IX. New Business

**Meeting Minutes**

I. Meeting Minutes
    a. Minutes from April 2020 were reviewed
    b. Minutes approved
II. Computer Lab Updates
    a. The computer labs on Lee campus have been updated. K-128 has been refreshed. This will greatly enhance the ability to teach the newest technologies. Many thanks to Jill DeValk for her efforts to make this happen by fall semester.
III. Tutoring for Fall
    a. Judy Dantes will be tutoring in person for the fall term in K-103. If the number of people becomes too great, she will explore Zoom options. They are working on a reservation system for making tutoring appointments.
    b. Judy tutored all through summer via Zoom.

c. She can do any of the programming classes, CGS1100 and basic accounting.

IV. TestOut Pilot
   a. Dr. Lyles received permission from Dr. Psihountas to use the TestOut platform for her networking classes. We will use it this fall and evaluate its effectiveness.
   b. Dr. Myers is using it for one online section of CGS1100. TestOut provided the access codes for this pilot.
   c. The courses prepare students for certification exams.

V. Curriculum Actions
   a. A reminder that October 12 is the last date to submit new program proposals.
   b. November 9 is the last date for changes for AY 2021-2022.
   c. The department needs to look at the Topic Outlines and Course Outcomes on the syllabi to determine if updates/changes should be made. We will be dividing up the work.

VI. Canvas Updates
   a. There is a new, helpful feature in Canvas. On the Assignments page, you can now edit all due dates in the course in one place.

VII. General Education Syllabus Review – BAS
   a. Just as with the AS programs, now is the time to revisit the BAS syllabi to determine if any updates are needed to the course outcomes.

VIII. Effectiveness Plans
   a. The results of the plans were distributed to faculty.
   b. Two new faculty members stepped up and developed them last fall and their work is very much appreciated.
   c. SLO 1 - CTS 1131: Computer Hardware - Describe the primary hardware components.
      i. Data was not collected for this SLO. Part of that was because the faculty were not used to the system and what should be done.
      ii. This SLO will be revised and included in next year's plans.
      iii. Care will be taken to create an assessment that is robust and can be used to measure student comprehension.
   d. SLO1 – CNT1000
      i. The data was collected, but the items were shown to be too easy and did not discriminate.
      ii. The questions need to be revamped and include higher order questions
      iii. Dr. Lyles and Dr. Myers will work on this for the next round of assessment.
   e. SLO 2 - COP 2360: C# Programming I - Demonstrate Programming in the C# Programming Language.
      i. The assessment and scoring rubric is complete.
      ii. Dr. Webster will administer this assessment in fall 2020.
   f. SLO3 - COP 2362: C# Programming II - Develop modular complex software in the C# Programming Language.
      i. This was a tentative pilot for Spring 2020 in which an assignment will be to write a C# program to create a modular complex Windows Forms application to meet different specifications. These plans were not delivered to the assessment office in time to perform analysis due to the emergency transition because of the Covid-19 pandemic. This assessment will be reviewed and collected in fall 2020.

g. SLO3 – CGS2135: Introduction to Digital Forensics
    i. This course was taught by an adjunct, and the data was not collected.
    ii. This course needs to be revamped and is not an ideal candidate for assessment at this time. The entire Digital Forensics certificate will be reviewed and update.
h. SLO3 - CTS2321 - Demonstrate how to configure the infrastructure network services and Web based Linux Services
    i. The course was not offered in spring, so no study was completed.
i. For 2020-2021 – We will use next month's meeting to decide what we want to assess and how we will do it. We will focus on classes that have fall/spring (and ideally summer) sections in order to collect enough data to analyze.
j. CTS1133 - Formulate maintenance and security procedures for Windows Clients
    i. The questions are not complex, and need to be redeveloped to create better discrimination.

Meeting adjourned at 3:45 pm

# Computer Science Assessment Report Spring 2020

Author: Joseph F. van Gaalen, Ph.D., Asst. VP, IR, Assessment & Effectiveness

## 1 INTRODUCTION

Florida SouthWestern State College's Computer Science Department has employed common finals across multiple courses as a means of assessment in CNT 1000 *Computer Networking Essentials*, COP 2362 *C# Programming II*, CTS 1133 *Computer Software*, and CTS 2321 *Linux Internet Servers*. While there are chances for systematic differences when testing concepts in multiple choice questions as opposed to free-response questions, when properly authored, multiple choice questions can be an effective measure of student learning and comprehension (Ward et al., 1987).

The assessment outcomes are intended to provide a baseline achievement moving forward. Further, the study will investigate the strength and performance of items in the exam. The assessment plan also provides comparisons between dual enrollment (concurrent) and non-dual enrollment students, online versus traditional students, and by site, where possible. Where data is sufficient, additional analyses are provided including distribution studies and longitudinal studies.

For additional detail or further analysis not provided in this report, please contact Dr. Joseph F. van Gaalen, Asst. VP, IR, Assessment & Effectiveness, Academic Affairs (jfvangaalen@fsw.edu; x16965).

## 2 CNT 1000

### 2.1 ASSESSMENT ITEM ANALYSIS

Insight into the strength of the assessment questions offers information on student learning and helps to discriminate those students which have learned the material and those that did not (Ding and Beichner, 2009). Item analysis measures the difficulty of the question, attempts to define the capacity of the question to discriminate between higher achieving from lower achieving students, and the reliability of the questions for measuring common materials (Doran, 1980).

The CNT 1000 common assessment consists of 10 multiple choice questions embedded within a larger assessment. Item difficulty for each of these questions was calculated using standard practices whereby the higher the value the easier the question (Ding and Beichner, 2009). A score of 1 means responses from all test takers were correct responses while a score of 0 means none were correct responses. A score of 0.5 ought to be a goal for the assessment author such that the question is neither too easy, nor too hard, so as to effectively discriminate between students of robust knowledge and those lacking (Ding and Beichner, 2009; Doran, 1980). A more detailed interpretation of item difficulty is presented in Table 1.

| Difficulty | Range of Values |
|---|---|
| Very easy | 0.85 – 1 |
| Moderately easy | 0.60 – 0.85 |
| Moderately difficult | 0.35 – 0.60 |
| Very difficult | 0.00 – 0.35 |

*Table 1. Item difficulty interpretation as defined by Doran (1980).*

Figure 1 depicts item difficult results for the CNT 1000. The graph has a gradient such that questions calculated within the range of moderately easy to moderately difficult (see Table 1) fall in the green shaded region fading to red for questions that are deemed too easy (near 1) or too difficult (near 0). A total of 3 of 10 questions exhibit scores outside the range of what is typically defined as acceptable or reasonable, compared with 6/10 in fall 2019. Questions 3, 6, and 10 exhibit item difficulty categorized as 'too easy' according to literature (Doran, 1980). Question difficulty should match the intent of the test in conjunction with corresponding levels of both student and course level (Doran, 1980). Adjustments should be made with this in mind.

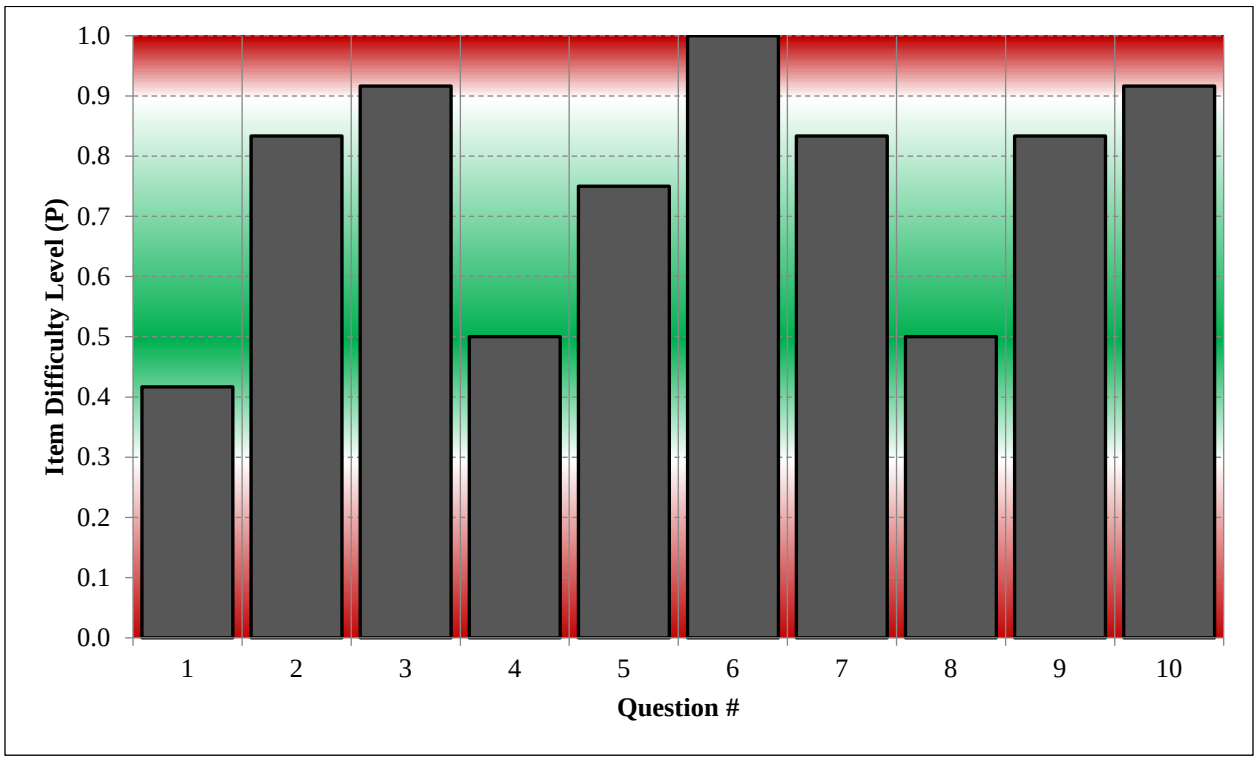


*Figure 1. Item difficulty results for CNT 1000 common assessment. Green depicts moderate questions with darker green being the generally accepted 0.5. Lighter green to red depicts questions progressively more difficult (near 0) or easier (near 1).*

An item discrimination index was calculated for each of the assessment questions. The item discrimination index measures performance of an item with respect to the most successful (upper quartile) and least successful (lower quartile) of the class. Results can be used to determine how well an item discriminates between high performing students and low performing students. This technique can be done using external quartiles (e.g. student overall course grade or some other performance representation) or internal (the overall score on the test in question). In this case, an internal criterion was used.

