

Running Title: Program Outcomes with Primary Literature

**Satisfying Program Level Outcomes by  
Integrating Primary Literature into the “Online” Classroom**

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**Abstract:**

Due to the COVID 19 pandemic, there has been a paradigm shift from traditional classroom instruction to a remote online modality. In an effort to expose students to the most current and relevant information in the field of Nuclear Medicine Technology without access to traditional resources found on a college campus, it has become imperative that access to primary literature within the field be made readily available. Nuclear Medicine Technology students at Bronx Community College are being taught to use the JNMT as the basis for their required presentations that span across the curriculum. Guided by the instructors and armed with a rubric ultimately used as a formative assessment tool, the students are required to explore current articles from the JNMT and ultimately present their findings to the cohort. By design, this “article share” project has successfully been implemented as a principal metric in satisfying JRC program requirements for accreditation, while also being conducive to increasing oral presentation skills and cohort socialization.

**Key Words:**

program outcomes, formative assessment, online, primary literature, distance learning

## **Satisfying Program Level Outcomes by**

### **Integrating Primary Literature into the “Online” Classroom**

As a general concept, education can be defined as “the process of receiving or giving systematic instruction” (1). However, in order for the “process” to be effective, there are many variables that must be addressed. Traditionally, instructors would deliver a steady stream of information to their students based on face to face interaction within the walls of a classroom. This “traditional” style of education was conducted solely as a synchronous form of instruction. Although having little flexibility, this system of learning has been widely used, successfully, for many years. However, classroom dynamics are changing. Nuclear Medicine Technology (NMT) programs around the nation are finding themselves having to adjust to the new modality of “distance learning”. Using distance learning, cognitive development will no longer be solely confined to the walls of a classroom. Specific locations and times will play less and less of a role in didactic courses.

Whether the transition to distance learning be a natural evolution dictated by expanding technology, or quickly forced upon us due to a global pandemic, the establishment of the “online” classroom will still need to satisfy Joint Review Committee on Nuclear Medicine Technology (JRCNMT) accrediting standards. As outlined in the *Accreditation Standards for Nuclear Medicine Technologist Education*, “instructional faculty must demonstrate the effectiveness in teaching courses, supervising laboratory experiences, evaluating student achievement, and developing curriculum. Faculty must also participate in program policy and procedure formulation and the assessment of program effectiveness.” (2). Accreditation standard B1.1 further asserts that “the sponsor must provide sufficient resources to assure achievement of the program's mission and expected outcomes.. .” These standards are required to be upheld regardless of the modality of instruction.

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Available resources, such as laboratory materials, resources, and equipment become an immediate obstacle of satisfying program requirements in the “online classroom”. It stands to reason that since students would no longer have access to the classroom resources they normally would, new types of resources that can be used to satisfy program level outcomes (PLO’s) must be procured.

As nuclear medicine educators who now find ourselves having to adapt to an online modality of instruction, it is imperative to be able to share all available resources with our students. As a benefit of the free membership to the Society of Nuclear Medicine and Molecular Imaging (SNMMI), the JNMT lends itself as a valuable resource for students both inside and outside of the classroom due to its ease of accessibility and relevance to the subject matter.

At Bronx Community College (BCC), we have developed projects within our didactic courses based on the integration of SNMMI membership, and specifically the use of JNMT as a primary source of information and current events of the industry. The implementation of these resources not only benefit the students in their understanding of the subject matter, but when executed properly, aids in formative and summative assessments of the Nuclear Medicine Technology Program, as outlined by the program level outcomes established by the JRCNMT.

The JNMT has several benefits that serve the students both in and out of the classroom. As Nuclear Medicine educators, we feel it is imperative to share the tools available to the students included in the free membership associated with the Society of Nuclear Medicine and Molecular Imaging. At Bronx Community College, we have developed projects useful in integrating the SNMMI and specifically, the JNMT into the classroom that can be completed both in-person or in an online classroom setting.

### **Program Overview**

Our program is designed to be completed over a two year period, with the first year consisting of didactic courses, and the second year combining didactic courses and clinical internship. We introduce the

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JNMT into the classroom early within the program, we assist the students in registering for the SNMMI before the first day of class. The NMT program holds an orientation session with incoming students prior to the beginning of the semester, in which copies of the JNMT are passed around to the students, displaying the written works available to them upon obtaining membership. In addition, the Program Director navigates the first-year students through the SNMMI website on the first day of class, demonstrating key tools available at the students' disposal. Tools available to the students include article access, scholarship and grant opportunities, information for upcoming events, and job postings. As educators within the program, we feel it is important to introduce these resources to the students early, as they can apply for scholarships and grants that are appropriate, as well as discover the latest and most relevant topics within the Nuclear Medicine field. For these reasons, we insist the students register as students for the Society of Nuclear Medicine upon entry into the program.

