

# A Comparative Study of Self-Confidence and Future Outlook Among Forensic Science Students

Cameron Bechard<sup>1</sup>, Abigail Castillo<sup>1</sup>, Tamra Legron-Rodriguez<sup>1</sup>, Nicole Lapeyrouse<sup>1\*</sup>

<sup>1</sup>*Department of Chemistry, University of Central Florida, 4111 Libra Drive, Physical Sciences Building, Orlando, FL 32816-2366*

*\*Corresponding author: Nicole.Lapeyrouse@ucf.edu*

**Abstract:** Self-confidence has been positively associated with various facets of accomplishment in academics, such as academic performance, persistence, and future employability of graduated students. In this mixed-methods study, forensic science students' self-confidence and future confidence levels at different points in their undergraduate degrees are measured and compared. Independent T-tests are utilized to compare the self-confidence and future confidence levels of forensic science students at the beginning of their forensic science degrees and forensic science students in the last year of their forensic science degrees. Additionally, open-response questions were analyzed using thematic analysis to gain further insight into the current confidence levels of forensic science students and where these students derive their confidence in themselves and their confidence in their futures as professional forensic scientists. The results show that forensic science students in the final year of their degree are reporting lower self-confidence levels and lower confidence in their futures as forensic science professionals. Further insight into students' perceptions of their confidence levels reveals that students in the first and final years of their forensic science degrees derive their confidence in contrasting ways that may be linked to their views regarding their future employability in the field. This paper highlights how the next class of future forensic science professionals are concerned about their employability and ability to support themselves, and the potential link to lower confidence levels in both themselves and their futures as forensic science professionals.

**Keywords:** self-confidence, forensic science students, future outlook

## Introduction

Self-confidence, the belief and trust an individual has in their ability to complete a task successfully, has been viewed as a key piece of achievement motivation (1, 2). Self-confidence is positively associated with accomplishing academic tasks, influential on academic performance, and has been recognized as pivotal for student academic attainment (3-5). In educational institutions, the perceptions that students develop and believe to be true about themselves and their ability to succeed academically are important predictors of whether that task will be completed successfully (1). This includes academic tasks, such as the completion of a degree, and further tasks dependent on the completion of a degree, such as obtaining employment in a related field. These perceptions have been discussed to persist past academics as an important factor regarding being perceived as "employable" within the field of the profession they have prepared for post-graduation (6).

In the 2000s, research regarding the ability of a graduate to gain and maintain employment increased. This body of literature has helped our understanding of employability and strategies that can be implemented to enhance the employability of graduates (7-10). Research supports curriculum designed to help students cultivate these skills, such as self-efficacy and metacognition,

which can help students develop confidence, which has been found to impact student motivation and workplace readiness (11, 12). Supporting students' confidence has been found to impact student motivation and workplace readiness. Research supports the development of undergraduate forensic science employability skills by increasing student self-confidence and self-efficacy in their interpersonal and communication skills (13-15). While some studies discuss methods to increase the employability of forensic science students over the last decade (14, 16, 17), there is a gap in the literature from the perspective of forensic science students regarding their confidence in their ability to be employed in the field of forensic science.

While student perceptions of self-confidence and its contribution to various academic concepts have been discussed extensively, much of the existing research focuses on evaluating and making predictions based on students' confidence in their current abilities (4-6, 18). However, there is a gap in the literature regarding confidence in students' future endeavors, particularly in transitioning to and sustaining employment in their chosen fields of profession. This is especially relevant for students preparing for specialized professions such as forensic science. It is important for educators to understand how students derive their confidence in their futures to better support students as they navigate from forensic science students to forensic science professionals.

To further the comprehension of forensic science

students' perspectives on their confidence in their futures in the field of forensic science, the following research questions were explored:

*Research Questions:*

1. Do the confidence levels of lower-level students differ from the confidence levels of upper-level students?
2. What do forensic science students highlight as factors that affect their confidence in being employed as professional forensic scientists?

**Methods**

*Ethics*

The following research presented in this paper adhered to the ethical guidelines outlined by the Institutional Review Board (IRB: STUDY00003077).