A generally accepted cutoff for valuing a question as adequately discriminating is 0.3, however, this cutoff is arbitrary and so whether a question is suitably discriminating or not is at the discretion of the test author (Doran, 1980). Table 2 presents a guide for discriminating question indices. Note that a negative discrimination index would mean the lower quartile of students is more likely to correctly answer the questions and so these, if they occur, should be closely examined immediately.

| Discrimination | Range of Values |
|---|---|
| Very strongly discriminating | > 0.6 |
| Strongly discriminating | 0.4 – 0.6 |
| Moderately discriminating | 0.2 – 0.4 |
| Weakly discriminating | 0.1 – 0.2 |
| Very weakly discriminating | 0 – 0.1 |

*Table 2. Item discrimination index interpretation (Doran, 1980).*

Figure 2 depicts item discrimination index results for CNT 1000. The graph has a gradient such that questions calculated as strong discriminators (see Table 2) fall in the green shaded region fading to white for moderate discriminators, and eventually to red for weak discriminators. A total of 2 of 10 questions exhibit discrimination index scores outside the range of what is typically defined as acceptable or reasonable, compared with 2/10 in fall 2019. Questions 6 and 10 are considered weakly discriminating according to the literature (Doran, 1980). Question 10 exhibits a negative index.

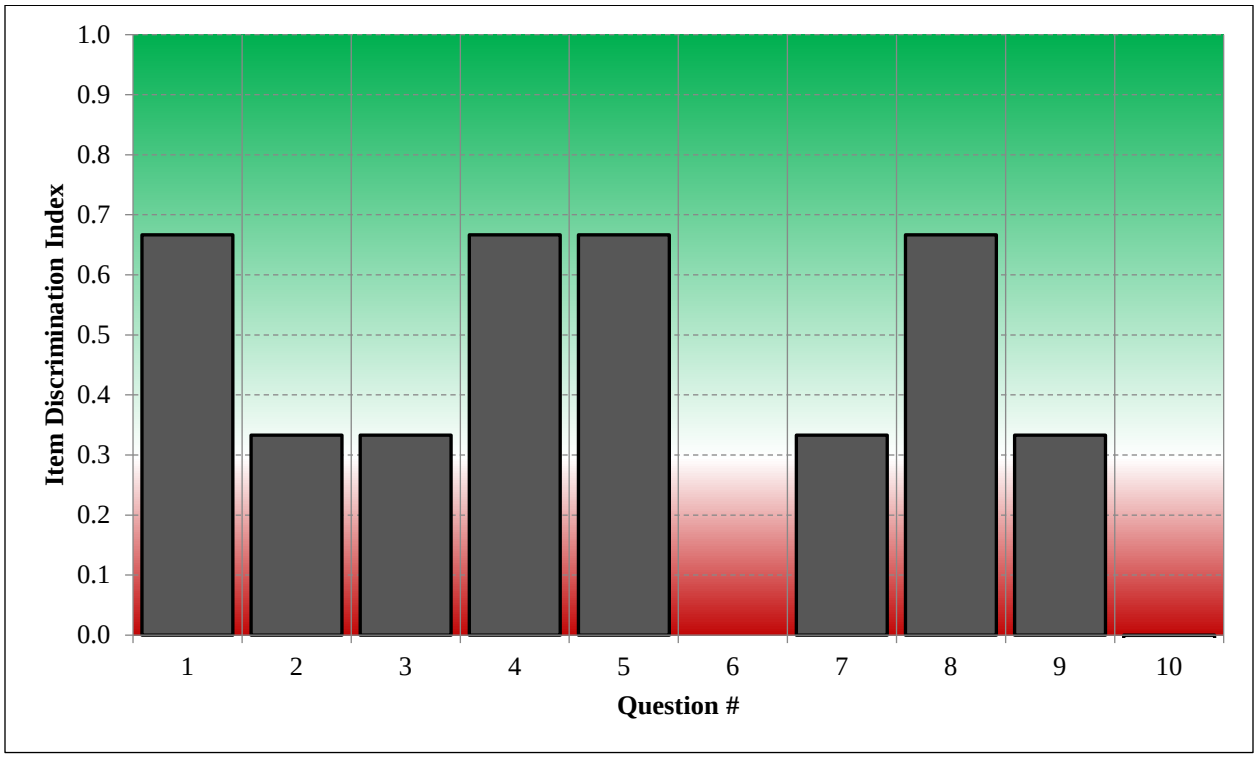


*Figure 2. Item discrimination index results for CNT 1000 common assessment. Green depicts stronger discriminators. White depicts moderately strong (>0.3) to moderately weak (<0.3) discriminators. Red depicts weak discriminators.*

Item discrimination indices are a measure of the discrimination of the correct option with respect to other options available yielding no information specific to any one discriminator themselves. Therefore, when reviewing discrimination index results with an eye towards revision it is important to review the nature of the distractors, in particular those items which may be questionable (Ding and Beichner, 2009;

Doran, 1980). Figure 3 and the associated Table 3 depict the percentage of response selection for each answer choice by question for the common assessment. A total of 1 of 10 questions exhibit a lower response rate for the correct response than for the 1st distractor, compared with 0/10 inf all 2019. Question 1 exhibits a lower response rate for the correct response than for the 1st distractor. Potential non-distractors exist in most questions, where less common distractors exhibit 2% response rate or less.

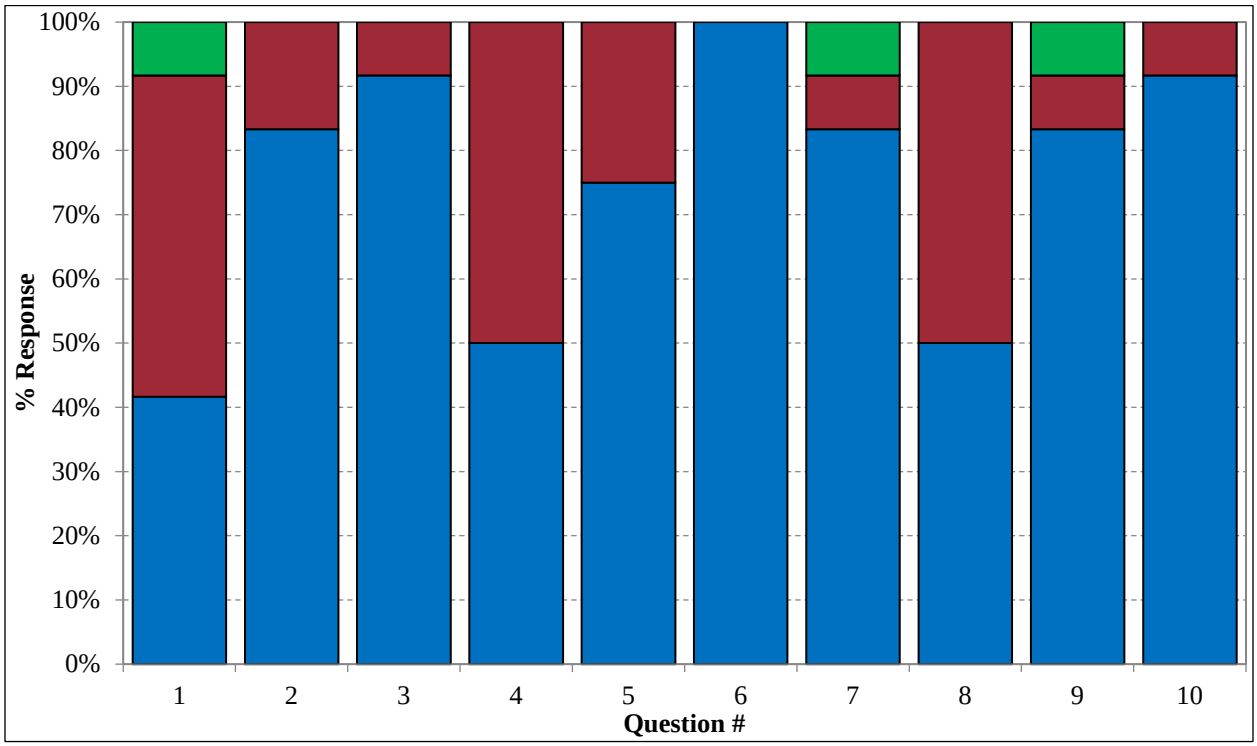


*Figure 3. Item response distribution for CNT 1000 depicting selection percentages of each response option for each question. Blue denotes correct responses, red the most commonly selected distractor, green the 2nd most commonly selected distractor, purple the 3rd most commonly selected distractor, and if applicable, light blue the least commonly selected distractor.*

| Q | Correct | 1st Distractor | 2nd Distractor | 3rd Distractor |
|---|---|---|---|---|
| **1** | C | A | B | D |
| **2** | A | B | C | D |
| **3** | A | B | D | C |
| **4** | B | A | D | C |
| **5** | B | A | C | D |
| **6** | D | A | C | B |
| **7** | C | A | D | B |
| **8** | B | A | C | D |
| **9** | A | B | D | C |
| **10** | A | B | D | C |

*Table 3. Response option for corresponding correct responses and distractors for CNT 1000. Cell colors reflect representation in Figure 3 above.*

In addition to item difficulty and discrimination index, a Point Biserial Index (PBI) was calculated for each of the assessment questions. The PBI measures the reliability of the item compared with score distribution (Ding and Beichner, 2009). In other words, a low PBI is indicative of an item either not testing the same material or not testing it in the same manner or level, since questions on the same test

ought to be testing material within the same domain as the other questions on that test. An item with a PBI of greater than or equal to 0.2 indicates the item is performing similar to that of its counterparts. A PBI lower than 0.2 indicates the material is not strongly linked with other items and may require review to ensure the efficacy of the question (Ding and Beichner, 2009).

Figure 4 depicts the PBI results for CNT 1000. The graph has a gradient such that questions calculated with strong reliability fall in the green shaded region fading to white for moderate to strong reliability, and eventually to red for weak reliability. A total of 2 of 10 questions exhibits a low PBI, compared with 2/10 in fall 2019. Questions 6 and 10 exhibits a low PBI meaning this version of the question may have limited reliability. Question 10 exhibits a negative PBI. Note that variability in question length, vocabulary, clarity, strength of distractors, potentially interconnected questions (clues for one question found in another), and option logic all have the potential to cause variability in PBI, should topical correlations exist (Suskie, 2004). A more thorough appraisal of the many considerations of writing a multiple choice and true/false assessment can be found on pages 200-211 of the Suskie (2004) work.

