# NBCRNA
National Board of Certification *&* Recertification for Nurse Anesthetists

# SEE Evaluation Report

# Reporting Year 2020

## September 1, 2019 – December 31, 2020

**Introduction**

The calendar year 2020 marks the fourth year since the NBCRNA launched a reconfigured version of the Self-Evaluation Examination (SEE) on September 1, 2016. Compared with the previous version of the SEE exam, the revised SEE featured the following changes:

- Alignment of SEE content outline with the four primary domains of NCE outline.
- Increased test length from 160 to 240 questions to improve reliability and usefulness of domain-level scores.
- Increased time limit from three hours to four hours to accommodate the increased test length.
- Enhanced predictive capability with respect to future performance on the National Certification Examination (NCE).

The content outline for the SEE underwent an updating in May 2018 to reflect the revisions to the NCE content outline earlier that year.

In 2020, NBCRNA has transitioned to align its fiscal year (FY) to a calendar year (CY). To cover the transition period, this evaluation report includes all SEE takers from September 1, 2019 through December 31, 2020, which is labeled as the report year 2020 (RY2020 = 16 months). Future reports will be based on the calendar year.

**Score and Timing Summaries**

From September 1, 2019, through December 31, 2020 (RY2020), the SEE has been administered to 6,318 examinees. This reflects an increase over an equivalent period, even with the pandemic reduced testing capacity since March 2020.  There were 4,441 examinees in fiscal year 2019 (FY2019) and 4,190 in FY2018. Table 1 contains the average total scores for the SEE in RY2020, FY 2019, and FY2018. The average scores are comparable. The SEE average scores for all reported categories in this table are higher in RY2020 except for examinees in their first program year.

*Score Performance*

Table 1. Comparison of Average Scores, FY2018, FY2019 and RY2020 SEE by Year in Program

| Year in Program | SEE Average (SD) RY2020 | SEE Average (SD) FY2019 | SEE Average (SD) FY2018 |
|---|---|---|---|
| Year 1 | 399.4 (48.3) | 404.8 (45.0) | 393.0 (47.5) |
| Year 2 | 412.7 (46.5) | 409.7 (43.5) | 406.1 (44.1) |
| Year 3 and Up | 432.4 (39.1) | 424.7 (41.3) | 419.7 (41.4) |
| **Total** | **425.3 (43.0)** | **417.6 (43.1)** | **411.1 (44.0)** |

Tables 2 contain descriptive summaries, for the overall score and domain-level scores, by year in program. More detailed information, including percentile transformations, is available in the respective calendar year of 2019 and 2020 SEE Interpretive Guides on the NBCRNA website.

**Table 2.  SEE Overall and Domain-Level Scores by Year in Program, RY2020 (September 1, 2019 – December 31, 2020)**

| | 1st Year in Program | | 2nd Year in Program | | 3rd Year in Program | | All | |
|---|---|---|---|---|---|---|---|---|
| | Avg | SD | Avg | SD | Avg | SD | Avg | SD |
| Total | 399.4 | 48.3 | 412.7 | 46.5 | 432.4 | 39.1 | 425.3 | 43.0 |
| Basic Science | 396.8 | 57.3 | 414.2 | 54.0 | 430.1 | 46.4 | 424.2 | 49.9 |
| Equipment, Instrumentation and Technology | 404.3 | 54.7 | 415.9 | 50.5 | 437.1 | 45.2 | 429.5 | 48.4 |
| General Principles of Anesthesia | 406.1 | 53.9 | 412.5 | 50.6 | 432.1 | 44.2 | 425.2 | 47.5 |
| Anesthesia for Surgical Procedures and Special Populations | 394.1 | 47.6 | 411.6 | 50.4 | 433.1 | 44.7 | 425.3 | 47.9 |

*Timing Study*

The time limit for the SEE was set at four hours (240 minutes). The average total test time on the SEE in RY2020 was 174.3 minutes (about 2 hours and 54 minutes), with a standard deviation of 41.9. A total of 27 examinees reached the time limit before completing all questions on the examination. Total test times did not differ significantly based on students' Year in Program. This average testing time is comparable to what was observed in FY2019, 176.5 (44.0) minutes, and in FY2018, 174.3 (44.0) minutes. The number of examinees running out of time in RY2020 (n = 27) is, however, fewer than those in FY2019 and FY2018; that was 31 and 41, respectively.