*Data Collection*

The design of this study was a mixed-methods study utilizing both quantitative and qualitative analyses. The data used in this study was collected as part of a larger research study on identity. The responses to the Professional Identity Status Questionnaire from students enrolled in one of two forensic science degrees were analyzed for this paper. The questions from this survey were slightly modified to better represent the population being studied. Students were asked to answer the Likert-scale questions on a scale of 1 (not at all) to 5 (very much). Four open-response questions were added to the end of the survey, including a revised version of one of the Likert-scale questions. The survey was distributed online using Qualtrics and made available to students through the learning management system Canvas. This survey was made available for 14 days to students enrolled in the courses beginning in the second week of the Fall 2021 semester. This was to limit the potential effects that the outcome of submitted assignments or exams could have on students' current confidence levels. The relevant questions from the survey are the following:

*Likert-scale (LS) questions:*

LS1: Does thinking of yourself as a professional in your field make you feel self-confident?

LS2: Does thinking of yourself as a professional in your field make you feel confident about the future? If so, why?

*Open Response (OR) questions:*

OR1: How do you feel at this moment in time as a future professional in your field?

OR2: Do you ever think that it would be better to prepare yourself for another profession? If so, why?

OR3: What do you see as the advantages and disadvantages associated with becoming a professional in your field?

OR4: How does thinking about yourself as a professional in your field make you feel confident about the future?

*Participants*

This paper focuses on the responses and results from students enrolled in one of two forensic science courses. The "lower-level" course, Introduction to Forensic Science, is the first forensic science course in the degree track for students pursuing a forensic science degree. This course aims to provide an overview of a variety of traditional disciplines of forensic science using professionals in forensic science to give forensic science students a better understanding of the scientific foundations for these disciplines (19). The "upper-level" course, Forensic Crime Scene Investigation, is a senior-year course taken later in the forensic science degree track. This course introduces students to the procedures for collecting, processing, and investigating forensic evidence discovered at the scene of a crime.

The participants in this study were pursuing a bachelor's degree in either the Forensic Science – Chemistry track or the Forensic Science – Biochemistry track. In total, 62 forensic science students completed the survey; 34 students enrolled in the lower-level course, and 28 students enrolled in the upper-level course. Not all students answered the open-response questions. To protect the identity of the participants in this study, gender-neutral pseudonyms will be used when describing the participants and their responses. The pseudonyms chosen are not reflective of gender or racial background. A list of these pseudonyms and pertinent participant data can be found in **TABLE 1**.

*Data Analysis*

The quantitative analysis in this study includes two independent T-tests comparing the Likert-scale responses from forensic science students to questions LS1 and LS2.

Thematic analysis was used to analyze the written responses collected and followed the process published by Braun and Clarke (20). The thematic analysis was conducted using an essentialist ontology, which states that the individual's words give insight into their experiences in reality. The five steps to the reflexive thematic analysis process are as follows: familiarization, generation of codes, theme construction, theme revision, and defining themes. To ensure all students' experiences were accounted for, an inductive method of analysis was chosen for this part of the study. Contrary to deductive thematic analysis, which uses a set framework to guide the thematic analysis, an inductive approach allows the themes to emerge naturally from the data (21). The first three steps were conducted individually for

each of the four OR questions as defined by Braun and Clarke (20). Two researchers separately analyzed the responses to each open-response question, generating a list of repeated words and patterns within the data.

**TABLE 1** Student participant pseudonyms and relevant information

Participant Pseudonym	Course	Class Standing
Arya	Upper-level	Senior
Casey	Upper-level	Senior
Jesse	Lower-level	Freshman
Jordan	Upper-level	Senior
Kris	Lower-level	Junior
Sam	Lower-level	Sophomore

The researchers collaboratively used these generated lists of words and patterns to create the defined codebooks. If a code was used in more than one codebook, the same definition was used between the codebooks. The researchers used these codebooks to code each question independently and met weekly to compare codes and discuss any disagreements or propose modifications. Codebooks were considered finalized after multiple sequential weeks which no changes were necessary. The researchers then independently coded each question with the finalized codebooks and continued to meet weekly to discuss any disagreements in coded responses. These meetings continued until all questions were coded and the coders reached 100% agreement in coded responses. Codes were then grouped under higher-order categories, marking the process of the initial theme construction. Once finalized, two researchers began to draw connections between different open-response questions to refine the initial themes further. These themes were revised by all researchers until a consensus was reached.