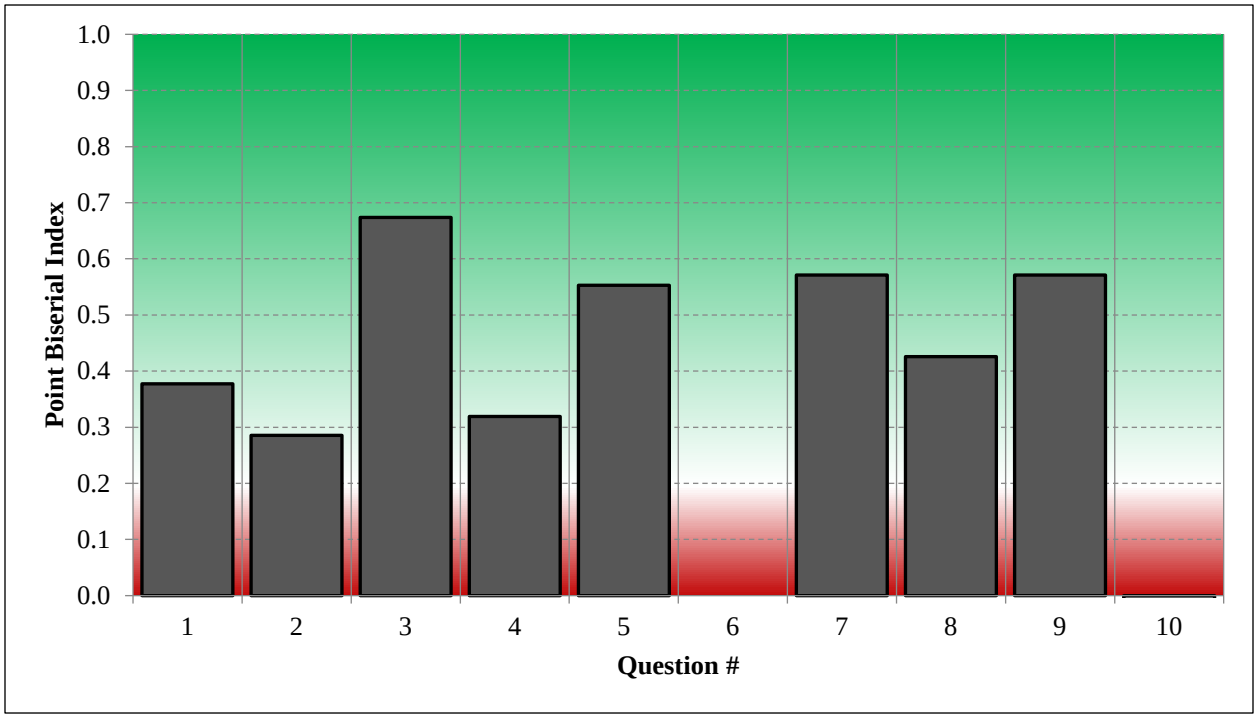


*Figure 4. Point Biserial Index (PBI) results for CNT 1000. Green shaded regions depict progressively stronger reliability. White shaded regions depict moderately strong reliability. Red shaded regions depict weak reliability.*

A full list of questions which scored poorly in each of the three item analyses is shown in Table 4. Questions 6 and 10 exhibit poor scorers in all three item analytics. Overall, 3/10 questions exhibit poor item difficulty scores, 2/10 questions exhibit poor item discrimination scores, and 2/10 exhibit poor PBI scores.

| Item | Item Difficulty | Item discrimination index | PBI |
|---|---|---|---|
| **Q3** | Too easy | | |
| **Q6** | Too easy | Weak | Low |
| **Q10** | Too easy | Weak | Low |

*Table 4. List of items that are outside the generally accepted scores of a strong multiple-choice question for CNT 1000.*

## 2.2 Descriptive Statistics and Learning Objectives

Using a common course assessment, the FSW Computer Science faculty defined 10 areas of interest in CNT 1000 for evaluation through 10 questions embedded in the final exam. The results will be used to measure achievement and conduct longitudinal studies toward goal setting for the 2020-21 academic year. The focus questions are:

1. What type of plan accounts for the worst-case scenarios, from a far-reaching hurricane to a military or terrorist attack?
2. A WAN link is a connection between one WAN site and another site.
3. What is a customer's endpoint device on a WAN is called?
4. PVCs are dedicated, individual links.
5. Broadband cable relies on the PSTN for transmission medium.
6. Which of the following types of communication occurs when the downstream throughput is higher than the upstream throughput?
7. Which of the following is used to convert T-Carrier frames into frames the LAN can interpret and vice versa?
8. An advantage of leasing a dedicated service over leasing a frame relay circuit is that you pay for only the amount of bandwidth required.
9. Which of the following attributes sets ATM apart from Ethernet and Frame Relay?
10. An advantage of SONET is its fault tolerance.

For the spring 2020 assessment, 12 artifacts were collected for CNT 1000 from 1 of 2 course sections in this assessment. One course section did not have the exam in the Learning Management System. The Descriptive statistics for achievement overall are shown in Table 5 and Figure 5. The mean score of each question is compared here. The distribution of scores is presented in Table 6 and Figure 6. Question 6 exhibits the highest mean score (at 100%) while Question 1 exhibits the lowest (42%). Artifact scores are centered on 7/10 and exhibit a moderate negative skew, meaning scores are tending somewhat towards higher values (Starkweather, 2010).

| ***Learning Outcome*** | ***Average % Correct*** |
|---|---|
| *1. What type of plan accounts for the worst-case scenarios, from a far-reaching hurricane to a military or terrorist attack?* | 42% |
| *2. A WAN link is a connection between one WAN site and another site.* | 83% |
| *3. What is a customer's endpoint device on a WAN is called?* | 92% |
| *4. PVCs are dedicated, individual links.* | 50% |
| *5. Broadband cable relies on the PSTN for transmission medium.* | 75% |
| *6. Which of the following types of communication occurs when the downstream throughput is higher than the upstream throughput?* | 100% |
| *7. Which of the following is used to convert T-Carrier frames into frames the LAN can interpret and vice versa?* | 83% |
| *8. An advantage of leasing a dedicated service over leasing a frame relay circuit is that you pay for only the amount of bandwidth required.* | 50% |
| *9. Which of the following attributes sets ATM apart from Ethernet and Frame Relay?* | 83% |
| *10. An advantage of SONET is its fault tolerance.* | 92% |

*Table 5. Student achievement level by question for CNT 1000.*

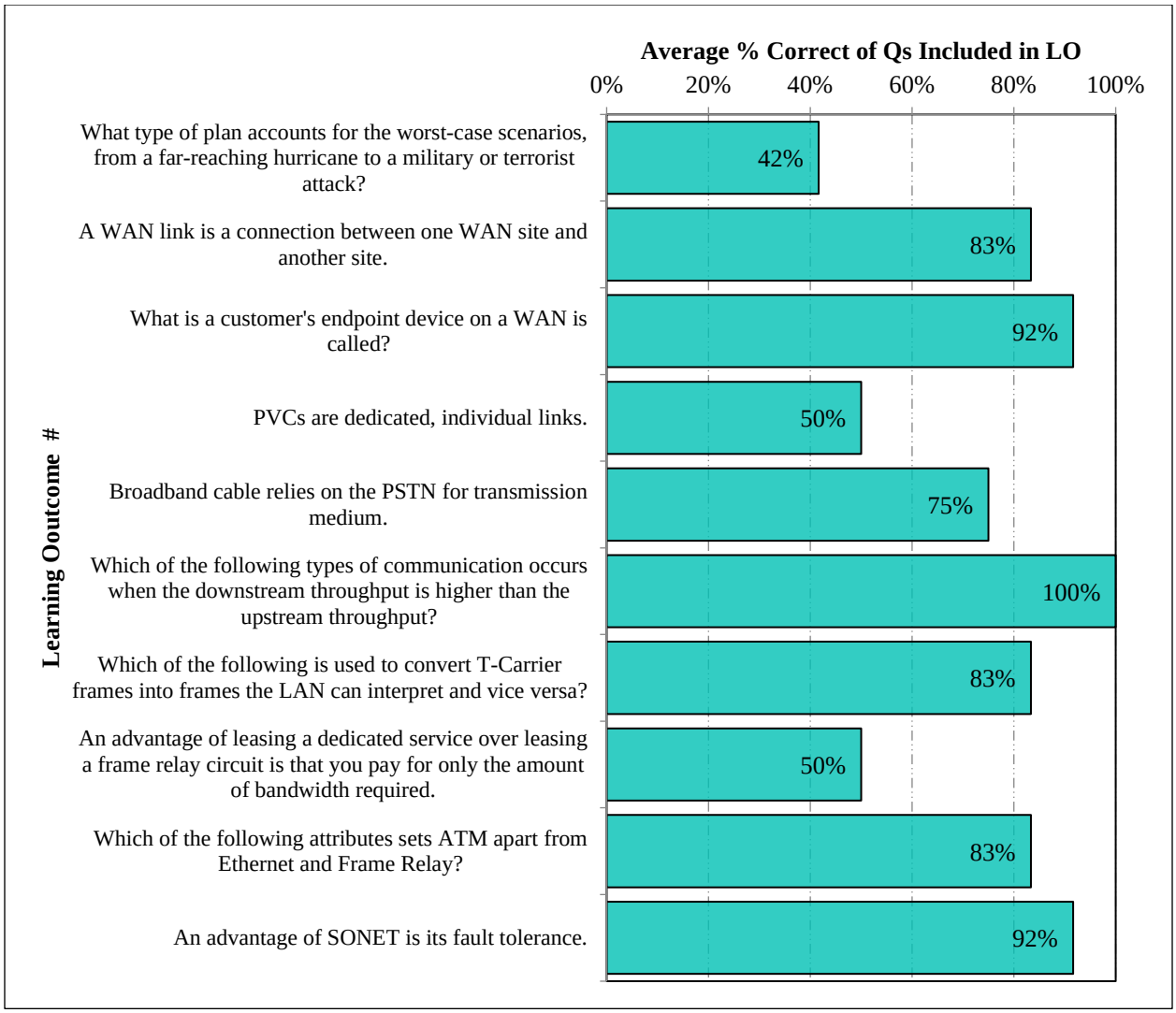


*Figure 5. Student achievement by question for CNT 1000.*

| *Maximum score* | *10* |
|---|---|
| n | 12 |
| Max | 10 |
| Min | 4 |
| Median | 7.5 |
| Mode | 7 |
| Mean | 7.5 |
| Standard deviation | 1.57 |
| Skewness | -0.68 |
| Kurtosis | 1.32 |