**Reliability**

Reliability is a psychometric indicator that represents the precision of test scores. Reliability is often described conceptually as the extent to which the scores are free of systematic error. The lower the error, the more reliable the scores, and the more useful they will be to stakeholders. In the specific context of the SEE, more reliable scores will help educators and students better identify the specific domains that are areas of strength and weakness.

The reliability of domain-level information was computed for the SEE as a function of the standard error of measurement (SEM) and standard deviation (SD). Specifically, the formula is:

$$\rho = 1 - \frac{SEM^2}{SD^2}$$

The range of reliability is from 0 to 1, with higher values indicating higher reliability. Table 3 contains the score reliability information for overall and domain-level scores for the SEE from September 2019 through December 2020.

Table 3. SEE Total and Domain Score Reliability RY2020 (September 1, 2019 through December 31, 2020)

| Domain | Reliability Index |
|---|---|
| Basic Sciences | 0.78 |
| Equipment, Instrumentation and Technology | 0.76 |
| General Principles of Anesthesia | 0.76 |
| Anesthesia for Surgical Procedures and Special Populations | 0.76 |
| **Overall** | ***0.93*** |

Similar to those since FY2017, following the substantial revisions to the SEE in September 2016, the reliability of the overall scores improved from 0.83 to 0.93; the sub-score reliability increased as well. This improved reliability should help assure educators that the scores arising from the current SEE are reliable indicators of their students' knowledge. Thus, the assessment obtained by use of the SEE should be more helpful for identifying students' strengths and weaknesses and for aiding in planning future study and/or remediation.

**Predictive Validity**

One of the goals of the SEE reconfiguration was to improve its predictive validity. In other words, it was desirable that the SEE help educators understand how students would perform on future attempts of the NCE. Ideally, the educators would be assisted in identifying students who were "at risk" for failing the NCE.

A correlation study was undertaken to evaluate the predictive power of the SEE. Of the examinees who took the SEE in RY2020, 3,061 have also gone on to complete their first attempt at the NCE, sometime between September 1, 2019 and January 31, 2021. This sample provides a basis for comparing performance on the SEE to eventual performance on the NCE. Figure 1 displays an X-Y plot (scatterplot), in which each point represents an examinee's SEE score (horizontal axis) plotted against their first-attempt NCE score (vertical axis). A clear, positive correspondence exists between the SEE scores and the NCE scores. It should be noted that, however, as RY2020 saw more SEE takers in their third year of training than in previous years, both NCE and SEE scores were more homogeneous compared with those for previous cohorts.