**Results**

*Quantitative Findings*

Two Independent T-tests were conducted to compare the self-reported confidence of lower-level and upper-level forensic science students. These two tests focused on both the self-confidence and confidence students feel regarding their future as forensic scientists. The results of the two Independent T-tests are shown in **TABLE 2**. The results do not reveal a statistically significant difference between the reported self-confidence scores of lower-level and upper-level students (LS1). However, it is important to note that the average reported self-confidence of the lower-level students is almost a full Likert-scale point greater than that of the upper-level students. Regarding confidence in their futures as professional forensic scientists, there is a statistically significant difference between the responses of the lower-level and upper-level students (LS2). Forensic science

**TABLE 2** Results of Independent-samples T-test analyses on average Likert scale responses between the lower-level and upper-level students \* Indicates statistically significant p-value

Likert-scale Question	Lower-level (x̄,S.E)	Upper-level (x̄,S.E)	P-value (α = 0.05)	Cohen's D Effect size
<i>Does thinking of yourself as a professional in your field make you feel self-confident?</i>	(4.75, 0.133)	(3.87, 0.184)	0.060	0.386
<i>Does thinking of yourself as a professional in your field make you feel confident about the future?</i>	(4.31, 0.137)	(3.87, 0.211)	0.041*	0.434

students in the upper-level course are reporting lower levels of confidence in their futures as professional forensic scientists compared to the lower-level students.

*Qualitative Findings*

*OR1: Current feelings*

Responses to OR1 reveal that 11.5% of lower-level students and 11.1% of upper-level students described themselves as being confident. More lower-level students describe themselves with a negative feeling (11.5%) compared to upper-level students (7.4%), while more upper-level students describe themselves with an anxiety-related feeling (14.81%) compared to 0% of lower-level students. However, the greatest percentage of students described themselves with a positive feeling, such as feeling “excited”, “good,” or “optimistic” in both the lower-level (50.0%) and upper-level courses (29.6%). Several students described themselves with mixed feelings in both the lower-level (26.9%) and upper-level (7.4%), with a majority of those in the lower-level course describing themselves with an anxiety-related feeling in addition to either a positive or negative feeling. Additionally, 29.6% of upper-level students described themselves with feelings that could not necessarily be classified as one of the four previously mentioned, using more neutral terms such as “feeling on-track” or “on the right path”.

*OR2: Factors affecting commitment to forensic science*

Similar percentages of students discussed reconsidering their commitment toward a future in forensic science, with 37% of upper-level students and 42.8% of lower-level students. This is concerning, as students in the upper-level course are in the senior year of their degree, and as such, it was expected that the percentage of upper-level students responding in the affirmative would be much lower. Between the two courses, two factors were discussed as the sources impacting their commitment. The first factor, discussed by 25.9% of upper-level students and only 10.7% of lower-level students, is tied to a lack of self-confidence or confidence that

forensic science is truly what they want to do in the professional forensic scientist, upper-level and lower-level

**TABLE 3** Student responses to OR3.

*OR3: What do you see as the advantages and disadvantages associated with becoming a professional in your field?*

Coded Responses	Description	Lower-level Advantage/Disadvantage (%)	Upper-level Advantage/Disadvantage (%)
<i>Advantages</i>			
Knowledge, Skill, Ability (KSA)	Mentions developing knowledge and skills related to the profession.	21.1%	14.3%
Occupational and Financial Reliability	Discusses the availability, stability, or financial compensation or cost in a positive way.	15.8%	25.0%
Making a Difference	Student describes enacting positive change in the profession	39.5%	35.7%
Job Satisfaction	Student describes themselves with positive feelings related to being a professional forensic scientist.	23.7%	25.0%
<i>Disadvantages</i>			
Aspects of the Profession	Disadvantages related specifically to the profession of forensic science (i.e. court appearances)	25.9%	22.6%
Occupational and Financial Unreliability	Discusses the availability, stability, or financial compensation or cost in a negative way.	11.1%	35.5%
Struggles with Mental Health	Student discusses the profession as potentially affecting their mental health in a negative way.	40.7%	16.1%
Heavy Workload	Students discuss the amount of work necessary to become a forensic scientist and maintain employment in the profession.	22.2%	25.8%

future.

