

# THE INTRAMUSCULAR INJECTION SKILLS OF LEVEL II AND LEVEL III NURSING STUDENTS DURING FACE-TO-FACE LEARNING AND ONLINE LEARNING

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## Abstract

**Background:** The world faces a great challenge due to the Covid-19 pandemic. It has affected the life of people including the education system. Because of this, various methods of teaching, such as online classes, were adapted. The research has focused on the comparison between the intramuscular injection skills of level II and level III students who learnt the subject matter through online learning and face-to-face learning, respectively.

**Method:** The study used a quantitative, descriptive-comparative research design with a total of 303 level II (105) and level III (198) qualified nursing-student participants from a private university in Manila. Modified questionnaires that were validated by three (3) experts were answered by the participants via Microsoft forms.

**Results:** The results reveal that Competence, Skills, and Knowledge have obtained a p-value of 0.0000 which is less than the 0.05 significance level or margin of error. This indicates that there is a significant difference in the obtained results from the independent groups. This shows face-to-face learning is the more effective learning modality in learning IM administration.

**Conclusion:** Generally, it can be inferred that face-to-face learning delivers better results in terms of students' knowledge, skills, and competence. Practical application of skills and clinical experiences can give more assurance and confidence for students on learning a certain skill and obtaining competences that are pivotal to intramuscular injection. Lastly, this may aid in coming up with an effective medium on how to help students absorb more information about the topic and determine the areas they need to focus more.

**Keywords:** Intramuscular Injection Skills, Online Learning, Face-to-Face Learning, Nursing Students.

## Introduction

The current pandemic has inevitably and drastically affected people's daily lives and disrupted worldwide and local businesses and movements including the academic teaching-learning processes, and Nursing Education is not an exception. In order to have continuous learning while ensuring the safety and well-being not only of the students and teachers, but of the community as a whole, various methods of teaching such as online classes where professors and students must talk through microphones and see each other through screens to communicate as if having a real time conversation in the classroom were adapted.

In the nursing field, one of the most essential parts of the skills to be taught is intramuscular injection administration since they will be administering medications to patients during their clinical rotations. In relation to this, in the new curriculum of the Institute of Nursing in Far Eastern University-Manila, the intramuscular (IM) injection skills were taught during the first semester of second year college. Level III nursing students were the first batch to experience the new curriculum and had the skills done in a traditional learning environment, face-to-face. Meanwhile, the level II nursing students who are under the same curriculum had the skills done in an online learning environment due to the occurrence of the pandemic.

According to the Educause Center of Analysis and Research (2019), community college students have taken online classes recently, and are twice as likely to choose them. In local context, a market research firm that is based in the United States, Ambient Insight, made a global report that states that the Philippines was identified to be included in the top

ten countries globally when it comes to the fast improvement and growth related to online learning revenues in the coming years. According to Oellermann, (2014), with Online learning, students have online access to the materials 24 hours and can access them with the use of hyperlinks. This results in a fair reduction of time used during lectures and it also increases the chances to collaborate in achieving a constructive learning. In contradiction, according to Caroline (2020), face-to-face learning has an edge over online learning because the main source of information is the professor. This kind of setting allows students to raise questions directly to the instructor, and have the whole class discuss it. With this being said, the diversity among the students helps instil confidence among each other by group presentations and speeches. Both online and face-to-face learning have been studied to be effective by different sources with different situations. In this study, learning Intramuscular injection administration using both methods is deemed to be the main subject.

Cafasso (2019) has given IM injection a definition of drug administration technique allowing medications to be imparted in the muscles, and absorbed in the bloodstream quickly. Medications administered through intramuscular are put in vascular tissues for faster absorption in the bloodstream.

The theoretical framework developed by Parker, D. & Gemino, A. C. in 2000 which was based on Mayer's Learning Model was used as one of the main theoretical backbones of this study where the main components are the Materials to be Learned, Presentation Method and Learner Characteristics. These main components then branch out together resulting in a Learning process, then Learning Outcome, and lastly, Learning Performance.

