



FORENSIC SCIENCE (BS)

Program Learning Assessment

2011-2015 Assessment Planning Cycle Key Findings and Proposed Actions

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**John Jay College of Criminal Justice
The City University of New York**

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Forensic Science (BS)

Student learning outcomes assessment in higher education has been drawing a lot of attention as the nation has been engaged in discussion on educational effectiveness at all levels. An institution-wide commitment to student learning, engagement, and success are central tenets of the mission of John Jay College of Criminal Justice. The five-year outcomes assessment plan of the Forensic Science Major (FOS) at John Jay College of Criminal Justice was developed for 2011-2015 to assess student achievement.

The primary goal of the FOS major is to help students acquire the updated knowledge and skills which will enable them to become competent scientists in society. The departmental learning goals for the FOS major are focused on 4 main aspects: Reasoning, Knowledge, Practical Skills, and Communication. The annual assessment of the FOS Major is conducted to determine whether the Department is meeting the proposed learning goals and serving our students.

The purpose of this executive summary of our five-year assessment (2011-2015) of the FOS program is to provide an overview of assessment and to draw conclusions from the findings. Most importantly, it will serve as a guide for designing the next five-year (2016-2020) assessment plan.

Mission

The mission of the Department of Sciences is to provide all John Jay College students with a meaningful understanding of basic scientific principles, scientific methodologies, and to develop their quantitative and analytical reasoning skills. Furthermore, the Department seeks to:

- Present all forensic science students with a sound multidisciplinary foundation in science, to equip these students with the skills needed to pursue advanced educational opportunities, and to prepare them to become scientific professionals;
- Offer forensic science graduate students the opportunity to develop their scientific research skills and to provide them with in depth knowledge of current and cutting edge analytical techniques used by the forensic science community;
- Endow those students enrolled in the forensic science track of the Criminal Justice Doctoral program with the comprehensive theoretical background and analytical skills necessary to conduct independent research toward advancing the discipline of forensic science.

Learning Goals

Upon completion of the FOS major, students will be able to

(Reasoning) Draw appropriate scientific conclusions from evidence and experimental data.

- Understand the role of creativity in problem solving
- Apply scientific principles in gathering and interpreting scientific data

(Knowledge) Acquire broad fundamental concepts, theories, and principles in physical and biological sciences.

- Use the primary scientific literature effectively in their own research
- Describe the scientific progress that has led to their research project

(Practical skills) Accrue hands-on laboratory and practical research skills, including emphasizing the role of quality assurance and objectivity in scientific data collection and how these relate to the system of professional ethics in science.

(Communication) Develop competence in oral and written forms of scientific communication.

Assessment Philosophy

The primary mission of the Forensic Science Major (FOS) is to facilitate student success. One way to measure student success is to conduct student learning assessment. The assessment of student learning outcomes is able to provide the fundamental data for promoting Major effectiveness and the improvement of Major programs and courses. Effective and valuable assessment is best attained when there is a clear definition of what the learning objectives/outcomes and the assessment cycle are. Going beyond assessment of simple acquisition of knowledge, FOS assesses students' mastery of subject matter and their ability to apply knowledge in the areas of Reasoning (critical thinking and creativity), Practical skills, and Communication.

FOS assessment is a faculty-led assessment to ensure a direct focus on learning. The assessment of student learning outcomes is ultimately the assessment of Major's capability to provide learning opportunities consistent with its mission. The data obtained from assessment is used exclusively to assess and improve teaching and learning, **not** for the evaluation of individual faculty members or students.

Assessment Cycle Review

The Department of Sciences has always been dedicated to providing the students with a high quality education. In Fall 2009, the Mission Statement of the Department of Sciences was revised to articulate the Department's vision and communicate it to the students. Program learning goals were also clearly established to provide the outline of departmental commitments in 2010. Moreover, in order to ensure the execution of our commitments, the 5-year outcomes assessment plan was set up and carefully implemented from 2011 to 2015. Various assessments have been completed. These range from an assessment of the Capstone courses to an assessment of selected laboratory courses scaffolding from the 100- to the 400-level courses. Specific departmental learning goals have been evaluated, annual reports have been written for review and evaluation, and the findings will provide suggestions for improvement. The following is a brief summary of each annual assessment.