An upper-level student, Arya, describes this in their response: “Sometimes because I am not totally sure I want to do this professionally”. The second factor, discussed by 14.8% of upper-level students and 25% of lower-level students, is related to their ability to gain employment in the field of forensic science. Students show concern related to the availability of jobs in this profession and being able to gain employment. Jesse, a lower-level student, describes this in their response: “Sometimes I think that I should get a less specific degree so that if the job market changes I am still guaranteed to find work.” Another lower-level student, Kris, echoes this sentiment more directly in their response: “... I get worried about job availability and competition.”

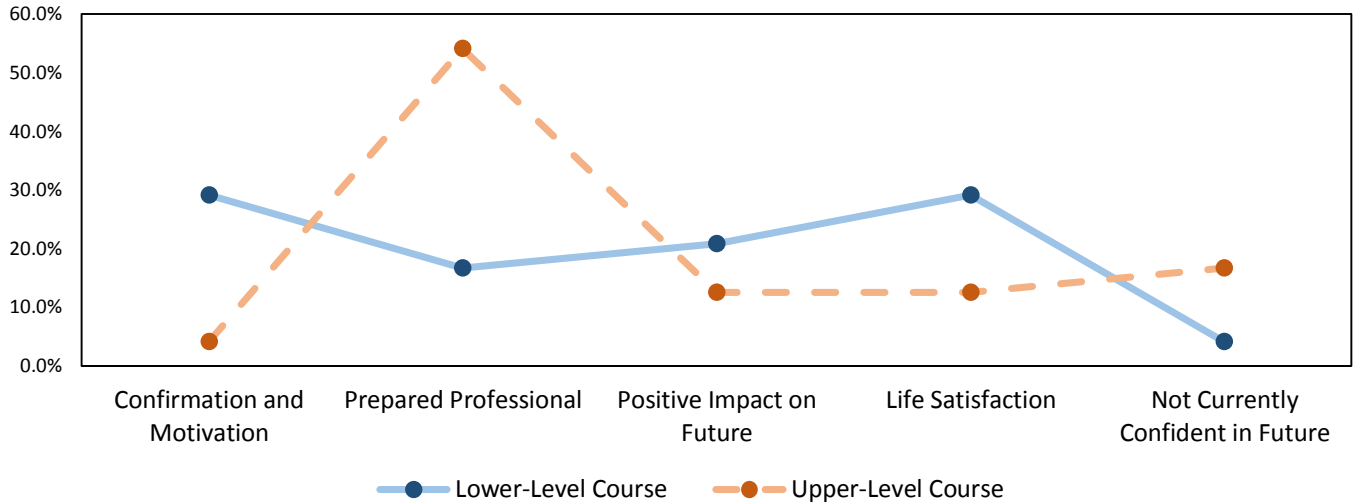
*OR3: Advantages and disadvantages of being a professional forensic scientist*

The responses to OR3 initially revealed an imbalance in perspective between the lower-level and upper-level students. In all, 27 students in the lower-level course list 38 coded advantages and 27 coded disadvantages to being a future professional forensic scientist. The 22 upper-level students who responded to this question listed 28 coded advantages and 31 coded disadvantages. When highlighting the advantages and disadvantages of being a

students discussed four main advantages and disadvantages. The descriptions and response percentages from the students are summarized in **TABLE 3**. For disadvantages, 40.7% of the total listed disadvantages from upper-level students related to low job availability and low salary (Occupational and Financial Unreliability). This category is reported the least out of the lower-level students, with only 11.1% of the coded disadvantages listed from lower-level students, with no disadvantages mentioning concerns of low salary. All disadvantages reported by the lower-level students in this category relate to competition for limited positions or local job availability. The most common disadvantage listed by lower-level students pertained to concerns that the profession will have a detrimental effect on the mental health of lower-level students.

*OR4: Students’ confidence in their future as forensic science professionals*

The results for this question comparing the responses of lower-level and upper-level students can be found in **FIGURE 1**. When discussing their confidence in the future, 29.2% of lower-level student responses state that thinking of themselves as professional forensic scientists helps confirm who they are to themselves, as well as increases their motivation to continue their degree when encountering obstacles (Confirmation and Motivation), compared to only 4.2% of upper-level students. Sam, a lower-level student, describes this in their response: “It



**FIGURE 1** Factors that influence forensic science students’ confidence in their future as professional forensic scientists.