The Pearson correlation between the two sets of scores was $r = 0.53$ (N=3,061). If we focus on examinees who had taken the SEE in their second or higher year of the program and at least two months prior to their first attempt at the NCE, the SEE–NCE correlation was higher at $r = 0.55$. This result represents a strong positive correlation between SEE performance and NCE performance. That is, about 31% of the variation in NCE scores can be explained solely by performance on the SEE.
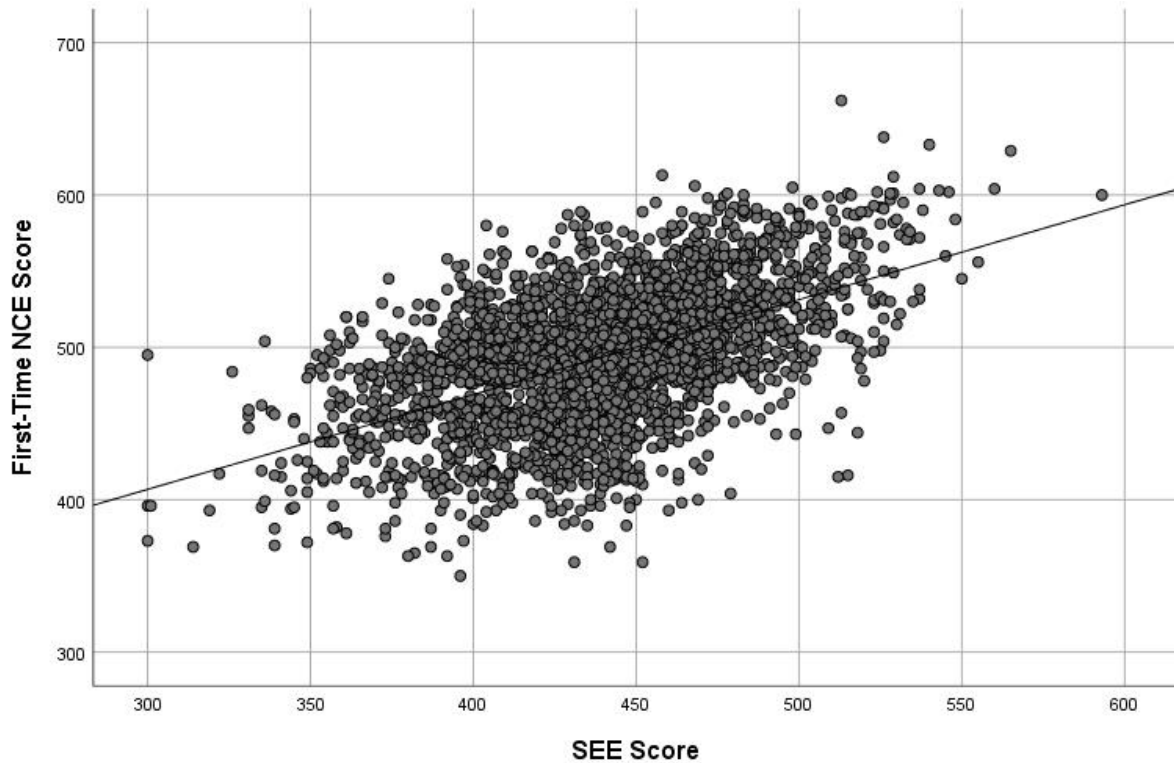
Figure 1. X-Y plot of RY2020 SEE Scores vs. First-time NCE Scores