### **First Year**

To generate discussions of current events in Nuclear Medicine Technology, we have begun to implement an “Article Share”, activity, which is designed to educate students about relevant topics within the field while cultivating ideas for potential research projects.

For the first-year students, this project begins with demonstrating how to navigate through the SNMMI website and identifying by what method to locate articles within the JNMT. This quick navigation period demonstrates how to search for current articles, or find published works based on keywords. During the first class, the Program Director shares an interesting article with the students based on current industry trends. The article is presented via a PowerPoint presentation, highlighting key points from the article and how this news has the potential to impact our field. Moving forward, the students are required to explore the SNMMI website at their own pace, selecting at least two articles of interest throughout the semester. The instructors ask the students to share these articles, via the discussion board feature of our learning management system, BlackBoard, in which one article is selected each week to share at the beginning of class. The articles that are of interest to the students but were not selected for

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class presentations are shared with the students on BlackBoard. This allows students to browse through additional articles of interest at their leisure and has easily transitioned into the distance-learning teaching format newly adopted due to COVID restrictions.

The article share presentation is a brief, 5-minute presentation, that highlights key points made within the article while allowing a short discussion period afterward. Instructors that have conducted this presentation format unanimously felt that this was an excellent way to increase class participation as well as spark areas of interest within the student groups. An example from the Journal of Nuclear Medicine used in the first-year class included the article, “Small-Animal 18F-FDG PET for Research on Octopus vulgaris: Applications and Future Directions in Invertebrate Neuroscience and Tissue Regeneration” (3). This article discussed methods in which FDG was utilized to image regenerative tissue studied in various octopi. From the instructor's point of view, this was an excellent article to highlight on the first day of class. This article not only demonstrated the unique properties of radiopharmaceuticals but also exhibited the unlimited potential of research being conducted within the field. Instructors who have utilized articles such as this at the beginning of class have noticed that this technique piques the interest of students about the field they have chosen to enter, while also serving to break up a long lecture.

In order to give students an incentive to participate in this article selection, it has been adopted as a small part of the students' grades within their introductory course. Five percent of the students' grade is awarded as participation points if they select two articles of interest and post them in the discussion board with a brief explanation about why they chose that particular article.

After completing the article share assignment with the first-year students, we felt this proved to be a successful project. Not only did this assignment demonstrate the value of the SNMMI and the JNMT, but it also helped to increase participation within the class. Instructors took note that students were less anxious to ask questions regarding the article and more open to having discussions with their classmates. This not only helped the cohort become more collegial but also decreased future anxieties about asking

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questions/participating in the lecture. This assignment with the first-year students helped pilot our more extensive article assignment as they progress into their second year.

### 2<sup>nd</sup> Year

During the second year of the program, students take classes in the evening after completing their clinical internship earlier in the day. In previous years, we felt it was often challenging to engage students during these classes, as many of them were tired or anxious to return home after completing a full day of their clinical requirements. After acknowledging the success of the article share presentation with the junior class, we decided to incorporate a version of this in the senior class as well.

Rather than students simply selecting articles, for this project, students present an article share of their own. Since students were able to observe a variety of article share presentations conducted by the instructor, and in conjunction with the rubric used to assess the assignment, they gained an understanding of how to format the presentation.

This project begins with assigning a random order in which students will present. Prior to this, a schedule is built that assigns two to three students to present on select days throughout the semester. Typically, two students present each class day that they do not have an exam. Depending on the number of students in attendance, these short article share presentations are conducted at the beginning of class for roughly seven sessions. Previously, instructors had reserved an entire class day for article share presentations, however, we felt that spreading the presentations out through the semester worked better for our courses. We observed that if the presentations are spread out over numerous classes, classmates responded with increased engagement, as opposed to holding all presentations on the same day. In addition, splitting the students up amongst numerous class days allows the article share presentations to be discussed prior to a lecture, serving to again improve overall focus for the lesson.

To initiate the project, students are first instructed to select two current articles from the JNMT, which they would like to present. Once selected, they send their article choices to the instructor via email.

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The instructor can then select one of the two articles for them to focus their effort. The use of this tactic has eliminated the possibility of duplicating the same article, or too many submissions addressing the same topic will be discussed.

Once the article has been selected, students are asked to deliver the presentation as a PowerPoint, using the same format as they had observed from their prior semester. To avoid taking too much time from the lecture, students are asked to present for only 5-7 minutes. Students are provided with a detailed rubric, which lays out the criteria in which they will be evaluated.