makes me feel assured of myself and that I know what I want to do.”. Approximately 20.8% of the lower-level students derive their confidence from the positive change they believe they will enact as professional forensic scientists (Positive Impact on Future), compared to 12.5% of upper-level students. Even more, 29.2% of lower-level students derive their confidence in their future from the satisfaction and security they will gain in their lives as professionals in forensic science (Life satisfaction), again compared to 12.5% of upper-level students. One lower-level student, Jesse, says it best in her response, “It makes me feel confident about the future because I know that I will have a job that I enjoy, with good pay, and many opportunities for upward motion in the location I hope to live!” The responses from the upper-level students to this question reveal that many of these students derive their confidence in the future from their perceptions of themselves as prepared and successful individuals (Prepared Professional), as 54.2% of upper-level students’ responses belonged to this category. The upper-level students focus on discussing confidence in their achievements, knowledge gained, and ability to succeed wherever life takes them. The response rate for these responses was the lowest out of the responses from the lower-level students (16.7%). Furthermore, a greater percentage of upper-level student responses (16.7%) compared to lower-level students (4.2%) who responded to this question admitted to not feeling confident in their future. The consensus from upper-level students was that confidence would be earned after gaining experience working in the field of forensic science, but not before. Casey is one of those upper-level individuals: “Now thinking of myself as a professional in my field now I am not so confident, but obtaining that status in the future I will be confident as I would have more experience and practice in the profession.”

**Discussion**

*Theme 1: Upper-level forensic science students look within themselves for confidence in the future, while lower-level students derive their confidence in the future from their optimistic expectations of the profession.*

When asked to describe how thinking of themselves as professionals in their field makes them feel confident about the future, the contrast in responses from the upper-level and lower-level students is apparent. Over half of the lower-level students report deriving their confidence in the future from their perceptions of advantages in the field of forensic science. The lower-level students describe their confidence in the future by imagining themselves in a place where all their physical and emotional needs are met as professionals in forensic science. These students believe they will be able to aid others who are less fortunate and enact positive change in the field. They make connections regarding job satisfaction and directly relate it to satisfaction in their life overall, being financially stable, and being able to bring justice to those most in need. Collectively, the responses from the lower-level students indicate their confidence in the future has a foundation in the idealistic views of the profession. The lower-level students believe that not only will they enact positive change in the field of forensic science, but that the field of forensic science, in turn, will positively change their lives. This is apparent from the lower-level students describing “great” salaries, “a wide range of job opportunities,” and their collective calls for “finding justice and giving families the closure they desire”.

Unlike the lower-level students, the upper-level students do not derive their confidence in the future from an abundance of confidence that the forensic science field will provide them. While a few upper-level students comment on these categories, a much larger percentage of upper-level students find their confidence in their future internally. Their confidence in the future is derived from seeing themselves as highly skilled, successful, and prepared professionals despite

all the disadvantages discussed in the previous question. However, the choice phrasing of some students implies that this level of self-confidence in the upper-level students is not quite at the same level compared to the self-confidence displayed by the lower-level students. Some responses from the upper-level students are phrased as conditional statements. They are primed with the phrase “If I succeed...” or “If I can be a professional...” indicating that some upper-level students are doubting whether they will successfully transition into the field of forensic science.

*Theme 2: Upper-level students demonstrate a more realistic understanding of the employment prospects and compensation of the profession compared to the optimistic view of the lower-level students.*

The responses to OR3 and OR4 show that some upper-level students view the field of forensic science as difficult to get into and associate the field with low financial gain. This may be affecting their outlook on their futures in the professional space and whether they are looking forward to joining the future career paths that they’ve been preparing for. The previous literature regarding the realities of being a professional forensic scientist has discussed features of the profession that should be improved (22). The responses from OR3 between the students in each course show that students in the upper-level course may have a more comprehensive and realistic understanding of the field, which may contribute to a more negative outlook on the profession. Their descriptions of advantages and disadvantages within the profession are more in agreement with published literature about forensic science technician positions compared to the responses from lower-level students (23). For Aspects of the Profession, students in the upper-level course repeatedly listed the same few concerns regarding court appearances and others’ opinions regarding professionals in the fields of forensic science or law enforcement. The responses from students in the lower-level course are less cohesive and relevant to the profession. For example, one lower-level student described the profession as an “office job.. where it’s indoors all the time”. This is not an unexpected result from the lower-level students, as the survey was distributed during the second week of the first forensic science course that the lower-level students take in their degree. As such, the lower-level students have less knowledge about the everyday experiences of professional forensic scientists.