*Table 6. Descriptive statistics for CNT 1000 common course assessment.*

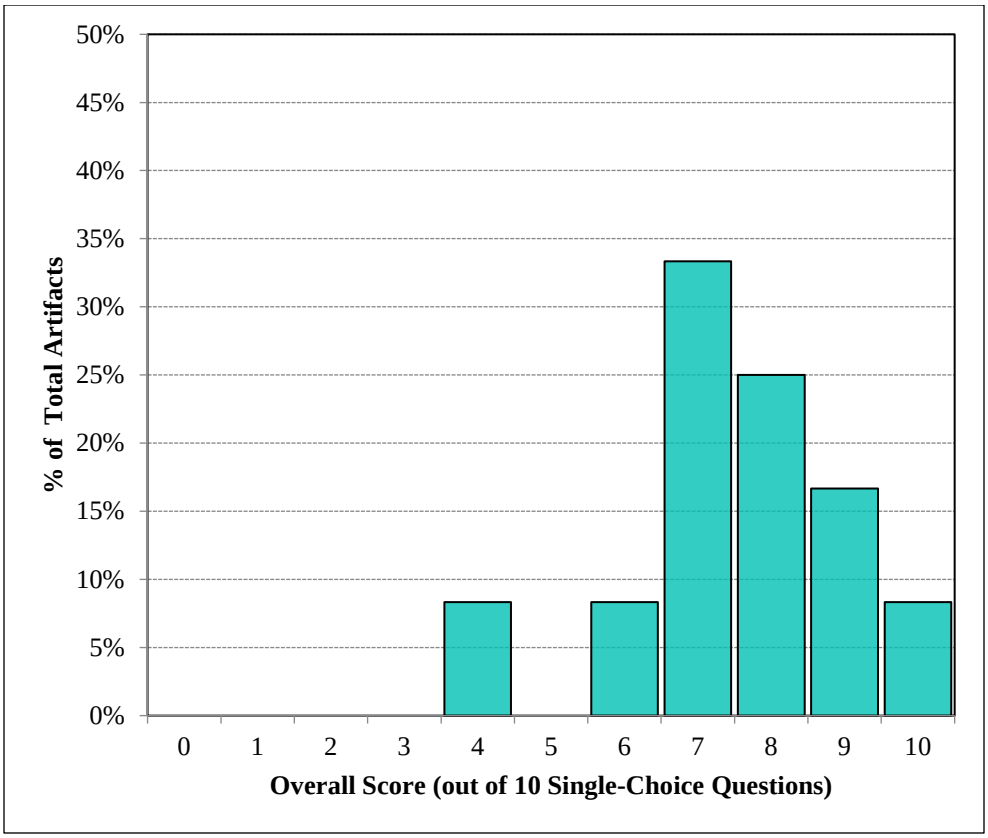


*Figure 6. Score distribution for CNT 1000 artifacts.*

## 2.3 Exploratory Analysis and Significance Testing

Multiple comparisons of artifact scores across varying formats, campuses, and student types were made, where possible, in order to add depth to the causes of the distribution of the artifacts. Each course was divided into the appropriate subgroups to perform the analysis. In cases where a subgroup is not represented in the course comparisons were not conducted and are noted for comprehensiveness.

### 2.3.1 Dual Enrollment to Non-Dual Enrollment Comparison

No dual enrollment sections of the course were offered in spring 2020 so no comparison study between dual enrollment and traditional sections could be completed.

### 2.3.2 Online to Traditional Comparison

While one online section of the course was run in spring 2020, no data was reported from this section, so no comparison study between online and traditional sections could be completed.

### 2.3.3 Comparison by Campus/Site

While two sites were represented in course offerings, data was only reported from one site, so no comparison by site could be completed.

## 2.4 LONGITUDINAL STUDY

### 2.4.1 Item Analysis

Item analysis results vary with the performance on an assessment. As such, it is necessary to review results over time for potential patterns or trends existing within the data as well as monitor any changes that may have resulted from alterations to the assessment questions. For brevity, detailed below in Table 7 are the common poor performing scores through time in item difficulty, discrimination index, and PBI. Questions 3 and 10 exhibit consistently poor scores in item analytics across terms.

| ***Q#*** | **Fall 2019** | **Spring 2020** |
|---|---|---|
| *Q2* | TE, W, L | |
| *Q3* | TE | TE |
| *Q5* | TE | |
| *Q6* | | TE, W, L |
| *Q7* | TE | |
| *Q9* | TE | |
| *Q10* | TE, W, L | TE, W, L |

*Table 7. List of items that are outside the generally accepted scores of a strong multiple-choice question for CNT 1000 for fall 2019 through the present. *TE – Too Easy, TD – Too Difficult, W – Weak discriminator, L – Low PBI.*

### 2.4.2 Data Distribution

Description of achievement over time in CNT 1000 is presented in Figure 7. Questions 3 and 10 are consistently the highest scoring. Question 4 is consistently the lowest scoring. Note that comparison from fall terms to spring terms is less useful as assessment reports across multiple course level and program level assessments at Florida SouthWestern State College typically exhibit substantial differences from fall to spring term and are better interpreted from fall-to-fall and spring-to-spring (see http://www.fsw.edu/facultystaff/assessment/history for further details). Overall score distribution has shifted negatively somewhat from the pilot in fall 2019 to the spring 2020 (Figure 8). However, sample size is still very small, so interpretation is limited.

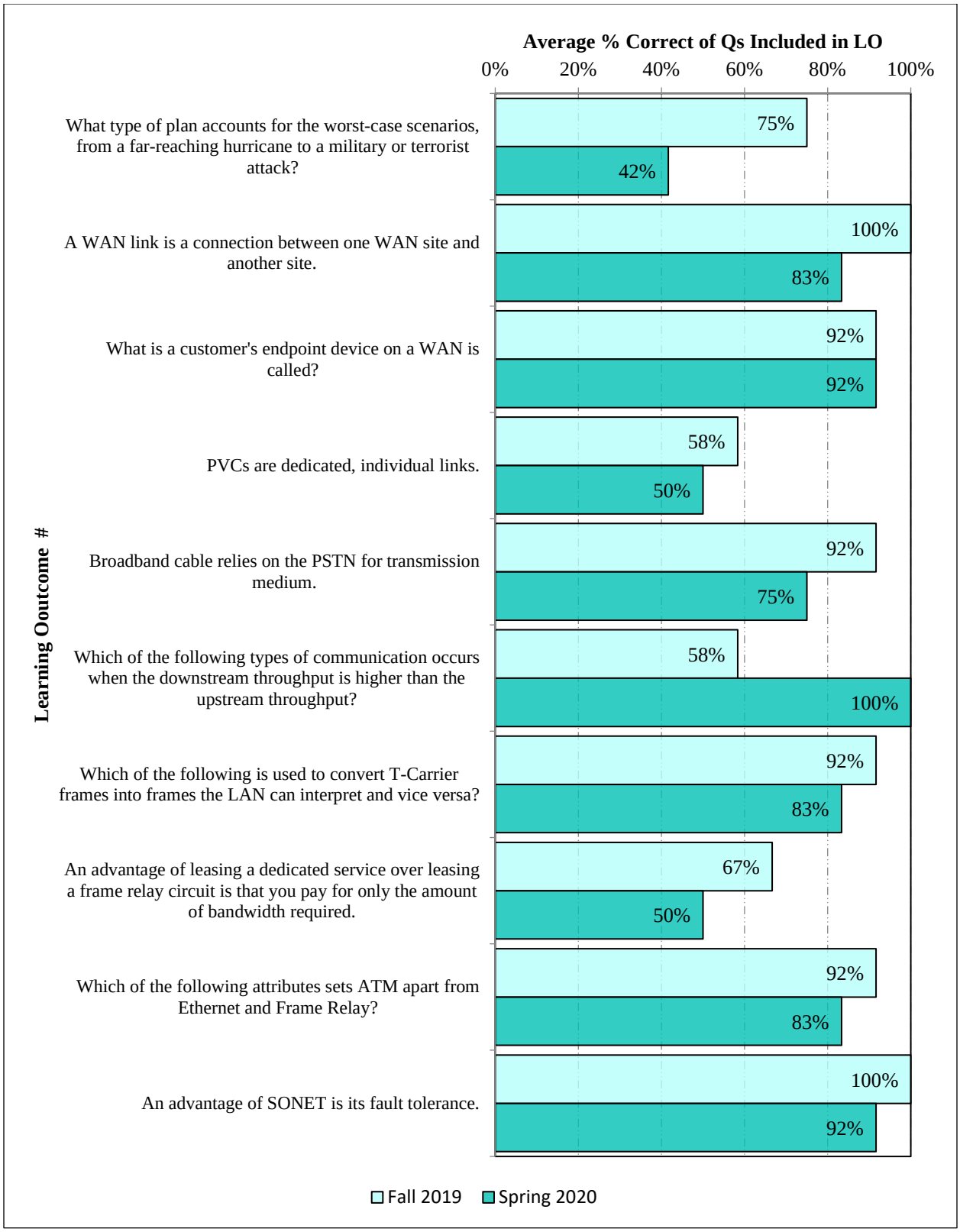


*Figure 7. Comparison of CNT 1000 assessment achievement over time.*

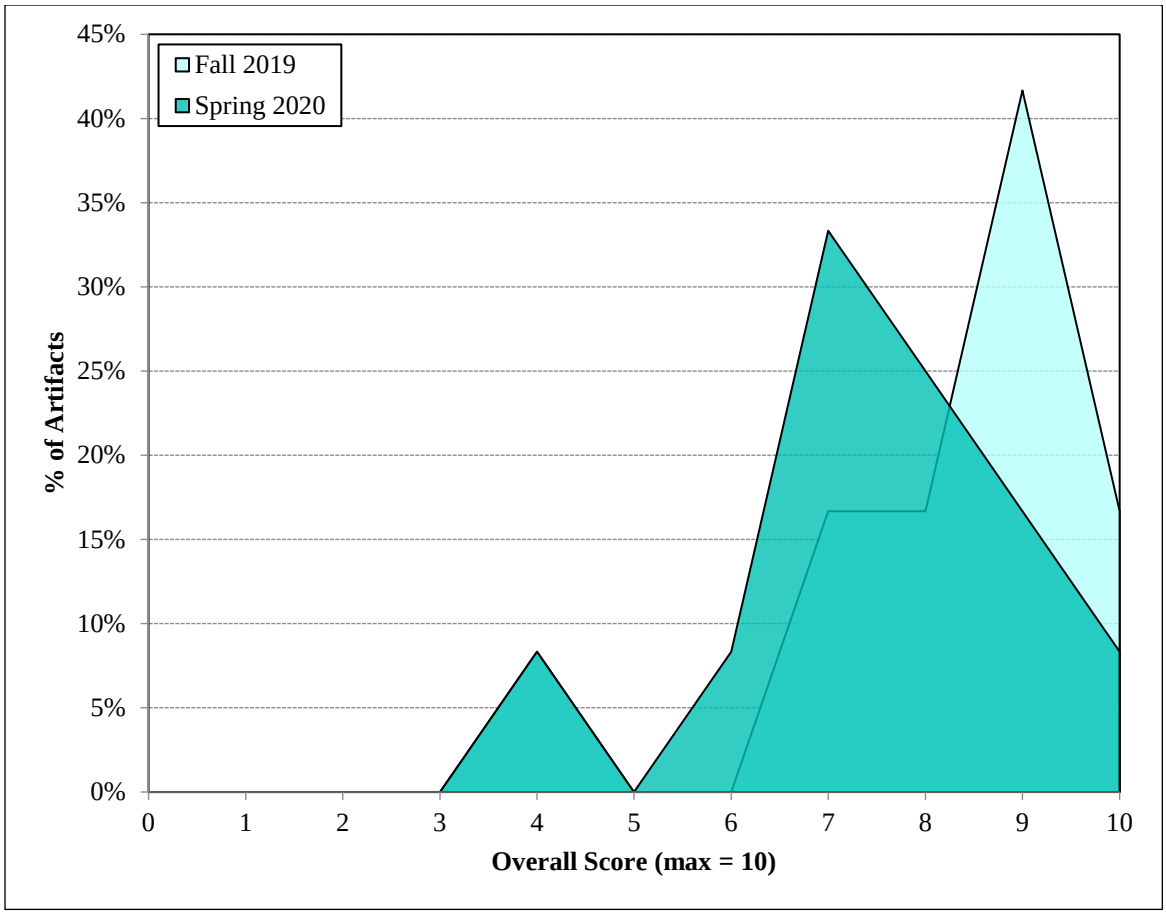


*Figure 8. Comparison of CNT 1000 score distribution over time.*

# 3 COP 2362

This was a tentative pilot for Spring 2020 in which an assignment will be to write a C# program to create a modular complex Windows Forms application to meet different specifications. These plans were not delivered to the assessment office in time to perform analysis due to the emergency transition as a result of the Covid-19 pandemic. This assessment will be reviewed for collected in fall 2020.