The grading rubric, (seen below in *Table 1*), has been utilized to guide the student presentations, as well as evaluate the project for our course assessment. The rubric assesses four grading criteria which include; delivery of the oral presentation, content and organization, overall PowerPoint formatting, and relevance to the field of Nuclear Medicine Technology. Using this rubric, students are evaluated on a 16 point scale, with 12 out of 16 points meeting our benchmark of 75% for course assessment. Since this project came into fruition last year, all of the students have met or exceeded the required project benchmark.

The program as a whole has recognized a variety of benefits to this article share project, in which many have been previously identified. Other recognized benefits include the number of current events discussed, improvement of oral and communication skills, and increased confidence to present at a chapter conference.

After conducting these presentations over the last year, a multitude of articles have been shared consisting of a variety of topics. Allowing the students to select the articles has expanded the diversity of topics presented to the class. Recent projects included topics pertaining to advanced instrumentation, novel radiopharmaceuticals, job outlook, COVID's effect on NMT studies, continuing education, and more. The 2019/2020 cohort was the first class to have the continuity of article share presentations in their junior and senior year. Students within this cohort were exposed to upwards of forty current articles from

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either the *Journal of Nuclear Medicine* or the *Journal of Nuclear Medicine Technology*. Students continue to express how much they enjoy the article share presentations, and how it has helped boost their passion for the field of Nuclear Medicine.

In addition, oral communication skills have been improved since the adoption of this project. Although requirements for the AAS degree in Nuclear Medicine require fundamental English and Communication courses, transfer students, in particular, may not have completed an oral presentation in some time. Allowing the students to speak in front of their classmates has aided in improving oral communication skills without the associated anxieties of presenting in front of a large group of people. Within the program, we feel that the practice of speaking in front of the class may help to improve a graduate's overall interview performance. Additionally, students have expressed their increased comfort level in conducting oral presentations, which has influenced them to present at chapter conferences. The class of 2019 had two students present abstracts at the Greater NY Chapter of the Society of Nuclear Medicine Conference, which was an increase from previous years. The class of 2020 intended to have three speakers; however, the conference was postponed due to COVID restrictions.

As challenging as this last year has been due to the pandemic, we are fortunate to still be able to run this project via a distance learning modality. This past year, students have been attending class synchronously, via the Zoom platform. Students have been conducting their presentations live via Zoom, sharing their screen and moving through the PowerPoint at their own pace. Students who do not have access to a webcam or have increased anxieties about public speaking can simply turn off their video, speaking over the PowerPoint. Especially in these unprecedented times, we are pleased to have observed that with the implementation of this project, the engagement between the members of the cohort has increased. However, similarly to that of the change in modality to instruction, the fluidity of the cohort has gone through its changes as well. Although still a cohesive unit, the online modality has reduced the personal interaction that seemingly develops naturally in a face-to-face setting. Even with this unforeseen

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consequence, the program feels fortunate to still be able to conduct these presentations in a very meaningful way.

### Assessing Effectiveness

Deciding which type of assessment to use when evaluating the effectiveness of the article share assignment must begin with an understanding of how and why it was assigned in the first place. This assignment not only tests student knowledge of industry standards and common practices, but it also is designed to evaluate the communication skills of the student by ultimately requiring a presentation toward the end of their coursework.

According to the instructors who administered this assignment to their classes, it was agreed that the success of the assignment weighed heavily on the structure of the rubric. To ensure that the rubric served its formative purpose, the descriptors were written in a way that “described” what was being asked of the students. The descriptors in each of the criteria explained to the student how to complete the assignment. In practice, this allowed the teacher and student to work together toward the common goals outlined in the assignment requirements. In contrast, if this rubric was designed solely for evaluative purposes, it could not act as a guide for the students, therefore being void of its intended purpose of a formative assessment tool.

As listed in Appendix D, Form J of the JRCNMT Program Outcome #8 requires that “The nuclear medicine graduate will be able to demonstrate written and oral skills focusing on effective communication” (4). The article share assignment was designed with this particular outcome in mind.

NMT 81 (Orientation to Nuclear Medicine) is the course in which this assignment is first introduced and assessed. As described earlier, the students are required to either log into the journal’s website or access printed copies and retrieve two articles based on their personal interest and how the topic contributes to the advancement of Nuclear Medicine Technology. An unforeseen, but welcome outcome of this assignment was that in large part, this was the first time these students were required to

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use a primary document as a resource in their course of study. Ultimately, the articles chosen by the students for this assignment were used by the instructor to promote classroom discussion, enhance the scope of study, and aid in fostering a sense of collaboration amongst the students.