AY 2010-2011: FOS402 capstone course assessment

The first year of the 5-year assessment cycle was focused on the FOS402 capstone course. A student poster presentation was used as the assessment tool. Eight program learning goals were evaluated in this assessment. After this annual assessment, the program learning goals were consolidated into 4 program learning goals.

Student scientific poster presentations were made after they completed their course requirements for Spring 2011. A total of eight students participated in this evaluation and their posters were assessed by a team of faculty members who used pre-determined questions (one for each goal) to evaluate student performances. Faculty members gave each student a score for each goal based on the course rubric which was designed based on course learning goals to match the Forensic Science Major learning goals.

Overall student performance was satisfactory. Most significantly, we found that our students demonstrated excellent oral communication skills and full understanding of the important roles of QA/QC in their research. Students also demonstrated good knowledge of practical research skills and the ability to make logical conclusions based on the data they had.

However, only 62.5% of students showed competent Scientific Literacy (Goal 2). This indicates about one third of students lacked the ability to search and interpret scientific literature that would be used to explain and support their findings. This phenomenon was also observed at Scientific Knowledge (Goal 4). Due to the weakness in developing Scientific Literacy (Goal 2) and in acquiring a broad background of Scientific Knowledge (Goal 4), 25% of our students fell below our expectation to demonstrate their ability to think and reason critically (Goal 1). They also were unable to apply scientific principles to problem solving and data interpretation (Goal 5).

Therefore, the curriculum for FOS402 should emphasize the development of scientific literacy (Goal 2) and focus on providing our students with a broad scientific background (Goal 4).

AY 2011-2012: FOS401 and FOS402 capstone courses assessment

The second year of the 5-year assessment cycle was focused on FOS401 and FOS402 capstone courses. Based on the first year assessment findings, FOS402 curriculum was revised with greater detail about course requirements, such as written literature reports/proposals,

Laboratory notebooks, and Final written report/poster presentations. Students were provided with this revised syllabus.

FOS401 Forensic Science Laboratory Internship

These assessments were performed to evaluate our FOS401 capstone course by analyzing student performance on two different assignments --- a reflective statement and a laboratory notebook --- which were submitted to the Course Coordinator at the end of the 400-hour internship. A total of eighteen (18) to twenty three (23) students participated in these assessments. Their reflective statements and laboratory notebooks were evaluated by faculty based on course rubrics which were designed based on course learning goals to match the Forensic Science major learning goals.

Student performance based on a reflective statement was above expectation in Knowledge, Practical Skills and Communication. However, it is important to note that the content of reflective statements varied significantly among students and therefore in the future we propose to give students more specific guidelines in the form of rubrics.

As for the students' notebooks, student performance was above expectation in the areas of Reasoning, Knowledge, Practical Skills, and Communication. Students performed very well in their notebook assignments.

The indirect assessments were performed by assessing students' supervisor's comments and the final grade. A total of fifteen (15) students participated in these assessments. Supervisor comments were evaluated by faculty based on course rubrics which were designed based on course learning goals. Supervisor's comments about student's practical skills and student's final grade were excellent, graded A. However, these comments and grades were not an auspicious way to evaluate true student performance. The final grade given to a student was not a good indicator to indirectly assess student performance.

FOS402 Undergraduate Research Internship

These assessments were set up based on the previous year's outcomes assessment report. Students were provided with a revised syllabus which included several new requirements --- a written literature report/proposal, a laboratory notebook, and a final report/poster presentation. These assessments were performed to evaluate our FOS402 capstone course by analyzing our student performance at three different stages --- 1) a written literature report after completion of 100 hours of their internship; 2) a notebook after completion of 200 hours of their internship; 3) a scientific poster presentation, which was made after completion of their course requirements for Spring 2012. A total of eight (8) to fifteen (15) students participated in these evaluations and their reports/notebooks/posters were assessed by a team of faculty members who used either rubrics for reports/notebooks or pre-determined questions and rubric to evaluate student poster presentations.