# 4 CTS 1133

## 4.1 Assessment Item Analysis

The CTS 1133 common assessment consists of 11 multiple choice. Item difficulty for each of these questions was calculated using standard practices whereby the higher the value the easier the question (Ding and Beichner, 2009). A score of 1 means responses from all test takers were correct responses while a score of 0 means none were correct responses. A score of 0.5 ought to be a goal for the assessment author such that the question is neither too easy, nor too hard, so as to effectively discriminate between students of robust knowledge and those lacking (Ding and Beichner, 2009; Doran,

1980). For a more detailed interpretation of item difficulty is presented in see Table 1 in Section 2.1. Figure 9 depicts item difficulty analysis results for CTS 1133. A total of 7 of 11 questions exhibit scores outside the range of what is typically defined as acceptable or reasonable, compared with 1/11 in fall 2019. Questions 1, 2, 4, 5, 9, 10, and 11 exhibits a high item difficulty score meaning it is deemed 'too easy' according to literature (Doran, 1980).

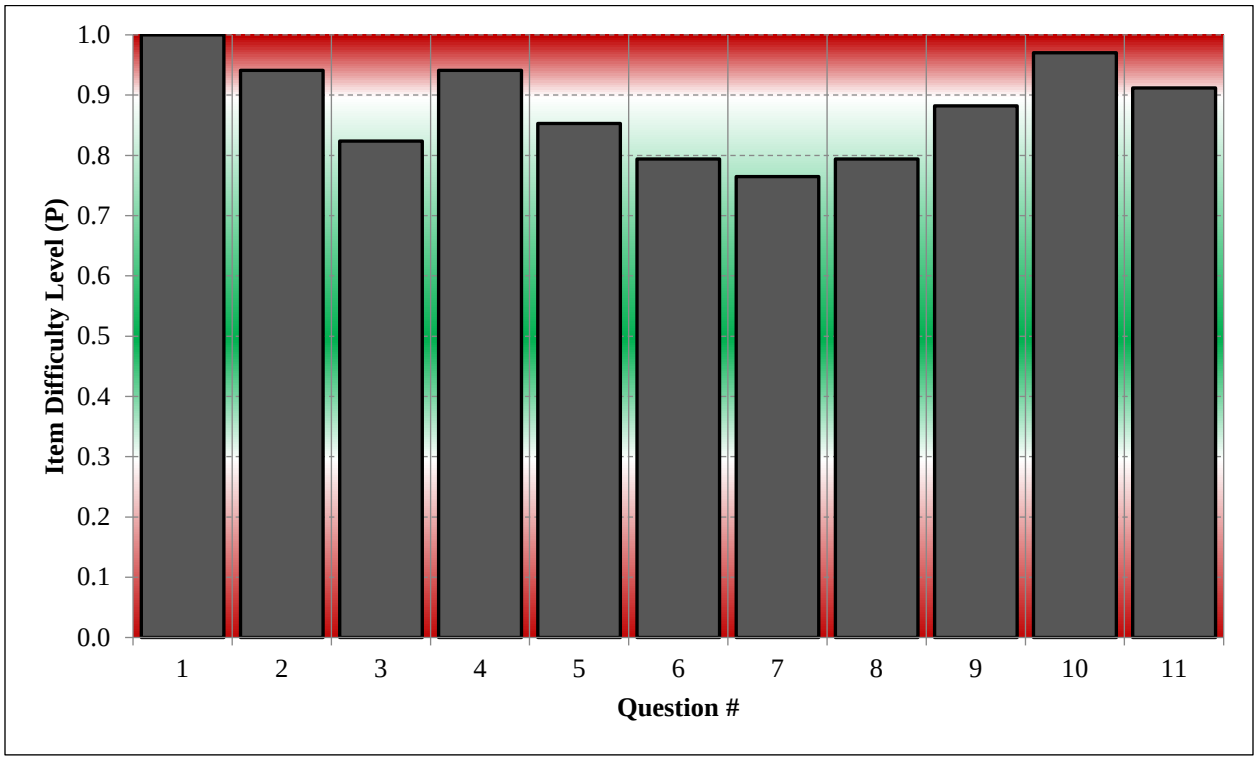


*Figure 9. Item difficulty results for CTS 1133 common assessment. Green shaded regions depict moderate questions with darker green centered on the generally accepted 0.5. Lighter green fading to red depict questions progressively more difficult (near 0) or easier (near 1).*

An item discrimination index was calculated for each of the assessment questions. An item discrimination index measures item performance with respect to the upper and lower quartile of the class. It effectively determines how well an item discriminates between high performing students and low performing students. For a description on the nature of what is considered a strong or weak discriminator index see Table 2 in Section 2.1.

Figure 10 depicts item discrimination index results for the CTS 1133. The graph has a gradient such that questions calculated as strong discriminators (see Table 2 in Section 2.1) fall in the green shaded region fading to white for moderate discriminators, and eventually to red for weak discriminators. A total of 5 of 11 questions exhibit discrimination index scores outside the range of what is typically defined as reasonable, compared with 0/11 in fall 2019. Questions 1, 2, 4, 10, and 11 exhibit a low discrimination index meaning they are considered weakly discriminating according to literature (Doran, 1980).

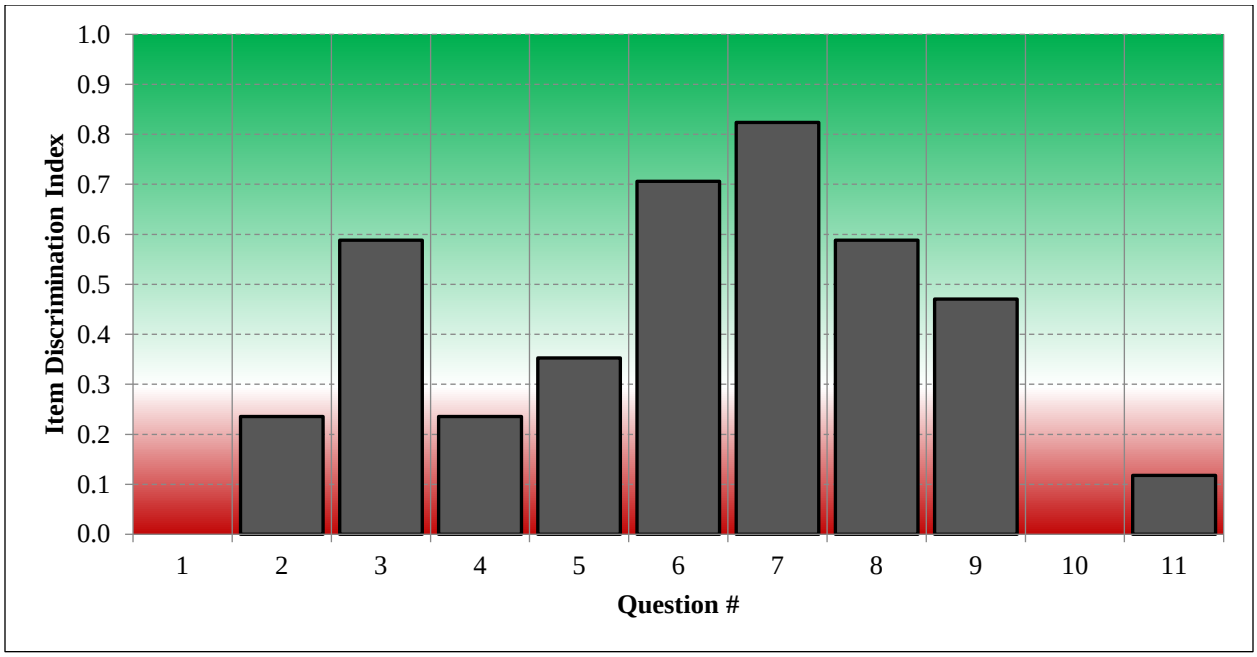


*Figure 10. Item discrimination index results for CTS 1133. Green depict progressively stronger discriminators. White depict moderately strong (>0.3) to moderately weak (<0.3) discriminators. Red depict weak discriminators.*

In support of the item discrimination study, a study comparing the rate of response for distractors for each question was completed. Figure 11 and the associated Table 8 depict the percentage of response selection for each answer choice by question. A total of 0 of 11 questions exhibit a greater response rate for the 1st distractor than the correct response, compared with 0/11 in fall 2019. No questions exhibit a greater response rates for the 1st distractor than the correct response.

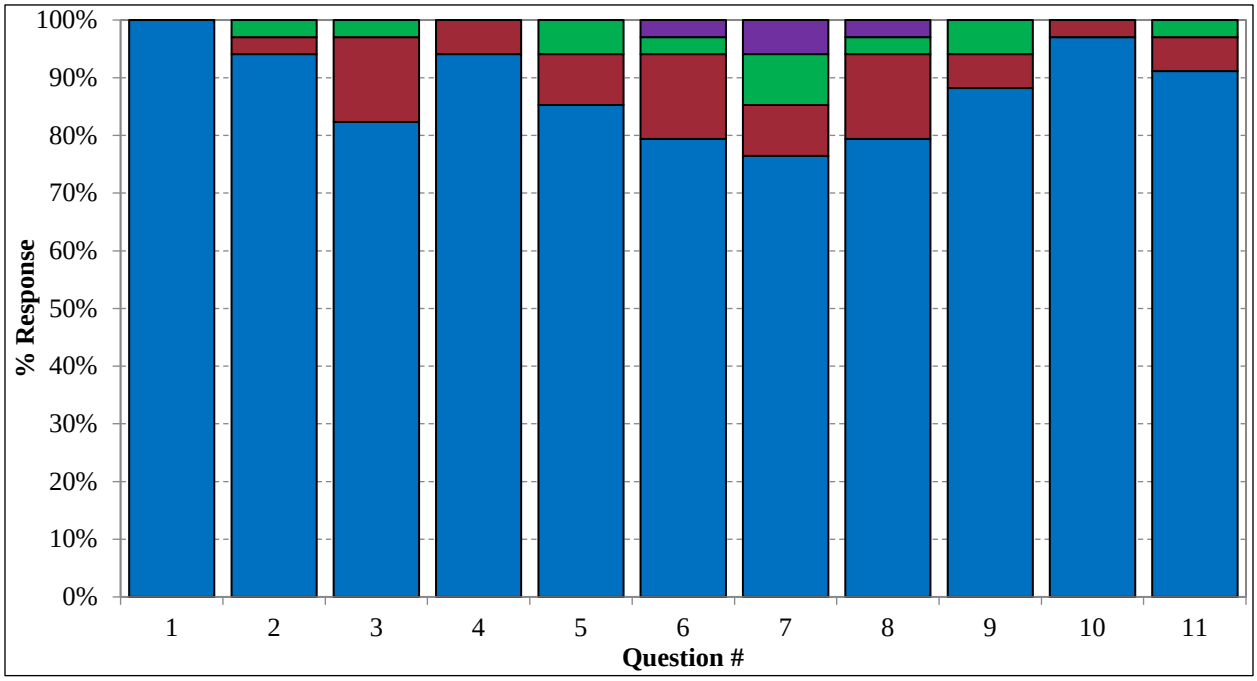


*Figure 11. Item response distribution for CTS 1133 depicting selection percentages of each response option for each question. Correct responses (blue), most commonly selected distractor (red), 2nd most common (green), and 3rd most common (purple).*

| Q | Correct | 1st Distractor | 2nd Distractor | 3rd Distractor |
|---|---|---|---|---|
| 1 | A | B | D | C |
| 2 | D | B | C | A |
| 3 | C | B | A | D |
| 4 | B | C | A | D |
| 5 | A | B | C | D |
| 6 | D | A | C | B |
| 7 | D | C | A | B |
| 8 | C | A | B | D |
| 9 | A | C | B | D |
| 10 | A | C | B | D |
| 11 | D | A | C | B |