The study sought to answer which learning modality is more effective in studying intramuscular skills of nursing students in Far Eastern University-Manila by comparing two learning methods which are face-to-face learning method and online learning method. In this study, the researchers propose to determine the knowledge, skills, and competence of the level II and level III nursing students in terms of intramuscular injection. Specifically, it sought to answer and address the following objectives: 1. To determine the demographic profile of the respondents in terms of year level; 2. To assess Intramuscular injection skill of Level II nursing students in terms of: a. Knowledge, b. Skill and c. Competence; 3. To assess the intramuscular injection skill of Level III nursing students in terms of: a. Knowledge, b. Skill and c. Competence; 4. To determine if there's a significant difference in the

result of the data when grouped according to Level II and Level III.

Primarily, this study helps health care providers, nursing students, and clinical instructors integrate the efficiency of both online learning and face-to-face learning which serves as an avenue in improving their knowledge, skills, and competence, essential in administering clinical injections. This determines which of the two learning modalities; face-to-face and online learning, is more effective in performing intramuscular procedures. This research suggested how competent, knowledgeable, comfortable, and confident students are, in which the skills of delivering care to patients is taught differently. Thus, the study encourages nursing administrations to develop methods to strengthen the student's knowledge, skills and competence in intramuscular injection so that they can improve and expand their capabilities. Moreover, data present in this study enables nursing professionals in terms of the development of possible online learning initiatives and programs to enhance their capabilities which are essential in the nursing services and community-based nursing care.

The researchers hypothesized that there is no significant difference in the assessed result of the IM knowledge, skills and competence of the respondents when grouped according to Level II and Level III.

## Methods

The respondents who are Level 2 and Level 3 Nursing students were screened through using inclusion criteria, to wit: Level II respondents should be (a) enrolled during the second semester of Academic Year 2020-2021 in the Far Eastern University-Manila; (b) under the Mixed Online Learning (MOL); (c) regular nursing students; and (d) agrees to participate in the study. Level III respondents should be (a) enrolled during the second semester of Academic Year 2020-2021 in the Far Eastern University-Manila; (b) under the Mixed Online Learning (MOL) and Asynchronous Online Learning (AOL); (c) regular nursing students; and (d) agreed to participate in the study. Moreover, the research locale was in Far Eastern University- Manila; however, the researchers were able to gather data regarding the knowledge, competence, and skills in intramuscular injection of the two groups by the means of answering the online survey questionnaire. A total of three (3) questionnaires were used in this study to measure the students' skills, knowledge, and competence when it comes to their intramuscular injection skills; said questionnaires were validated by experts and had undergone pilot testing.

Using Microsoft Forms as the medium to obtain their demographic profile which comprises their name (optional) and their year level, they were subsequently directed to answer the questionnaire in accordance with their respective year level. The level II, who learned the intramuscular injection skills through online learning modality, answered a set of 3 questionnaires to assess their knowledge, skills, and competence in administering intramuscular injection. Whereas, the level III, who learned intramuscular injection skills through face-to-face learning, also answered a set of questionnaires consisting 3 different assessments for the particular skill. Objective questionnaire to determine their level of Knowledge on the subject matter wherein the results were interpreted as Good, Fair and Poor. For the questionnaire related to Skills, which has 2 subsections namely, Preparation and Procedure, they were asked a total of 19 questions where the respondents are to rate their level of agreement or disagreement to a specific learning factor related to the subject matter whether they Strongly Agree (5), Agree (4), are Neutral/Indecisive (3), Disagree (2), or Strongly Disagree (1). On the other hand, the questionnaire related to Competence, a total of 13 questions were given to the respondents which they answered according to their perspective if their competence to a certain aspect Exemplary (5); Accomplished (4), Developing (3), Beginning (2) or Poor (1). Moreover, the study used a descriptive comparative research design to identify the effectiveness of

learning intramuscular injection skills in online learning and in face-to-face learning in terms of knowledge, skills, and competence between groups of respondents.