Upper-level students discussed financial compensation and its relation to time commitment and workload as prominent disadvantages to the profession. Approximately 27.2% of the upper-level students listed disadvantages related only to a low salary. This was not found at all in the responses from the lower-level students, who only discussed financial compensation as an advantage to the profession. The few lower-level

students who listed disadvantages related to the category Occupational and Financial Reliability are more concerned with local job availability. Only 13.6% of upper-level students listed financial compensation as an advantage, and none of the responses described financial compensation in an overly positive way. Jordan, an upper-level student, stated, “I can make a decent amount of money” as an advantage. This was the most enthusiastic response that described financial compensation as an advantage. The rest of the responses simply stated “salary” or “the money” as an advantage, with no positive adjectives. The lower-level students describe financial compensation much more positively, using adjectives such as “good,” “great/greater,” and describing the pay as “making enough to be financially stable,” which is not reflected in the responses from the upper-level students. While some students in both courses show some concern about a heavy workload and a poor work-life balance once they are professional forensic scientists, the lower-level students look past this and instead focus on making a positive difference in their lives and the lives of others, which makes them confident in their futures. In contrast, the upper-level students focus on being confident in themselves and being prepared to join the field of forensic science to support being confident in their futures, yet more upper-level students admit to not being confident in their futures.

This contrast in responses concerning the financial compensation and expected workload of the profession is reflected in publications as recent as 2020 that discuss many forensic science professions as underpaid and overworked (24-26). One study on factors that boost students’ self-perceived employability concluded that factors related to self-responsibility were among the most influential factors in students being confident in their employability (6). Upper-level students’ perspectives align more closely with the current literature. As such, upper-level students have more realistic expectations of the profession compared to lower-level students. This may not only be a contributing factor to the lower reported self-confidence found in the quantitative results, but also contribute to why upper-level students are looking within themselves for confidence in their future. One recommendation to address this is to encourage forensic science students to engage directly with the field of forensic science, such as volunteering, engaging in forensic science undergraduate research, or communicating with diverse individuals within forensic science. Lower-level forensic science students can use these experiences to gain a fuller understanding of the responsibilities of different forensic scientists, as real-world discussions and communicating with scientists have been found to be influential for first-year students (19). Upper-level students can also benefit from these experiences, as the results of this study show that their confidence is more rooted in themselves and their perceptions of their level of preparation. Therefore, engaging in these experiences may help these students feel more prepared and positively influence their confidence in the field, which has been found in other fields such as medicine and business (27, 28).

## **Conclusion**

In this study, self-confidence and confidence in the future are explored from the perspectives of forensic science students. By analyzing these perceptions from forensic science students, valuable insight is gained into how aspiring forensic scientists envision their careers and potential impact in this field. This research provides a deeper understanding of the perspectives of the next generation of forensic science professionals, their aspirations, and the factors that influence their confidence as they prepare to enter this dynamic discipline. This study found distinct differences in the ways that lower-level and upper-level forensic science students build the foundation of their confidence. Students early in their forensic science degrees view the profession through an optimistic lens, holding high expectations about the occupational and financial benefits of the profession, while students later in their forensic science degree have a more realistic outlook on this profession that is more aligned with the literature. This study discusses the implications of these views and how they may contribute to the lower confidence levels displayed by upper-level students toward becoming professionals in forensic science. The literature supports the idea that confidence is “fluid” and may shift during the first few years for individual college students (29). However, in disciplines such as engineering and biology, no statistical differences have been found when comparing the self-efficacy and motivation levels between first-year and senior students (30-32).

## **Limitations**

This study was conducted at a large R1 university; the participants were students enrolled in bachelor's degree programs in forensic chemistry or forensic biochemistry. The degree programs are math and science-intensive and structured to prepare students to pursue an occupation in forensic science or for entry into graduate programs in forensic chemistry or biochemistry. If this survey were to be used at a different type of institution or with students in a forensic science program with a different focus, the results may differ from those in this study. Furthermore, the data collected was only administered once during the semester and was only available for 14 days beginning in the second week of the semester.

There is one limitation related to the wording of OR2. The phrase “If so, why?” may have been interpreted by students to only elaborate on reasons for preparing themselves for a profession outside of forensic science, but not reasons related to why they do not see a reason to prepare for another profession. This may have led to the multiple unelaborated “No” responses collected from students in both courses.

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