*Table 8. Response option for corresponding correct responses and distractors for CTS 1133. Cell colors reflect representation in Figure 11 above.*

In addition to item difficulty and discrimination index, a PBI was calculated (Figure 12). An item with a PBI of greater than or equal to 0.2 (green shades) indicates the item is performing similar to that of its counterparts. A PBI lower than 0.2 (red shades) indicates the material is not strongly linked with other items and may require review to ensure the efficacy of the question (Ding and Beichner, 2009). A total of 2 of 11 questions exhibit PBI scores outside the range of what is typically defined as acceptable or reasonable, compared with 0/11 in fall 2019. Questions 1 and 10 exhibit a low PBI meaning this version of the question may have limited reliability.

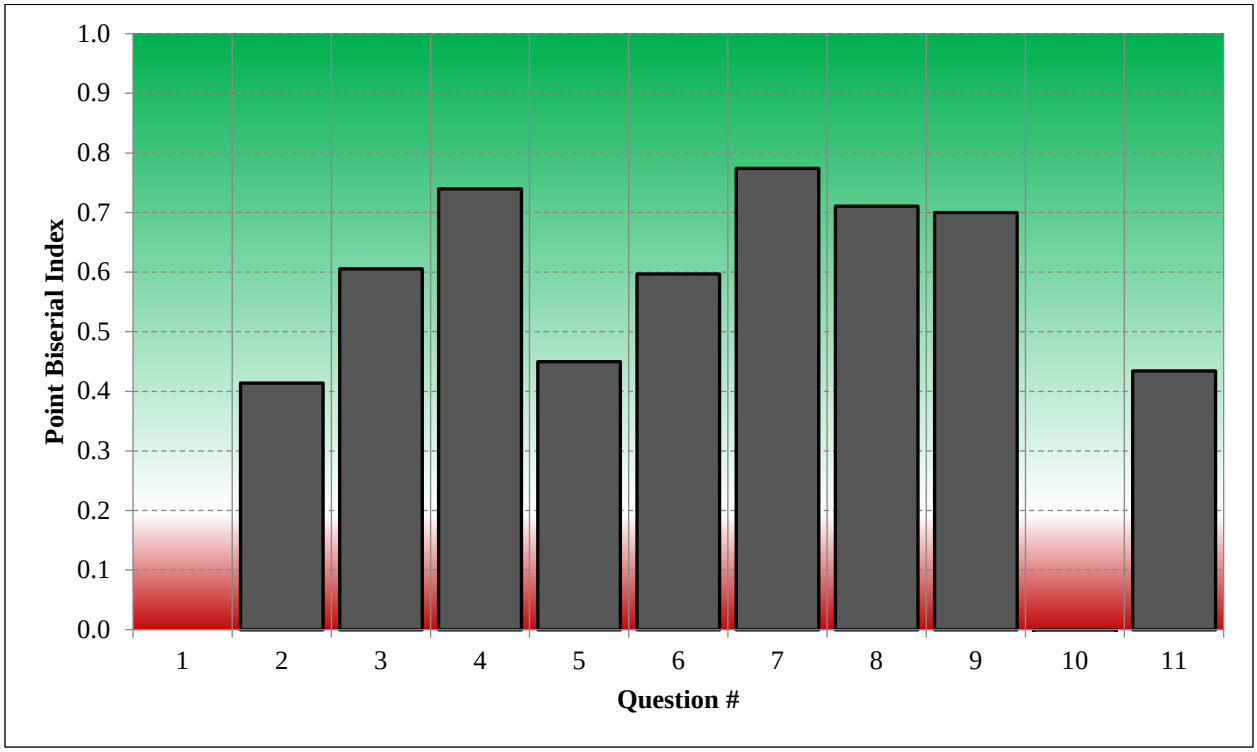


*Figure 12. Point Biserial Index (PBI) results for CTS 1133. Green shaded regions depict progressively stronger reliability. White shaded regions depict moderately strong reliability. Red shaded regions depict weak reliability.*

A full list of questions which scored poorly in each of the three item analyses is shown in Table 9. Questions 1 and 10 exhibit poor scores in all three item analytics. Questions 2, 4, and 11 exhibit poor

scores in two of three item analytics. In total, 7/11 questions score poorly in item difficulty, 5/11 score poorly in discrimination index, and 2/11 score poorly in PBI.

| Item | Item Difficulty | Item discrimination index | PBI |
|---|---|---|---|
| **Q1** | Too easy | Weak | Low |
| **Q2** | Too easy | Weak | |
| **Q4** | Too easy | Weak | |
| **Q5** | Too easy | | |
| **Q9** | Too easy | | |
| **Q10** | Too easy | Weak | Low |
| **Q11** | Too easy | Weak | |

*Table 9. List of items that are outside the generally accepted scores of a strong multiple-choice question for CTS 1133.*

## 4.2 Descriptive Statistics, Learning Outcomes, and Objectives

Using a common course assessment, the FSW Computer Science faculty defined 11 areas of interest in CTS 1133 for evaluation through 11 questions embedded in the final exam. The results will be used to measure achievement and conduct longitudinal studies toward goal setting for the 2020-21 academic year. The focus questions are:

1. Several computers in your organization are being used from within the building after hours when the company is closed. Your manager has asked you to configure the computers to limit access to business hours. Which of the following steps can be taken to limit access to the computers?
2. You recently created several new user accounts in the Sales OU and configured them with the appropriate group membership, logon scripts, and printer access. Except for one new sales employee, all employees are actively using the account. The remaining employee will be using the account within the next two weeks. What is best practice for the remaining unused account?
3. A technician, who was signed into a windows computer as local administrator, accessed the Local Security Policy console and changed the Lock Screen timeout from 10 minutes to 60 minutes. After the technician completed the change, the user signed into AD and discovered that the setting had reverted to 10 minutes. What can the technician do to keep the setting from reverting from 60 to 10 minutes?
4. While performing disk and file maintenance on the company file server, you determine a user in the accounting department has been accidentally saving documents to all shared folders on the file server. The user's computer was recently passed to her from another user in the company, and according to the company policy, the user should have access only to the accounting share. Which of the following best describes this situation?
5. You are having difficulty changing permissions for a folder on an NTFS volume that was created by another user. How can you best solve this issue without losing data in the folder?
6. An administrator is assigning Windows user accounts to user groups based on the user's role and notices the built-in Power Users group. What is the purpose of the Power Users group in Windows 7 and later?
7. A Windows 10 user is copying a file from the C:\data folder to the E:\data folder. The C: drive is formatted with NTFS, and the D: drive is formatted with FAT 32. What happens to the permissions of the file on the D:\ drive when copied?

8. A Windows 10 Home user is attempting to encrypt the contents of a folder on a volume formatted with NTFS. The user contacted you to ask why the option encrypt the folder is disabled. What is the most likely reason the encryption option is disabled?
9. Your computer has a single HDD formatted with NTFS with the following data folders: C:\Documents & C:\Pictures. You create a new child folder under the C:\Documents folder. What term describes the permissions the new folder automatically attains from the C:\Documents folder?
10. Which of the following best meets the requirements of a strong password?
11. Which of the following security settings can best help minimize brute force attacks on local user account passwords?

For the spring 2020 assessment, 34 artifacts were collected for CTS 1133 from 2 of 3 course sections. One online section did not report data. Descriptive statistics for achievement overall are shown in Table 10 and Figure 13. The mean score of each question is compared here. The distribution of scores is presented in Table 11 and Figure 14. Question 1 exhibits the highest mean score (100%) while Question 7 exhibits the lowest (76%). Artifact scores are centered on 11/11 and exhibit a large negative skew, meaning scores are tending heavily towards higher values (Starkweather, 2010).

| ***Learning Outcome*** | ***Average % Correct*** |
|---|---|
| *1. Several computers in your organization are being used from within the building after hours when the company is closed. Your manager has asked you to configure the computers to limit access to business hours. Which of the following steps can be taken to limit access to the computers?* | **100%** |
| *2. You recently created several new user accounts in the Sales OU and configured them with the appropriate group membership, logon scripts, and printer access. Except for one new sales employee, all employees are actively using the account. The remaining employee will be using the account within the next two weeks. What is best practice for the remaining unused account?* | **94%** |
| *3. A technician, who was signed into a windows computer as local administrator, accessed the Local Security Policy console and changed the Lock Screen timeout from 10 minutes to 60 minutes. After the technician completed the change, the user signed into AD and discovered that the setting had reverted to 10 minutes. What can the technician do to keep the setting from reverting from 60 to 10 minutes?* | **82%** |
| *4. While performing disk and file maintenance on the company file server, you determine a user in the accounting department has been accidentally saving documents to all shared folders on the file server. The user's computer was recently passed to her from another user in the company, and according to the company policy, the user should have access only to the accounting share. Which of the following best describes this situation?* | **94%** |
| *5. You are having difficulty changing permissions for a folder on an NTFS volume that was created by another user. How can you best solve this issue without losing data in the folder?* | **85%** |
| *6. An administrator is assigning Windows user accounts to user groups based on the user's role and notices the built-in Power Users group. What is the purpose of the Power Users group in Windows 7 and later?* | **79%** |
| *7. A Windows 10 user is copying a file from the C:\data folder to the E:\data folder. The C: drive is formatted with NTFS, and the D: drive is formatted with FAT 32. What happens to the permissions of the file on the D:\ drive when copied?* | **76%** |
| *8. A Windows 10 Home user is attempting to encrypt the contents of a folder on a volume formatted with NTFS. The user contacted you to ask why the option encrypt the folder is disabled. What is the most likely reason the encryption option is disabled?* | **79%** |
| *9. Your computer has a single HDD formatted with NTFS with the following data folders: C:\Documents & C:\Pictures. You create a new child folder under the C:\Documents folder. What term describes the permissions the new folder automatically attains from the C:\Documents folder?* | **88%** |
| *10. Which of the following best meets the requirements of a strong password?* | **97%** |
| *11. Which of the following security settings can best help minimize brute force attacks on local user account passwords?* | **91%** |