Student performance of a written literature report was satisfactory in the Knowledge and Communication aspects. Students demonstrated excellent written communication skills. However, only 64.3% of these students demonstrated a basic understanding of their research projects as well as showing the evidence that supports a claim for conducting their own research projects. Only 14% of students clearly explained the rationale of their research project and 36% of the students clearly described the significance of the project and their methods.

Student performance on laboratory notebook was below satisfactory in Reasoning, Practical Skills, and Communication skills. We found that our students did not demonstrate good scientific notebook writing skills. Due to a weakness in their written communication skills, we were unable to assess a good understanding of students' practical research and reasoning skills. From this assessment, a student's reasoning skills and practical skills may not be appropriately and correctly assessed due to the student's weakness in communication skills – lab notebook writing.

Student performance on the poster presentation for 2011-2012 was satisfactory. Students showed strong evidence of knowledge which was found to be a weak point of the assessment for the prior year (2010-2011). This demonstrates that the new assignment of a written literature report was very helpful in terms of improving student knowledge level.

However, Reasoning Skills were still the weakest aspect of student performance as was the case in the prior year (2010-2011). The new assignment of notebook writing was designed to help students to develop their reasoning skills; however, only 62.5% of students showed satisfactory reasoning skills in their notebook assignments. This indicates that students did not have sufficient ability to think and reason critically. Students did not apply scientific principles to problem solving and data interpretation.

Since all of the evaluated students met departmental expectations in their written literature reports and poster presentations, this indicates that the scoring rubrics with three different performance levels may not properly evaluate student's performances. These scoring rubrics could not correctly distinguish the differences of student's performances.

The curriculum for FOS402 will once again emphasize the development of scientific literacy (Knowledge). It should also focus on providing our students with comprehensive training in scientific writing and with a journal article discussion session.

An indirect assessment was performed to evaluate our FOS402 capstone course by assessing the student final grade. Mentors gave each student a grade based on their performances in conducting experiments, writing a literature report and laboratory notebook, and giving a research presentation. We found that the final grade was not a good indicator to indirectly assess student performance. Basing the findings on direct assessments, students' final grades did not reflect their performances.

AY 2012-2013: BIO412 and TOX416 assessment

The third year of the 5-year assessment cycle was focused on the BIO412 and TOX416 courses. Based on the second year assessment findings, we found students lacking Communication (writing) and Reasoning Skills for the laboratory notebook and report. In the third year of the 5-year assessment cycle, students were provided with guidelines and instructions in laboratory notebook writing at the beginning of the semester with emphasis on the discussion section which is critical for learning "Reasoning Skills". Their first lab report and then their last lab report were collected for assessment.

A total of twenty one (21) students participated in these assessments. Their reports or laboratory notebooks were evaluated by faculty based on course rubrics which match our departmental learning goals. Students' performance for the first report did not meet departmental standards. But, students' performance for the last report met departmental standards. This indicates that student's performance was improved as compared to the first report/notebook.

Among those departmental goals, student's performance on Practical Skills and Communication showed the most improvement. Communication skills remain the weakest part of students' performance. It is also important to know that the minimum grade for those learning goals did not change as compared to the first report/notebook. This indicates that some students did not improve their performance.

AY 2013-2014: TOX416 assessment

The fourth year of the 5-year assessment cycle was focused on TOX416 course. Based on the second year assessment findings, we found students lacking the communication skills and the reasoning skills for the laboratory notebook and report. In the third year of the 5-year assessment cycle, students were provided with the guidelines and instructions on laboratory notebook writing at the beginning of semester. Students showed the improvement in report writing. In this fourth year of the 5-year assessment cycle, lab reports and oral presentations were used for assessment.