**Research Question No. 1:** What is the demographic profile of the participants in terms of their year level?

## Results

**Table 1 :Demographic Profile of Respondents in Terms of Year Level**

YEAR LEVEL	FREQUENCY	PERCENTAGE (%)
LEVEL 2	105	34.7%
LEVEL 3	198	65.3%
<b>TOTAL</b>	<b>303</b>	<b>100%</b>

Table 1 shows the demographic profile of the respondents in terms of Year Level, specifically, it shows that Level III has the higher percentage with 65.3% as compared to Level II with 34.7%.

**Research Question No. 2:** What is the intramuscular injection skill of level II nursing students in terms of knowledge?

**Research Question No. 3:** What is the intramuscular injection skill of level III nursing students in terms of knowledge?

**Table 2: The Intramuscular Injection Skill of Level II and Level III Nursing Students in Terms of Knowledge**

KNOWLEDGE		LEVEL 2		LEVEL 3	
Scoring	Verbal Interpretation	Frequency	Percentage (%)	Frequency	Percentage (%)
8 to 10	Good	64	61	161	81.3
4 to 7	Fair	34	32.4	37	18.7
1 to 4	Poor	7	6.7	0	0
<b>Total</b>		<b>105</b>	<b>100</b>	<b>198</b>	<b>100</b>

Table 2 shows the intramuscular injection skills of level II nursing students in terms of knowledge. The results demonstrated that 61% of the respondents have Good grasp of the Intramuscular injection knowledge, while 6.7% resulted in having Poor. The residual respondents of 32.4% are perceived to have

Fair knowledge on the subject matter. Moreover, results for Level III demonstrated that 81.3% of the respondents have Good grasp of the Intramuscular injection knowledge, while 18.7% resulted in having Fair, the data also shows that no percentage from the poor category was obtained.

**Table 3: The Intramuscular Injection Skill of Level II and Level III Nursing Students in terms of Skills**

SKILLS	LEVEL 2		LEVEL 3	
	Weighted Mean	Verbal Interpretation	Weighted Mean	Verbal Interpretation
1. I learned how to determine the injection site and needle size based on the patient's age, weight, and size of the muscle.	3.22	Neutral	4.10	Agree

2. I learned the different articles needed for intramuscular injection.	3.51	Agree	4.20	Agree
3. I learned how to properly perform handwashing before preparing the materials.	4.50	Strongly Agree	4.48	Agree
<b>Overall Weighted Mean</b>	<b>3.74</b>	<b>Agree</b>	<b>4.26</b>	<b>Agree</b>
<b>PROCEDURE</b>				
4. I learned how to properly check the medication label carefully. (on the patient's chart, medication card, and at patient's bedside before giving to patient)	3.94	Agree	4.43	Agree
5. I learned how to confirm the correct dosage according to the physician's order, available drug, and computation	3.78	Agree	4.30	Agree
6. I learned how to properly dilute the content of the vial using diluent and shaking it vigorously.	3.01	Neutral	3.98	Agree
7. I learned how to aspirate the desired amount of medicine from the vial/ampule while observing proper aseptic technique.	3.22	Neutral	4.37	Agree
8. I learned how to properly change the needle to gauge 23 needle and expels air from the syringe	2.90	Neutral	4.33	Agree
9. I learned how to determine and select a site free from skin lesions, tenderness, swelling, hardness, or localized inflammation and one that has not been used frequently.	3.47	Neutral	4.41	Agree
10. I learned how to properly position the client based on the chosen site of injection.	3.24	Neutral	4.42	Agree
11. I learned to put on gloves prior to the procedure.	4.42	Agree	4.42	Agree
12. I learned how to clean the site with an antiseptic swab using circular motion and cleaning the outer part first going to the center.	3.88	Agree	3.96	Agree
13. I learned how to inject the medication steadily and slowly while holding the syringe in a 90-degree angle.	3.11	Neutral	4.39	Agree
14. I learned how to withdraw the needle smoothly in at the same angle of insertion.	3.07	Neutral	4.42	Agree
15. I learned how to properly dispose the used articles including the syringe and needle in an ordinary garbage bin.	3.80	Agree	3.94	Agree
16. I learned how to document the procedure and nursing assessment	4.08	Agree	4.47	Agree
<b>Overall Weighted Mean</b>	<b>3.53</b>	<b>Agree</b>	<b>4.30</b>	<b>Agree</b>
<b>Strongly Disagree (SD)= 1.00-1.50; Disagree (D)= 1.51-2.50; Neutral (N)= 2.51-3.50 Agree (A)=3.51-4.50; Strongly Agree (SA)=4.51-5.00</b>				