Figure 2 displays two box-and-whisker plots, which can be understood as a top-down view of a normal (bell curve) distribution. The box plot on the left represents SEE scores for examinees who failed their first attempt of the NCE; the plot on the right represents those examinees who passed the NCE on their first attempt. The bold line at the center of each box represents the median (50th percentile) of the SEE score for either group. The top and bottom edges of the box represent the interquartile range (IQR), with the lower box-edge representing the 25th percentile, and the top box-edge representing the 75th percentile. The box thus represents the middle 50% of the scores in the distribution. The lines at the top and bottom of the "whiskers" represent 1.5 times the IQR, above and below the median. The few dots below or above the lines signify extreme values. Clearly, the mean SEE score for the eventual NCE passers is higher than the mean for the NCE non-passers. However, there were some degree of overlap between the two score distributions. The centers of the passing group and of the failing group became closer to each other compared with those of the previous years.
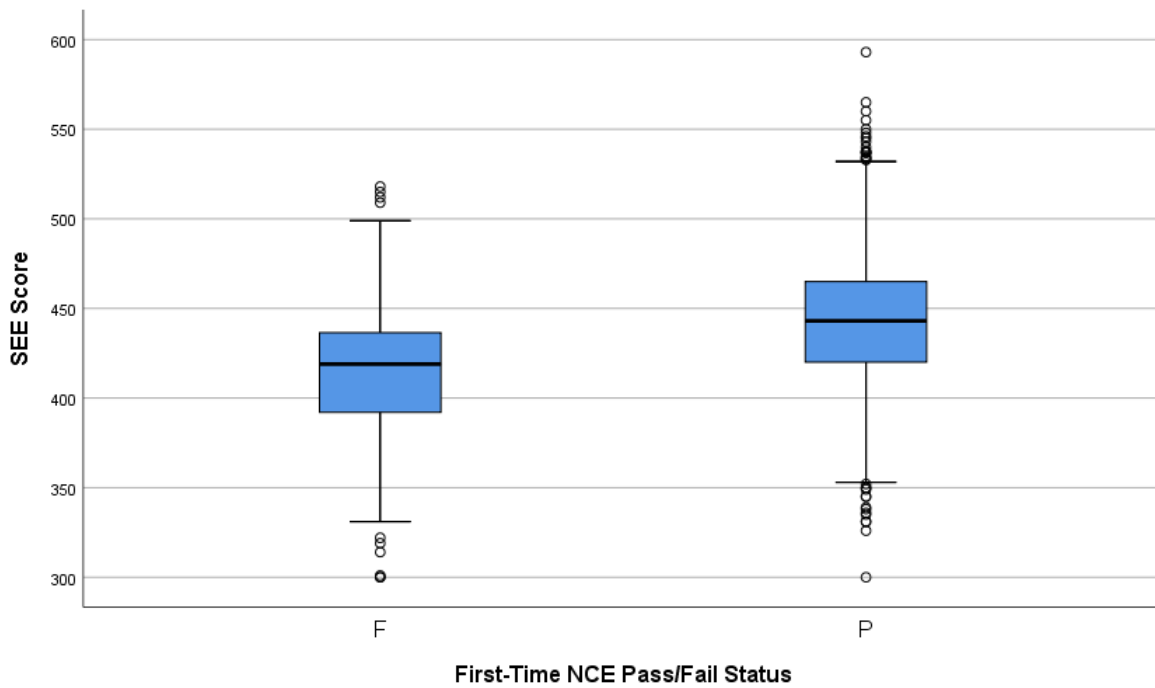
Figure 2. Plots of RY2020 SEE Scores for Passing vs. Failing First NCE Attempt

Figure 3 presents a sidelong view of the SEE scores for the NCE passing and failing groups. Again, there is a clear upward shift in SEE scores for students who eventually passed NCE at their first attempt.
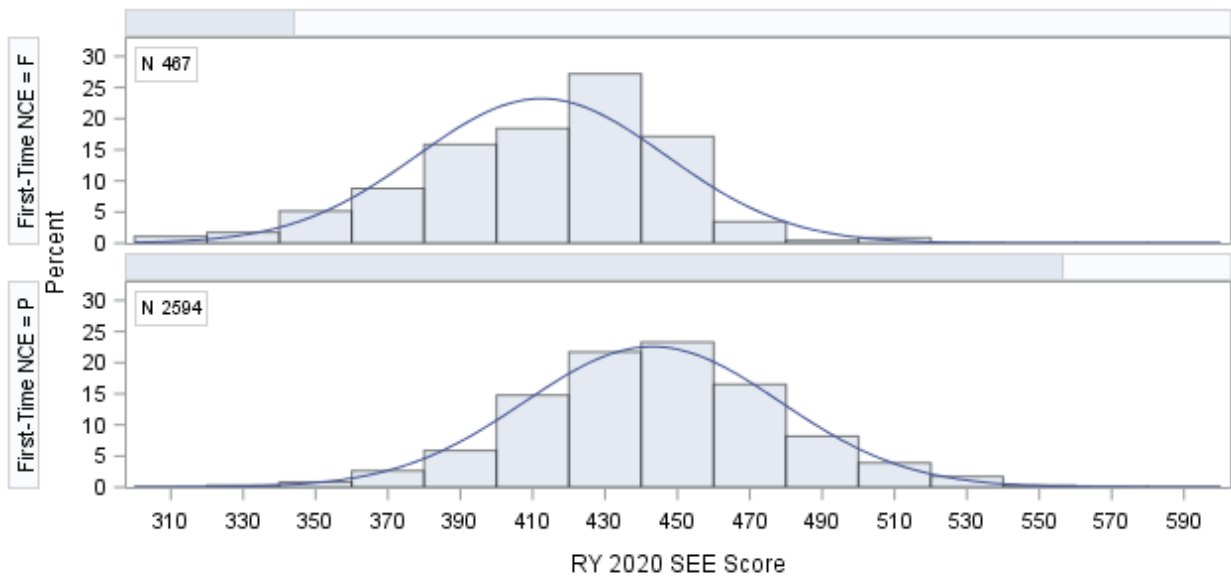