*Table 10. Student achievement level by question for CTS 1133.*

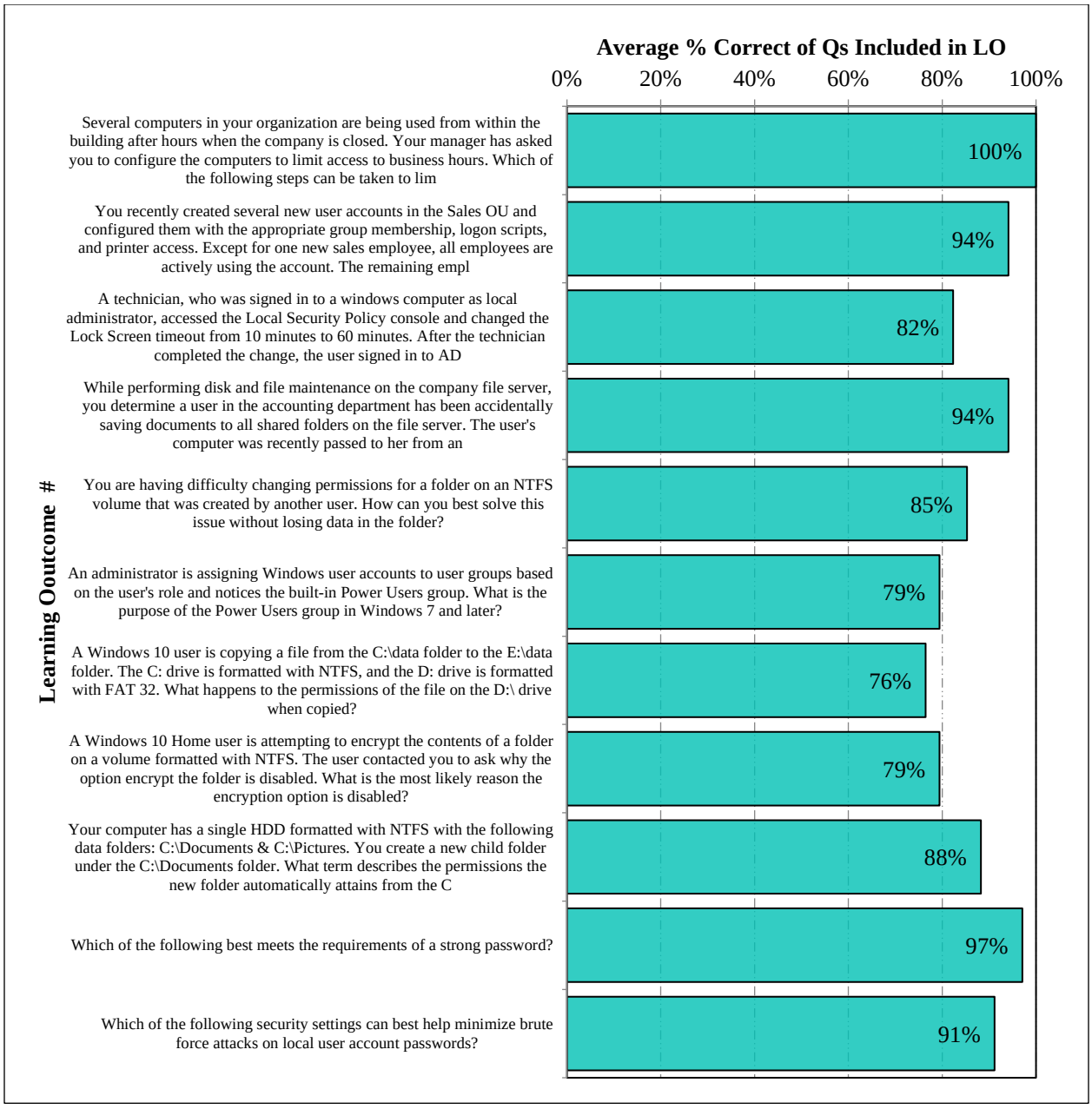


*Figure 13. Student achievement by question for CTS 1133.*

| *Maximum score* | *11* |
|---|---|
| n | 34 |
| Max | 11 |
| Min | 3 |
| Median | 11 |
| Mode | 11 |
| Mean | 9.7 |
| Standard deviation | 1.92 |
| Skewness | -1.83 |
| Kurtosis | 3.72 |

*Table 11. Descriptive statistics for CTS 1133 common course assessment.*

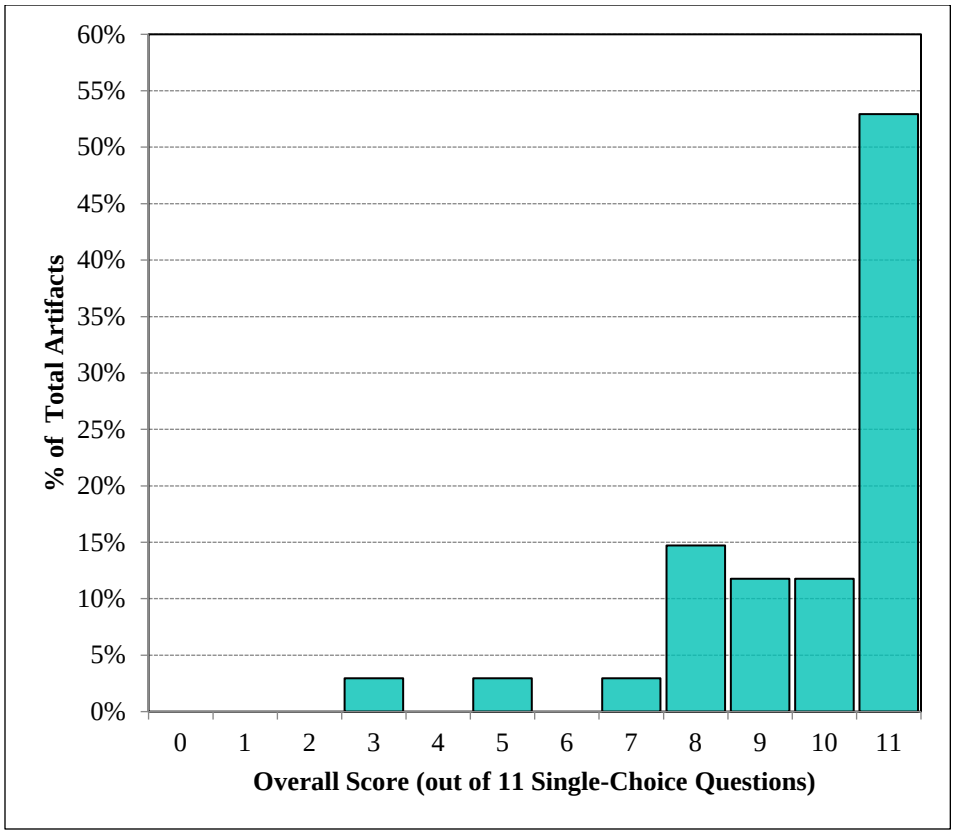


*Figure 14. Score distribution for CTS 1133.*

## 4.3 Exploratory Analysis and Significance Testing

Multiple comparisons of artifact scores across varying formats, campuses, and student types were made, where possible, in order to add depth to the causes of the distribution of the artifacts. Each course was divided into the appropriate subgroups to perform the analysis. In cases where a subgroup is not represented in the course comparisons were not conducted and are noted for comprehensiveness.

### 4.3.1 Dual Enrollment to Non-Dual Enrollment Comparison

No dual enrollment sections of the course were offered in spring 2020 so no comparison study between dual enrollment and traditional sections could be completed.

### 4.3.2 Online to Traditional Comparison

While one online section of the course was run during spring 2020, data was not reported from that section so no comparison study between online and traditional artifacts could be completed.

### 4.3.3 Comparison by Campus/Site

Because all collected data stems from one site, no comparison by site could be completed.

## 4.4 LONGITUDINAL STUDY

### 4.4.1 Item Analysis

Item analysis results vary with the performance on an assessment. As such, it is necessary to review results over time for potential patterns or trends existing within the data as well as monitor any changes that may have resulted from alterations to the assessment questions. For brevity, detailed below in Table 12 are the common poor performing scores through time in item difficulty, discrimination index, and PBI. Question 10 exhibits consistently poor scores in item analytics across terms. Questions 1, 2, 4, 5, 9, and 11 exhibit poor scores in item analytics in the first term following the pilot.

| *Q#* | Fall 2019 | Spring 2020 |
|---|---|---|
| *Q1* | | TE, W, L |
| *Q2* | | TE, W |
| *Q4* | | TE, W |
| *Q5* | | TE |
| *Q9* | | TE |
| *Q10* | TE | TE, W, L |
| *Q11* | | TE, W |

*Table 12. List of items that are outside the generally accepted scores of a strong multiple-choice question for CTS 1133 for fall 2019 through the present. *TE – Too Easy, TD – Too Difficult, W – Weak discriminator, L – Low PBI.*

### 4.4.2 Data Distribution

Description of achievement over time in CTS 1133 is presented in Figure 7. Most questions exhibit substantial increases in achievement from the pilot (fall 2019) to the first full term of study (spring 2020). Note that comparison from fall terms to spring terms is less useful as assessment reports across multiple course level and program level assessments at Florida SouthWestern State College typically exhibit substantial differences from fall to spring term and are better interpreted from fall-to-fall and spring-to-spring (see http://www.fsw.edu/facultystaff/assessment/history for further details). Overall score distribution has shifted greatly towards more positive values from the pilot to the first full term. Note the above regarding term achievement differences and sample size being small in fall 2019, so interpretation may be limited.