**Research Question No. 2:** What is the intramuscular injection skill of level II nursing students in terms of Skill?

**Research Question No. 3:** What is the intramuscular injection skill of level III nursing students in terms of Skill?

Table 3 shows that the Level II respondents who chose “strongly agree” have already learned the skill on how to properly perform hand washing before preparing the materials needed in administering intramuscular injection. Meanwhile, the Level II respondents picked “agree” on the skills in the statement numbers 3, 4, 5, 11, 12 and 15, and they answered neutral for the skills in numbers 1,6, 7, 8, 9, 10, 13 and 14. Based on the data, it can be observed that “neutral” answers from the level 2 respondents are mostly the skills that are considered to be more technical or syringe-handling and patient-handling procedures in intramuscular injection. These procedures are geared more on to the actual administration of the drug compared to the steps on which they “agree”.

Meanwhile, for Level III, all statements asked in the questionnaire were answered by a verbal interpretation of “agree”. Since the level III nursing students had an actual and hands-on learning experience in administering medications via intramuscular injection, they are certain of what they are doing in terms of skills. Furthermore, the Related Learning Experiences (RLEs), which is composed of clinical and skills laboratories that the level III were exposed to during the face-to-face classes has been an opportunity for the students to have their skills trained which associates with their verbal answer of “agree” in preparation and procedural skills of intramuscular injection.

**Table 4: The Intramuscular Injection Skill of Level II and Level III Nursing Students in Terms of Competence**

COMPETENCE	LEVEL 2		LEVEL 3	
	Weighted Mean	Verbal Interpretation	Weighted Mean	Verbal Interpretation
1. I can explain the procedure and rationale to the child and family.	3.53	Accomplished	4.27	Accomplished
2. I can select the syringe size and needle size according to the volume and dose of medication correctly.	2.75	Developing	3.96	Accomplished
3. I can select the size of needle correctly.	2.87	Developing	3.94	Accomplished
4. I can choose and position the client appropriately.	3.17	Developing	4.39	Accomplished
5. I can independently prepare the equipment and supplies needed in IM injection.	3.27	Developing	4.36	Accomplished
6. I mastered and can perform the procedure independently and correctly without any doubt.	2.54	Developing	4.03	Accomplished
7. I can locate a proper site for intramuscular injection.	2.89	Developing	4.34	Accomplished
8. I can clean the site with alcohol using an inward circular motion.	3.49	Developing	4.14	Accomplished
9. I can flatten the skin on the selected injection site.	2.88	Developing	4.04	Accomplished
10. I can insert the needle quickly at a 90-degree angle.	2.65	Developing	4.27	Accomplished
11. I can continue to inject the medication even if there's blood retracted.	2.13	Developing	2.95	Developing
12. I can withdraw the needle with a steady, smooth, straight way and same angle of insertion.	2.7	Developing	4.36	Accomplished
13. I can recap the needle and throw it in a yellow bin.	3.41	Developing	4.03	Accomplished
<b>Overall Weighted Mean</b>	<b>2.94</b>	<b>Developing</b>	4.08	Accomplished
<b>Poor (P)= 1.00-1.50; Beginning (B)= 1.51-2.50; Developing (D)= 2.51-3.50 Accomplished (A)=3.51-4.50; Exemplary (E)=4.51-5.00</b>				

**Research Question No. 2:** What is the intramuscular injection skill of level II nursing students in terms of Competence?

**Research Question No. 3:** What is the intramuscular injection skill of level III nursing students in terms of Competence?

Table 4 shows that Level II participants have a weighted mean of 3.53; a verbal interpretation of “Accomplished” is gathered when asked if they can explain the procedure and rationale to the child and family. This is because the step can be completely carried out by verbalization, almost all nursing skills start with the step of explaining the procedure to be done thus the participants are already familiar with it.