Students' performance for the final lab report was above departmental standards, with the best performance being in the "Practical skills" learning goal. Among these learning goals, students' performance in "Communication" was not as consistent as compared to the other three learning goals. However, overall student performances in Reasoning, Knowledge, Practical Skills, and Communication were improved as compared to the prior year (2012-2013).

Students' performances in oral presentations were below departmental standards. Their use of technology for the oral presentation was strong, but the way students presented (in terms of communication with their audience, and logical use of their claims and evidence) was weak. This indicates that students knew how to use communication aids (e.g. video, PowerPoint slides etc.) to help their presentations, but they were not prepared to do the public speaking. It is also important to know that the students' performances on Practical Skills (Organization) met the satisfactory level, but students' performance varied dramatically from one to the other. This indicates that some of students did not present their topics clearly, logically and in a well-organized fashion and thus it was hard to follow the line of reasoning.

Final grades for the TOX416 lecture were used for the indirect assessment of the learning goal of Knowledge. About 87.2% of students had met the departmental expectation of the Knowledge learning goal. The students' final grades for TOX416 laboratory were used for the indirect assessment of the Practical Skills learning goal. About 87.2% of the students have met the departmental expectations on the Practical Skills learning goal. This indicates that the changes we made to the laboratory component of TOX416 based on the previous year's (2012-2013) assessment data have helped students achieve the departmental learning goal.

AY 2014-2015: Scaffolding assessment --- CHE104, CHE220, CHE321, and TOX416

In the fifth year of the 5-year assessment cycle there was a scaffolding assessment from 100-level to 400-level courses. Based on the fourth year assessment findings, we found that students had improved their writing communication skills, but not their oral presentation skills. Their reasoning skills were still below departmental expectations. In the fifth year of the 5-year assessment cycle, students were provided with guidelines and instructions for laboratory report writing at the beginning of semester. The lab reports were collected and used for assessment on

Practical Skills learning goal. Three subareas of Practical Skills (Inquiry and Analysis; Quantitative Literacy; and Problem Solving) were focused in this assessment.

Students' performance for the selected lab exercise report was above departmental standards except TOX416 in two of the sub-areas (Inquiry and Analysis: Limitations and implementations; Problem Solving: Evaluate outcomes relative to the problem and professional ethics in science). This could be due to (1) these sub-areas presented much greater challenges for TOX416 students, (2) the standards of the rubrics for TOX416 were too high, or (3) the standards of the rubrics for CHE104, CHE220, and CHE321 were too low.

The Quantitative Literacy showed the largest discrepancy among CHE220 students. Even though CHE220 students' performances were above satisfactory, a large percentage of students in CHE220 did not meet departmental expectation. This indicates that students' performances in CHE220 was inconsistent, that is, some students performed very well and others performed below expectations. This may indicate that students who have high performances in CHE104 might not perform well in CHE220 and students who have low performances in CHE220 could do much better in CHE321. This could be due to (1) CHE220 students were not well prepared, (2) a particular lab exercise was too difficult for CHE220 students, (3) the standards of the rubrics for CHE220 were too high, or (4) the standards of the rubrics for CHE104, CHE321, and TOX416 were too low.

Revising the courses, the lab exercises, the guidelines for lab report writing, and the rubrics is needed for the future assessment.

Forensic Science (BS)

Program Learning Assessment. Key findings and proposed actions
(2011-2015)

Program Learning Goals

1. Reasoning: Draw appropriate scientific conclusions from evidence and experimental data.
2. Knowledge: Acquire broad fundamental concepts, theories, and principles in physical and biological sciences.
3. Practical skills: a) Accrue hands-on laboratory and b) practical research skills.
4. Communication: Develop competence in oral and written forms of scientific communication.