The number of students in the pool that was assessed was twelve. All twelve students submitted articles before or on the due date. A simple satisfactory/unsatisfactory rubric was used to evaluate the quality and thoughtfulness of the articles chosen. After quickly analyzing the data, it was found that every student that participated in this assignment received a satisfactory rating from the professor, which positively affected the students' class participation grades. It should also be noted that remote learning largely prohibited using the journal in its printed format, as the students did not have access to the college library. Over the entire class, final class participation grades averaged 90%, which exceeds the benchmark of 75% established by college standards and practices.

As the students progress through their coursework, NMT 71 (Nuclear Physics Laboratory) is the course that the students will conduct a presentation, using the JNMT as their primary source. By this time, the students have been well versed in accessing and sourcing information from the journal and are now required to prepare a presentation on a topic of their choice, albeit approved by the instructor. Due to the cumulative nature of this assignment, the students understood the significance of this project and how it would ultimately affect their class participation grade. The grades were based on how well the student adhered to the criteria of the rubric.

The benchmark for the total class participation assessment, which includes "Formal Assignment #1" (the article share assignment) and Formal Assignment #2 (a separate assignment unrelated to the article share, but still addressed the SLO for the course) is  $\geq 75\%$ . The students used the article share rubric as a guide through the entire process leading up to their presentation. The cumulative results of the article share assignment are as follows.

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Throughout the course, guidance and revisions were encouraged leading up to the final assessment of the article share presentation. Reviewing the data, the class average for the article share presentation was 87.4%, which exceeded the benchmark by 12.4% and ultimately satisfies the student learning outcome.

In retrospect, there were several observations the faculty member who implemented the assignment had upon the completion of the course. First, she noted that overall participation had increased as compared to other cohorts of the same course in previous semesters. After an informal inquiry of the students, she found that there was a general feeling that an online modality of instruction allowed the students to feel less intimidated when asking questions or giving presentations. “Public speaking”, at least in an online classroom, is no longer performed in public. This allowed students that were normally apprehensive about speaking in front of a large audience a feeling of increased confidence.

Due to the success of the article share assignment, and how closely it aligns with required student learning outcomes, it has been decided at Bronx Community College that this type of assignment will continue to be employed. Exposing the students early in their nuclear medicine technology careers to the JNMT has allowed the students to rely on the valuable, reputable, and relevant information that a primary resource provides.

### **Conclusion**

As educators, we all recognize the many challenges of this past academic year. Didactic courses have transitioned to an online modality, while clinical courses were saddled with restrictions due to the COVID-19 pandemic. To ensure that our students remain the priority during these challenging times, the Nuclear Medicine Technology program at Bronx Community College will be participating in an “Online Modality Assessment Project”. Conducted by the college, this project will analyze how well Student Learning Outcomes are being satisfied in an online modality. It is expected that the Nuclear Medicine

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Technology Program will have a significant presence in this college-wide assessment due to how it has successfully embraced the “online classroom” and its recent reaccreditation by the JRCNMT.

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**Table 1**

<b>Article Share Rubric</b>	<b>Needs Improvement 1</b>	<b>Fair 2</b>	<b>Accomplished 3</b>	<b>Exemplary 4</b>	<b>Score</b>
<b>Delivery</b>	Holds no eye contact with audience & reads entire report from notes	Displays minimal eye contact with audience, while reading mostly from notes	Consistent use of direct eye contact with audience but still frequently returns to notes	Holds attention of entire audience with direct eye contact, seldom looks at notes	
	Speaks in low volume – causes audience disengagement	Speaks in uneven volume with little or no inflection	Speaks with satisfactory volume	Speaks with volume and inflection to maintain audience interest	
<b>Content/ Organization</b>	Does not have grasp of the information and cannot answer questions about the topic selected	Content is relatively disorganized-challenging to follow.	Presentation is well organized and thought out	Demonstrates full knowledge by answering questions with explanations	
		Student can answer only basic questions about the selected topic	Student is at ease with expected answers to most questions.	Presentation was clear and organized put together with a logical order	
<b>PowerPoint</b>	Unorganized presentation with no pictures, graphics, or title slide	Somewhat organized presentation – only one picture included. Title slide missing some components including the article link	Organized presentation with a few pictures and appropriate title slide including the article link	Well-written, organized presentation including pictures/graphics. Title slide had all necessary components	
<b>Relation to the Field</b>	Article did not relate to NMT or related physics field	Some relation to NM, Molecular Imaging, or Physics – Lacking Purpose/Understanding. A Nuclear Medicine article selected, but not from a peer-reviewed journal.	Topic directly related to NMT or suggested health field. Article selected from a peer-reviewed journal.	Well-written, detailed explanation of relation to our field. Topic selected from peer-reviewed journal and covered with proficiency	