Meanwhile, the level III respondents had already performed and practically done the procedure hands-on with the supervision of their clinical instructors during their skills lab which consisted of return demonstrations and revalidate where students would perform the procedure in front of their clinical instructor with regards to the intramuscular

procedure. The level III nursing students had also applied their skills already when they had their rotational clinical exposures during their first and second semester in their second-year college which includes administering vaccines such as BCG, Hepatitis B, Pentavalent Vaccine, OPV, IPV, MMR, and medications in paediatrics and newborns. This was done during their internship in their paediatrics and maternity concept rotation where there are actual patients who are in line, waiting for their turn to be vaccinated. This made the respondents’ competence in intramuscular injection already in an “accomplished” stage. In the case of number 11 that only resulted with a weighted mean of 1.49 or developing, where it stated that they have learned to continue to inject the medication even if there is a blood retracted. This only shows that the respondents have read and noticed that there is something wrong with this statement. Since they have already done several IM injections, they know when to continue and when to stop injecting medication. One reason is also because the level III students may not have yet experienced such a situation before that is why they are a little bit sceptical about it.

**Table 5: Mann Whitney U-Test: Difference in the Intramuscular Injection Skills between Level II and Level III Nursing Students**

Intramuscular Skills	Year Level	Mean Rank	Test Statistic	p-value	Decision	Remarks
Competence	Level II	103.7	5327.000	0.000	Reject Ho	Significant
	Level III	177.6				
Preparation	Level II	78.2	2648.000	0.000	Reject Ho	Significant
	Level III	191.1				
Procedure	Level II	90.0	3881.000	0.000	Reject Ho	Significant
	Level III	184.9				
Knowledge	Level II	124.0	7455.000	0.000	Reject Ho	Significant
	Level III	166.8				

Mann Whitney U test. Confidence level = 95%. Significance level = 5%

**Research Question No. 4:** Is there a significant difference in the result of the data when grouped according to Level II and Level III?

Table 5 shows Mann Whitney U-Test results on the difference in the intramuscular injection skills between level II and level II nursing students, and it revealed that all relevant factors such as Competence, Preparation Skills, Procedure Skills and Knowledge have obtained a p-value of 0.0000. The obtained p-values are less than the 0.05 significance level or margin of error which indicates that there is a significant difference in the obtained results and values from the independent groups. This shows that when learning intramuscular injection

skills, face-to-face learning is more effective learning modality since it offers an hand-on performance where the instructor could focus on one student at a time to guide them in performing the skill, and have an interactive environment, resulting in a greater knowledge, skills, and competence, as compared to a full online learning, where it is harder to focus and be hands-on to a student since they are only monitoring them through their computer or phone screen.

## Discussion

### A. Knowledge

For Level 2, although there are high results of students having a good grasp in learning intramuscular injection, there are still 6.7% of students who are perceived to have poor knowledge. Based on the data, it can be inferred that although there is a large percentage from the population who has a good grasp of knowledge in intramuscular injection, it cannot be denied that there are still some of whom experienced difficulties in learning, factors that hinders them to study through online such as socio-economic factor where some students might be having difficulties in accessing the internet because they cannot afford a strong internet connection. In addition, External factors such as human and environmental interruptions are unavoidable in online learning. Considering that students are learning from home, these could disrupt their efficient learning process. The analysis is supported by an article published by Adedoyin O. B., and Soykan E. (2020), where they have mentioned that the academic performance of students in online learning could be affected by economic and resource differences.

As for the Level 3, students in face-to-face learning modality were taught by having a clinical instructor perform it in front of them while discussing the rationale. Since there are constant and immediate interactions between students and educators, educators can better assess and understand the strengths and shortcomings of their students. Moreover, students were free to ask questions and have a discussion when the skill became confusing and get the answer they needed right away. A factor that is also contributing to their knowledge is that they had the chance to experience it hands on, several times such as in their skills laboratory, in their graded return demonstration where they have to perform the step-by-step procedure of the skill while explaining the rationale behind those steps. This was all performed in front of a clinical instructor which gave them the advantage in understanding the procedure more precisely since they were supervised and guided by their clinical instructors on how the procedure was actually performed which leads to a better retention of knowledge. This analysis is sided by headspace, The National Youth Mental Health Foundation-Australia, where they cited in 2021 that face-to-face learning gives students more ability to concentrate because of cognitive and environmental factors and therefore, retention of knowledge is high.