Outcomes Assessment

Program Learning Goal #	% Meet / Exceed ¹	Key Findings	Proposed Actions (Semester Implemented)	Was action effective? ⁴		
				Follow-up assessment Sem. Year	% Meet / Exceed	
2011						
Assessment Context² : Capstone FOS 402 (n=8), Tool³ : Poster presentation						
1	87.5	Make logical conclusions based on data.	Replicate study with larger sample. Consolidate overlapping learning goals. Revise poster questions. Emphasize the development of scientific literacy and provide students with broad scientific background (Sp 12).	Sp12	100	↑
2	62.5	Not able to explain significance of research findings.		Sp12	100	↑
3a	100	Understand role of quality assurance and control.				
3b	87.5	Good knowledge of practical research skills.		Sp12	100	↑
4	100	Excellent oral communication.		Sp12	100	=
2012						
Assessment Context : Capstone FOS 401 (n=18), Tool : Reflective statement						
1	77.8	Some understanding of decision-making process.	Redesign rubric for reflective statement to connect learning objectives with purpose of reflective statement (2012-13).			
2	94.4	Able to apply general concepts to scientific applications.				
3	94.4	Understand use of blanks and positive and negative controls.				
4	94.4	Clearly describe in writing the internship projects.				
Assessment Context : Capstone FOS 401 (n=23), Tool : Laboratory notebook						
1	100	Know difference between objective and subjective data.	New guidelines for reflective statement and laboratory notebook (2012-13).			
2	100	Explain scientific concepts used to design experiments.				
3	100	69.6% show consistent proficiency in all aspects.				
4	100	Highest score in student performance.				
Assessment Context : Capstone FOS 401 (n=15), Tool : Laboratory Internship - Supervisor Comments						
3	100	High performance in practical skills.	Mentor survey to evaluate student performance (Sp13).			

(1) Percent represents ratio of students who met or exceeded expectations. Where scores represent mean performance, the mean score and highest scale value are indicated (e.g., 3.3 out of 4). (2) Assessment context may relate to comprehensive program review, specific academic setting (e.g., course #, capstone, internship), class standing (e.g., seniors, transfers, alumni), post-graduation outcomes (e.g., placement, further education, employers ratings of employee skills), or indicators of learning progress. (3) Examples of tools include exams, portfolios, research projects, lab reports, papers, essays, surveys, licensure tests, performances, presentations. (4) Re-assessment of learning follows the implementation of actions to determine their effectiveness in improving learning outcomes.

Outcomes Assessment

Program Learning Goal #	% Meet / Exceed	Key Findings	Proposed Actions (Semester Implemented)	Was action effective? Follow-up assessment Sem. Year % Meet / Exceed
2012 (cont.)				
Assessment Context : Capstone FOS 401 (n=24), Tool : Final Grade				
	100	All students received a grade of A.		
Assessment Context : Underg Research Internship FOS 402 (n=14), Tool : Written Literature Report/Proposal				
2	100	14% of students clearly explain research projects / rationale.	Syllabus with new guidelines for written assignment. Offer scientific writing workshops (2012-13).	
4	100	36% clearly describe significance of project and methods.		
Assessment Context : Underg Research Internship FOS 402 (n=8), Tool : Laboratory Notebook				
1	62.5	Try to explain experimental results, not always accurately. Poor performance in reasoning and practical skills could be due to lacking the communication skills.	New guidelines for laboratory notebook writing; notebook collected a different stages during internship; scientific writing workshops will be offered (2012-13).	Sp13 3.24 of 4
3	75.0			Sp13 3.24 of 4
4	75.0			Sp13 3.02 of 4
Assessment Context : Underg Research Internship FOS 402 (n=15), Tool : Poster Presentation				
1	100	On average, weakest component of student performance.	Revise rubric to increase performance levels. (2012-13).	
2	100	Satisfactory scientific literacy and background knowledge.		
3	100	Average performance in research skills above satisfactory.		
4	100	Performance in oral communication above satisfactory.		
2013				
Assessment Context : BIO 412 and TOX 416 (n=21), Tool : Laboratory Reports				
<i>First Report</i>				
1	2.81 of 4	Overall student performance for the first report did not meet departmental standards (<3.00). Overall student performance for the last report met departmental standards (> 3.00). This indicates that overall student performance improved compared to the first report/notebook. Performance on practical skills and communication showed the most improvement, but not for all students.	Scoring rubric will be revised to meet the course learning goals (F13). Use rubric for student assessment (Sp14). Syllabi revised to include guidelines for report and laboratory notebook writing (F13). Provide samples of report and notebook (Sp14).	
2	2.83 of 4			
3	2.74 of 4			
4	2.45 of 4			
<i>Last Report</i>				
1	3.24 of 4			Sp14 87.5
2	3.24 of 4			Sp14 91.7
3	3.24 of 4			Sp14 91.6
4	3.02 of 4			Sp14 91.7
Assessment Context : BIO 412 and TOX 416 (n=21), Tool : Final Grade				
	100	Student performance met expectations with a grade of B.		See 2014 Grades