Figure 3. Normal Distributions of SEE Scores for Passing vs. Failing First NCE Attempt

Table 3 summarizes the SEE score for both the NCE passing and failing groups. Comparing the 2,650 SEE takers in FY2019 (September 1, 2018 – August 31, 2019) who took NCE later at their first-attempt to the respective group of 3, 061 SEE takers in RY2020 (September 1, 2019 – December 31, 2020), the pass rate of NCE increased from 79.2% to 84.7%. As shown in Tables 3a and 3b, the average SEE scores went up for both who passed or failed the NCE at the first-attempt from FY2019 to RY 2020. Specifically, the average SEE scores for those who passed the NCE at the first-attempt in FY2019 was 437.5 and was 443.1 in RY2020.

Table 3a. Summary of SEE Scores by First-Time NCE Performance FY2019

| First-Time NCE Performance | N | SEE Score | |
| --- | --- | --- | --- |
| | | Average | SD |
| Fail | 551 | 395.2 | 35.7 |
| Pass | 2,099 | 437.5 | 34.3 |

Table 3b. Summary of SEE Scores by First-Time NCE Performance RY2020

| First-Time NCE Performance | N | SEE Score | |
| --- | --- | --- | --- |
| | | Average | SD |
| Fail | 467 | 412.4 | 34.4 |
| Pass | 2,594 | 443.1 | 35.4 |

**Survey feedback**

In addition to the analysis of SEE scores, NBCRNA sought examinee perceptions of the SEE. After completion of the examination, a survey was administered; the survey questions are split into two sections and administered randomly to SEE takers were surveyed about their attitudes towards SEE. The following results represent the responses of 3,164 examinees in RY2020. For comparison, the responses of 2,167 and 2,074 SEE takers in FY2019 and FY2018, respectively, were also included for the same questions.

The survey prompts appear below, along with the candidate responses. These totals and responses are reflective of tests administered; some candidates may have tested more than once during RY 2020 and responses from each administration are counted. Overall, the results in all three years are consistently positive and supportive of the SEE Examination.

**1.** In my exam, the areas of the SEE content outline were fairly represented.

Combining the strongly agree and agree responses, 88.0% of candidates agreed. It should be noted that the 200 scored items on the SEE are a precise reflection of the content outline, while the 40 pretest items may not be.

| Answer Choices | RY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | Responses | N | Responses | N | Responses | N |
| Strongly Agree | 25.7% | 812 | 23.0% | 499 | 22.8% | 473 |
| Agree | 62.3% | 1,972 | 64.0% | 1,386 | 64.4% | 1,336 |
| Disagree | 10.2% | 322 | 10.4% | 226 | 10.9% | 227 |
| Strongly Disagree | 1.4% | 45 | 2.0% | 44 | 1.3% | 27 |
| *No Response* | 0.4% | 13 | 0.6% | 12 | 0.5% | 11 |
| Total | | 3,164 | | 2,167 | | 2,074 |

**2.** The questions on my test today fairly reflected the subject matter knowledge that I have been taught in my educational program.