## **B. Skills**

For level 2, the result shows the strength and weaknesses of the online modality in terms of carrying out the preparation and procedures in the intramuscular injection where the students answered neutral on steps that they have no actual experience and are more technical to do. This means that these

parts of the skill should be taught in a more innovative way of teaching and techniques through online learning, for it to be acquired by the students effectively.

The analysis is supported by an article published by University of Illinois Springfield entitled “ION Professional Learning Programs” where they have mentioned the importance of recognizing the fact that there are subjects that are not fit for an online learning setting since the ideal medium of instruction cannot be portrayed through the digital medium in comparison to the hands-on approach — wherein the learning objectives can be further achieved with the contribution of physical movement and practice. Additionally, it states that even with the given possibility of the technological simulation to imitate the physical attributes of learning, this does not imply that it will be the most fitting teaching method.

Level III on the other hand, as part of their skills laboratory, the students in face-to-face learning modality performed the skill with a step-by-step procedure with an actual patient in front of their clinical instructor and they are being graded with a performance evaluation tool. Also, the students exercised their skill in their clinical rotation or internship in the hospital setting and barangay clinics. Learning a skill by seeing the instructors doing it in actual, is a great way to make the skill retain in the memory of the learner. Furthermore, having the experience in performing the skill with an instructor to assist is a great opportunity to correct mistakes executed by the learner, it makes the learner be confident in what they are doing.

Just like the level III respondents, the researchers had also learned IM injection under face-to-face learning modality. Thus, the investigators cannot also deny the fact that this type of learning modality had contributed a lot in developing the skills needed in administering intramuscular injection. Through face-to-face learning, students undergo hands-on and actual demonstrations with the guide of their respective professors which resulted in the development of the skills. Aside from this, during their clinical duties in assigned hospitals they were also taught and guided how to deliver IM injection to different age groups with their clinical instructors’ supervision.

## **C. Competence**

These results show that the level II are more confident and competent in doing explanations about the actual procedure itself but have less competence in doing the more technical, and hands-on parts of the skill. This is because the level II students have not had a hands-on practical session where an instructor would guide them on the spot in

supervising every movement that they execute. Self-practice and the use of learning aides is factors that may have boosted their judgement on their capability to execute the skill. Students tend to be less competent in learning the skill, intramuscular injection in line with a new and different learning mode of learning.

Moreover, the level II nursing respondents have learned the procedure via online learning compared to the level III respondents which were taught the traditional way. This gives them the advantage of briefly learning the intramuscular injection skill since the level III performed return demonstrations and engaged in clinical exposures wherein the procedure was regularly practiced. Unlike for the level II which did not have any brief hands-on experience with regards to the procedure. That is why the Level II respondents' competence in intramuscular injection is still in a developing stage while Level III's are already in the accomplished stage.

## Conclusion

Generally, it can be inferred that face-to-face learning delivers better and more effective results in terms of students' knowledge, skills and competence which yielded significantly higher mean scores and more positive perception. Practical application of skills and clinical experiences can give more assurance and confidence about learning a certain skill or obtaining, in an accomplished or exemplary manner, competences that are pivotal to intramuscular injection. It can also be drawn that the counterpart of learning which is the instructors' efficiency of teaching the students are also better-off when it comes to face-to-face learning rather than online learning.

Hence, it can be concluded that the goals of this study were successfully met in which researchers were able to answer the profile of the respondents with respect to their year level, assessed their knowledge, skills, and competence in performing intramuscular injection and likewise determine which type of learning modality is proven to be more effective when it comes to the intramuscular skills of the Level II and Level III nursing students of Far Eastern University.

## Conflict of Interest

There is no conflict of interest between the authors in this manuscript.

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