Outcomes Assessment

Program Learning Goal #	% Meet / Exceed	Key Findings	Proposed Actions (Semester Implemented)	Was action effective? Follow-up assessment Sem. Year % Meet / Exceed
2014				
Assessment Context : TOX 416 (n=24), Tool : Laboratory Report				
1	87.5	Performance of laboratory report was much better than that of oral presentation.	Assess 'Reasoning' across different levels of learning (freshmen to seniors). Set up rubric. Implement assessment (Sp16).	
2	91.7			
3	91.6			
4	91.7			
Assessment Context : TOX 416 (n=39), Tool : Oral Presentation				
1	69.2	Most students provide accurate & complete explanations.	Revise rubric for oral presentation. Revise guidelines of student oral presentation; assess oral presentation based on revised rubric and guidelines (Sp16).	
2	79.5	Information in presentation consistently accurate.		
3	69.2	Performance varied dramatically among students (kurtosis<0)		
4	35.9	Know how to use communication aids (e.g., video) in presentations, but not prepared to do public speaking.		
4	82.0			
Assessment Context : TOX 416 (n=39), Tool : Grades				
2	87.2	74.4% exceeded expectations on practical skills. Changes based on previous year assessment helped achieve dept goals.	Redesign the indirect assessment plan by outcomes assessment committees (Sp16).	
3	87.2			
2015				
Assessment Context : CHE 104 (n=20), CHE 220 (n=21), CHE 321 (n=10), TOX 416 (n=20), Tool : Laboratory Report				
Goal 4: Practical Skills: Inquiry and Analysis				
CHE 104	93.0	Performance in these 4 courses met expectations, except TOX416 in one sub-area (Limitation / Implications). Though CHE220 students' performance was above satisfactory, 24% to 34% of students did not meet expectations.	Revise rubrics by Dept Outcomes Assessment Committees (F15). Choose Lab exercise as an assessment tool for Bio related courses (BIO104, CHE135, BIO315, BIO413) by lab instructors and Dept Outcomes Assessment Committee (F15). Revise the curriculum of CHE220 and TOX416 (Sp16). Develop lab report writing guidelines for Biology related courses (F15). Implement the scaffolding assessment for Biology related courses, by lab instructors and Dept Outcomes Assessment Committees (SP 16). Close loop for 2013-14 assessment (please see 2013/2014 assessment report) (Sp 16).	
CHE 220	73.0			
CHE 321	98.0			
TOX 416	89.0			
Goal 4: Practical Skills: Quantitative Literacy				
CHE 104	85.0	Students' performance in these 4 courses met expectations. Even though CHE220 students' performance was above satisfactory, 29% to 52% of students did not meet expectations.		
CHE 220	61.0			
CHE 321	98.0			
TOX 416	95.0			
Goal 4: Practical Skills: Problem Solving				
CHE 104	88.0	Performance in these 4 courses met expectations, except TOX416 in one sub-area (Evaluate outcomes relative to the problem). Performance in CHE220 was above satisfactory, but 15% to 34% of students did not meet expectations.		
CHE 220	80.0			
CHE 321	100.0			
TOX 416	88.0			