Overall agreement with this statement (strongly agree and agree) totaled 83.6%, slightly higher than previous years.

| Answer Choices | RY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | **Responses** | **N** | **Responses** | **N** | **Responses** | **N** |
| **Strongly Agree** | **22.3%** | 706 | 19.7% | 426 | 18.4% | 382 |
| **Agree** | **61.3%** | 1,941 | 62.2% | 1,347 | 63.4% | 1,314 |
| **Disagree** | **13.4%** | 423 | 15.5% | 336 | 15.6% | 323 |
| **Strongly Disagree** | **2.5%** | 78 | 2.1% | 46 | 2.1% | 44 |
| *No Response* | 0.5% | 16 | 0.6% | 12 | 0.5% | 11 |
| **Total** | | 3,164 | | 2,167 | | 2,074 |

**3.** The questions on my test today were clearly written.

Responses which agreed (strongly agree and agree) totaled 81.5%. This represents some small decline over the past two years (83.4% - 2019; 84.3% - 2018).

| Answer Choices | RY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | Responses | N | Responses | N | **Responses** | **N** |
| **Strongly Agree** | **20.4%** | 647 | 18.2% | 395 | 18.7% | 388 |
| **Agree** | **61.1%** | 1,934 | 65.2% | 1,413 | 65.6% | 1,361 |
| **Disagree** | **16.3%** | 515 | 14.9% | 322 | 13.8% | 287 |
| **Strongly Disagree** | **1.7%** | 55 | 1.2% | 27 | 1.4% | 30 |
| *No Response* | 0.4% | 13 | 0.5% | 10 | 0.4% | 8 |
| **Total** | | 3,164 | | 2,167 | | 2,074 |

**4.** It is helpful to have the SEE based on the content outline for the National Certification Examination (NCE).

Responses which agreed (strongly agree and agree) totaled 95.8% similar to what was reported in previous years.

| Answer Choices | FY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | Responses | N | Responses | N | Responses | N |
| Strongly Agree | 49.4% | 1,562 | 44.0% | 953 | 46.2% | 958 |
| Agree | 46.4% | 1,467 | 51.5% | 1,117 | 49.0% | 1,017 |
| Disagree | 2.9% | 91 | 3.0% | 65 | 3.2% | 66 |
| Strongly Disagree | 0.9% | 30 | 0.9% | 19 | 1.3% | 26 |
| No Response | 0.4% | 14 | 0.6% | 13 | 0.3% | 7 |
| Total | | 3,164 | | 2,167 | | 2,074 |

**5.** Receiving SEE scores for the same domains that also appear on the NCE (e.g., Basic Sciences, Equipment, etc.) will help me identify relative strengths and weaknesses when I prepare for the NCE.

Overall agreement continues to be strong with 97.1% of candidates responding strongly agree or agree.

| Answer Choices | RY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | Responses | N | Responses | N | Responses | N |
| Strongly Agree | 56.2% | 1,779 | 51.9% | 1,125 | 54.2% | 1,125 |
| Agree | 40.9% | 1,293 | 44.1% | 956 | 41.5% | 860 |
| Disagree | 1.6% | 52 | 3.0% | 64 | 2.8% | 59 |
| Strongly Disagree | 0.8% | 24 | 0.6% | 12 | 1.0% | 20 |
| No Response | 0.5% | 16 | 0.5% | 10 | 0.5% | 10 |
| Total | | 3,164 | | 2,167 | | 2,074 |

**6.** Taking the SEE will help me to better prepare for the NCE.

Overall agreement continues to be strong with 94.9% of candidates responding strongly agree or agree.

| Answer Choices | RY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | Responses | N | Responses | N | Responses | N |
| Strongly Agree | 51.5% | 1,629 | 44.9% | 973 | 47.5% | 986 |
| Agree | 43.4% | 1,372 | 48.4% | 1,049 | 46.1% | 956 |
| Disagree | 3.5% | 110 | 5.1% | 111 | 4.4% | 92 |
| Strongly Disagree | 1.2% | 38 | 1.1% | 23 | 1.3% | 26 |
| No Response | 0.5% | 15 | 0.5% | 11 | 0.7% | 14 |
| Total | | 3,164 | | 2,167 | | 2,074 |