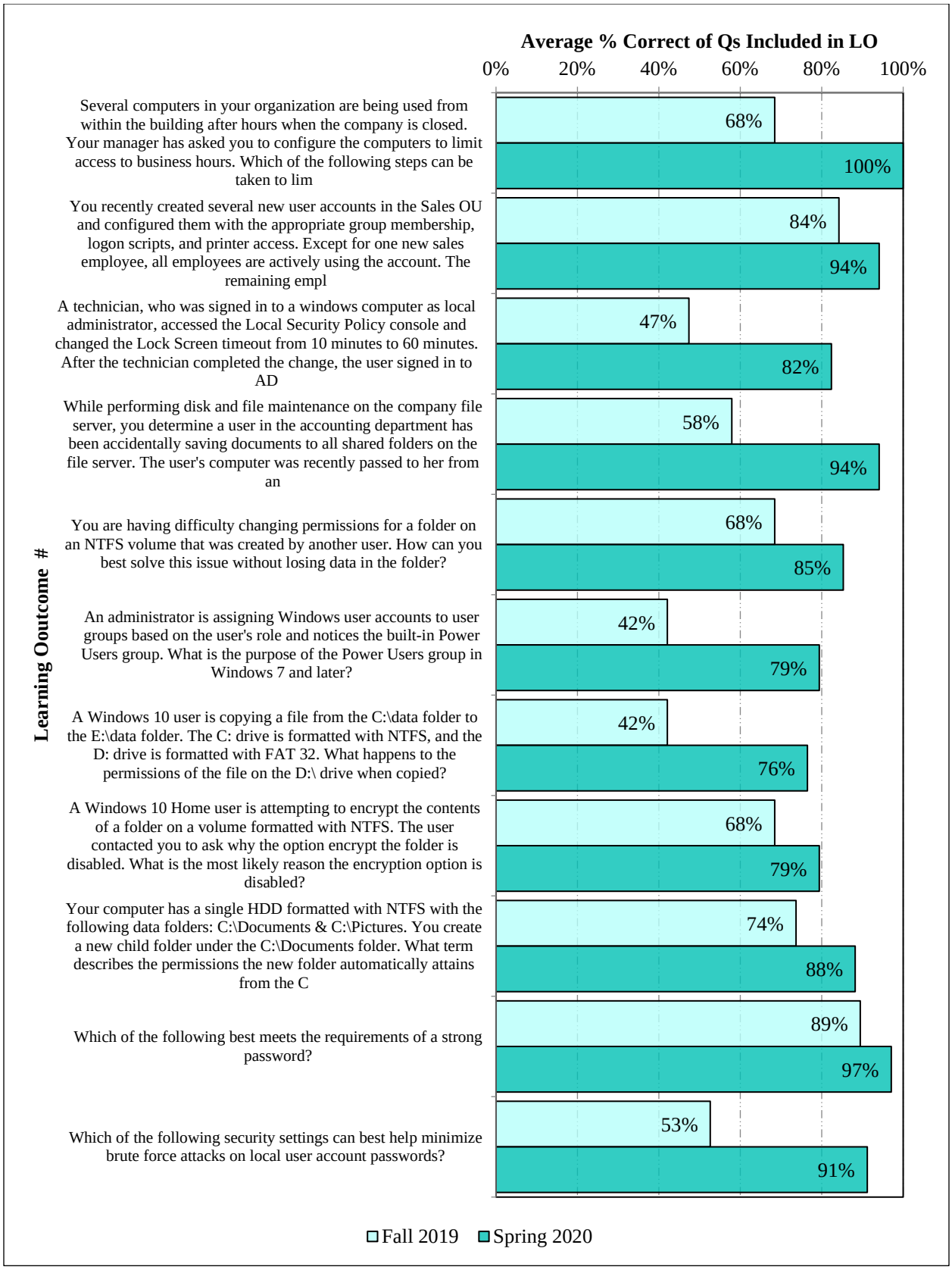


*Figure 15. Comparison of CTS 1133 assessment achievement over time.*

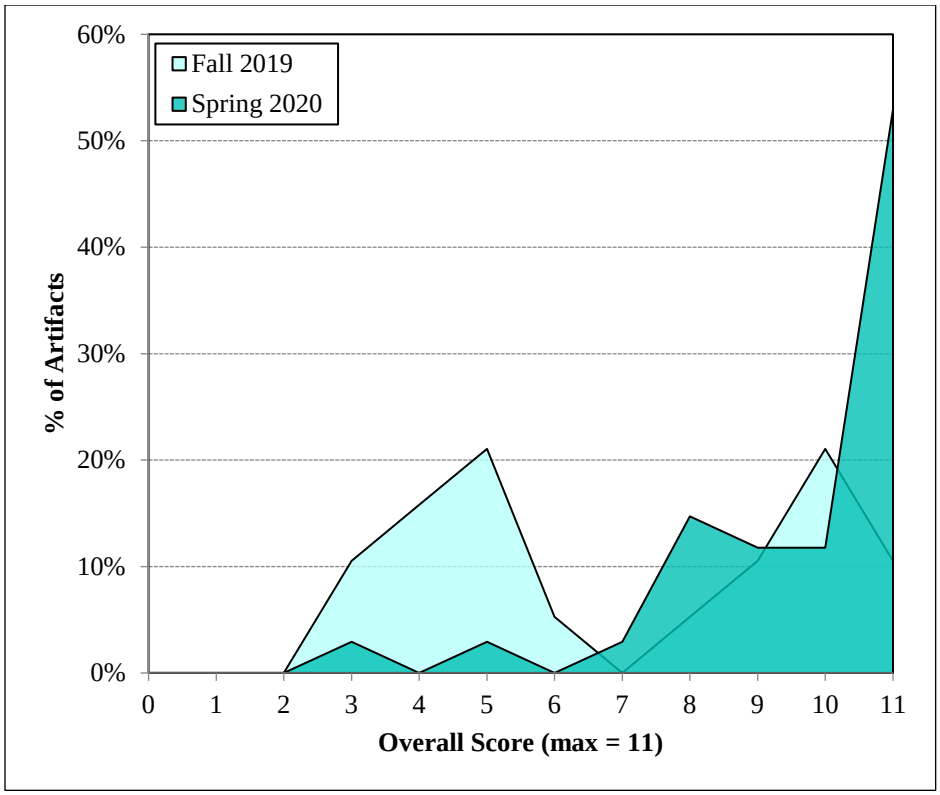


*Figure 16. Comparison of CTS 1133 score distribution over time.*

# 5 CTS 2321

No courses were run in spring 2020, so no study was completed.

# 6 CONCLUSIONS

FSW's Computer Science Department has employed common finals across multiple courses as a means of assessment in CNT 1000 *Computer Networking Essentials*, COP 2362 *C# Programming II*, CTS 1133 *Computer Software*, and CTS 2321 *Linux Internet Servers*. The results are intended to provide a baseline achievement moving forward as well as investigate the strength and performance of items in the exam.

## 6.1 CNT 1000

A drill-down of CNT 1000 results are as follows:

1. In an item analysis of the 10 questions in the common course assessment, a total of 3 of 10 questions exhibit scores outside the range of what is typically defined as acceptable or reasonable, compared with 6/10 in fall 2019. Questions 3, 6, and 10 exhibit item difficulty categorized as 'too easy' according to accepted standards.
2. In the same item analysis of the 10 questions, a total of 2 of 10 questions exhibit discrimination index scores outside the range of what is typically defined as acceptable or reasonable, compared with 2/10 in fall 2019. Questions 6 and 10 are considered weakly discriminating according to accepted standards. Question 10 exhibits a negative index.

3. In a study comparing response rate of correct answers and distractors, a total of 1 of 10 questions exhibit a lower response rate for the correct response than for the 1st distractor, compared with 0/10 inf all 2019. Question 1 exhibits a lower response rate for the correct response than for the 1st distractor. Potential non-distractors exist in most questions, where less common distractors exhibit 2% response rate or less.
4. In the same item analysis of the 10 questions, a total of 2 of 10 questions exhibits a low PBI, compared with 2/10 in fall 2019. Questions 6 and 10 exhibits a low PBI meaning this version of the question may have limited reliability according to accepted standards. Question 10 exhibits a negative PBI.
5. In a study of focus questions, Question 6 exhibits the highest mean score (at 100%) while Question 1 exhibits the lowest (42%).
6. Distribution of all artifacts is centered on 7/10 and exhibit a moderate negative skew, meaning scores are tending somewhat towards higher values.
7. No dual enrollment sections of the course were offered in spring 2020 so no comparison study between dual enrollment and traditional sections could be completed.
8. While one online section of the course was run in spring 2020, no data was reported from this section, so no comparison study between online and traditional sections could be completed.
9. While two sites were represented in course offerings, data was only reported from one site, so no comparison by site could be completed.
10. In a longitudinal study of item analysis, questions 3 and 10 exhibit consistently poor scores in item analytics across terms.
11. In a longitudinal study of achievement and data distribution, questions 3 and 10 are consistently the highest scoring. Question 4 is consistently the lowest scoring. Overall score distribution has shifted negatively somewhat from the pilot in fall 2019 to the spring 2020. However, sample size is still very small, so interpretation is limited.

## 6.2 COP 2362

This was a tentative pilot for Spring 2020 in which an assignment will be to write a C# program to create a modular complex Windows Forms application to meet different specifications. These plans were not delivered to the assessment office in time to perform analysis due to the emergency transition as a result of the Covid-19 pandemic. This assessment will be reviewed for collected in fall 2020.

## 6.3 CTS 1133

A drill-down of CTS 1133 results are as follows:

1. In an item analysis of the 11 questions in the common course assessment, a total of 7 of 11 questions exhibit scores outside the range of what is typically defined as acceptable or reasonable, compared with 1/11 in fall 2019. Questions 1, 2, 4, 5, 9, 10, and 11 exhibits a high item difficulty score meaning it is deemed 'too easy' according to accepted standards.
2. In the same item analysis of the 11 questions, a total of 5 of 11 questions exhibit discrimination index scores outside the range of what is typically defined as reasonable, compared with 0/11 in fall 2019. Questions 1, 2, 4, 10, and 11 exhibit a low discrimination index meaning they are considered weakly discriminating according to accepted standards.
3. In a study comparing response rate of correct answers and distractors, a total of 0 of 11 questions exhibit a greater response rate for the 1st distractor than the correct response,

compared with 0/11 in fall 2019. No questions exhibit a greater response rates for the 1st distractor than the correct response.

4. In the same item analysis of the 11 questions, a total of 2 of 11 questions exhibit PBI scores outside the range of what is typically defined as acceptable or reasonable, compared with 0/11 in fall 2019. Questions 1 and 10 exhibit a low PBI meaning this version of the question may have limited reliability according to accepted standards.
5. In a study of focus questions, Question 1 exhibits the highest mean score (100%) while Question 7 exhibits the lowest (76%).
6. Distribution of all artifacts are centered on 11/11 and exhibit a large negative skew, meaning scores are tending heavily towards higher values.
7. No dual enrollment sections of the course were offered in spring 2020 so no comparison study between dual enrollment and traditional sections could be completed.
8. While one online section of the course was run during spring 2020, data was not reported from that section so no comparison study between online and traditional artifacts could be completed.
9. Because all collected data stems from one site, no comparison by site could be completed.
10. In a longitudinal study of item analysis Question 10 exhibits consistently poor scores in item analytics across terms. Questions 1, 2, 4, 5, 9, and 11 exhibit poor scores in item analytics in the first term following the pilot.
11. In a longitudinal study of achievement and data distribution overall score distribution has shifted greatly towards more positive values from the pilot to the first full term. Note the above regarding term achievement differences and sample size being small in fall 2019, so interpretation may be limited.

## 6.4 CTS 2321

A drill-down of CTS 2321 results are as follows:

1. No courses were run in spring 2020, so no study was completed.

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