**7.** Taking the SEE gives me a sense of what to expect when I take the NCE.

Overall agreement continues to be strong with 95.3% of candidates responding strongly agree or agree.

| Answer Choices | RY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | Responses | N | Responses | N | Responses | N |
| Strongly Agree | 47.4% | 1,499 | 40.0% | 867 | 42.4% | 880 |
| Agree | 47.9% | 1,515 | 52.5% | 1,137 | 51.0% | 1,057 |
| Disagree | 3.2% | 101 | 5.9% | 127 | 4.8% | 100 |
| Strongly Disagree | 0.9% | 30 | 1.0% | 22 | 1.2% | 24 |
| No Response | 0.6% | 19 | 0.6% | 14 | 0.6% | 13 |
| Total | | 3,164 | | 2,167 | | 2,074 |

**8.** I had adequate time to complete my examination today (i.e., I did not feel rushed).

Overall agreement continues to be high with 91.5% of candidates responding strongly agree or agree. These are slightly more positive results than seen previously (2019 – 89.1%; 2018 – 89.8%)

| Answer Choices | RY2020 | | FY2019 | | FY2018 | |
|---|---|---|---|---|---|---|
| | Responses | N | Responses | N | Responses | N |
| **Strongly Agree** | **48.0%** | 1,519 | 42.7% | 925 | 44.2% | 917 |
| **Agree** | **43.5%** | 1,375 | 46.4% | 1,005 | 45.6% | 945 |
| **Disagree** | **6.2%** | 196 | 7.9% | 172 | 7.7% | 159 |
| **Strongly Disagree** | **1.8%** | 57 | 2.3% | 49 | 2.1% | 43 |
| *No Response* | *0.5%* | *17* | *0.7%* | *16* | *0.6%* | *13* |
| **Total** | | 3,164 | | 2,167 | | 2,074 |

**Conclusions**

The analysis and evaluation of the RY2020 SEE examination data showed results consistent with the FY2019 and FY2018 SEE examination data, confirming once again that the SEE has performed in a manner as intended based upon the stated goals. When the three-years of SEE examination data are compared, the main findings are:

- Testing volume continued increasing in RY2020.  From September 2019 to December 2020, even with the COVID-19 pandemic and reduced testing center capacity, the SEE has been administered to 6,318 examinees, representing approximately a 6% yearly increase rate similar to that of the FY2019 (N=4,441) from the FY2018 (N=4,190).
- Overall scores, as well as content domain-specific scores for the SEE from RY2020, FY2019 and 2018, are comparable, and slightly higher for RY2020 for takers in their second or higher training year and overall.
- The test time of four hours (240 minutes) appears to be adequate for the vast majority of test takers to complete the examination.
- There is a strong positive correlation between SEE scores and performance on the first NCE attempt, especially for second-year and third-year students who take the SEE at least two-months prior to their first NCE exam. It should be noted that, however, as RY2020 saw more SEE takers in their third year of training than in previous years, both NCE and SEE scores were more homogeneous compared with those for previous cohorts. The homogeneity of NCE and SEE scores can explain the relatively lower correlation coefficient seen in RY2020 (r=0.53) than in FY 2019 (r=0.61).
- The reliability of scores on the SEE in RY2020, both overall and across all specific domains, were comparable to those in FY 2019 and FY2018. In addition, it is important to point out that the reliability of SEE scores were substantially improved since the launching of the reconfigured SEE in 2016 in comparison to the previous SEE format, making domain-level scores a much sounder foundation upon which to base remediation.
- Candidate perceptions of the SEE in RY2020, FY2019 and FY2018 were generally positive. More people in RY2020 expressed higher satisfaction than in two previous years regarding the content relevance and helpfulness of SEE in preparing for the NCE.

The NBCRNA will continue to collect examination performance data and publish evaluation results for the communities of interest. This data will include testing time, predictive validity, examination reliability, and stakeholder perceptions to guide the effective purposeful planning and utilization of the SEE examination.