Self-Perceived Competence of Graduating Nursing Students in Pharmacology E-Learning

Alyannah M. Bonifacio [a*], Cyrille Dianne S. Mallari [a], Bianca Denise C. Masujer [a], Babylyn F. Matias [a] and Aldrin N. San Juan [a]

[a] Emilio Aguinaldo College, Manila, Philippines.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

Original Research Article

ABSTRACT

Background: Nurses' competency plays important role in the delivery of care, through their experiences it enables them to acquire the knowledge, skills, and attitude for providing nursing care. E-learning helps to connect with student to facilitate learning and provide online instruction to help student to study. Drug administration is one of the major areas that nursing student must prioritize because of its potentially dangerous consequences in patient safety.

Purpose: This study aimed to determine the self-perceived competence among graduating nursing students in Pharmacology E-learning in one College at Manila that will serve as basis in promoting competency of the student.

Methods: The study utilized a quantitative research design and questionnaire is administered to graduating nursing students to assess their knowledge, skills, and attitude towards medication management.

Results: Demographic information, including age, place of origin, and Pharmacology course grade, were also collected. The study examined significant relationship between demographic information, and self-perceived competence in terms of knowledge, skills, and attitude. Majority of the

---

Corresponding author: Email: ambonifacio.mnl.eac.edu.ph;

respondent received very satisfactory to excellent remarks. These findings indicate that Pharmacology E-learning had no adverse impact on the performance of graduating nursing students in terms of their pharmacology competence.

Conclusion: The study revealed that most of the respondents performed well in their Pharmacology subject, with most of them received Excellent to Very Satisfactory grade range and no failing grades indicating that the teaching and learning process of the subject was implemented effectively and competently.

1. INTRODUCTION

Nurses' competence is based on the knowledge and skills and attitude for providing nursing care. Clinical competence trough apprenticeship model help student to acquire competency [1]. Nursing is a performance-based profession, clinical learning environments play an important role in the development of professional abilities and preparing nursing students to enter the nursing profession and become registered nurses [2]. Student on their final year expand their resources to acquire knowledge in certain course. E-learning is becoming a more popular format for formal education to enhance online instruction in promoting knowledge [3,52-59]. On-site learning refers to instruction that takes place at a physical location of an institution, such as a classroom, lecture hall, or laboratory, where students have direct access to and contact with their instructors [19-22]. The face-to-face element of campus learning with human interaction, eye contact, facial expressions, and verbal cues is generally agreed to be essential in encouraging student-lecturer interaction and engagement in the learning process [34-41]. However, when a COVID-19 pandemic occurred, maintaining and continuing learning became critical and difficult because everything had to be learned online and by yourself [13-18]. One of the critical aspects of nursing that has been difficult to learn online and without face-to-face simulation is drug dosage calculations, and learning how to calculate drugs is an essential skill for nurses to perform their duties more responsibly and with commitment [4,60-67]. E-learning has several advantages, such as flexibility, cost-effectiveness, and accessibility. However, it also has limitations, such as the lack of social interaction and hands-on experience, which can affect the development of critical competencies [23-27]. As a result, it is crucial to assess the effectiveness of E-learning in developing essential skills such as drug dosage calculations among nursing students.

Drug administration is a critical nursing function with potentially dangerous consequences if errors occur [5], and it has been recorded as one of the common risks to patient safety. Inaccurate doses can result in patient morbidity and mortality. In which, it requires the use of both numerical and conceptual calculation skills, where numerical skills are the knowledge and ability to use formulas, perform mechanical calculations, and follow rounding and conversion rules, while conceptual skills are required to recognize the desired amount of medication and the strength of the supply in order to calculate the dose needed [6]. Nurses must be able to calculate accurate drug dosages in order to administer drugs to patients safely, as they are responsible and accountable for making sure accurate drug doses are administered to patients [28-33]. Knowing how to calculate drugs increases a nurse's confidence in nurses' abilities as a healthcare professional, allowing nurses to perform their duties more responsibly and with dedication [7,75-86]. However, it continues to be a challenge for nursing students, particularly graduating students, as their ability and level of knowledge in performing drug dosage calculations will be tested both as students and when they become nurses in clinical or hospital settings [8,42-51].

This study aims to investigate the competence in Pharmacology E-learning among graduating nursing students. The results of this study will provide valuable insights into the effectiveness of E-learning in developing essential competencies in healthcare education and inform future educational practices.

2. METHODS

2.1 Research Design

This study is a descriptive correlational research design whose primary objective is to characterize the relationship between two or more variables

without attempting to manipulate them. According to Creswell [9], a descriptive correlational design is a research design used to explore the relationships between two or more variables. In this design, researchers aim to describe and examine the patterns of relationships between variables without manipulating them or establishing causality. In relation to the aims of the study, the variables of interest are the self-perceived competence of graduating nursing students after they finished their Pharmacology E-learning set-up amidst the COVID-19 pandemic. This study as this allowed the researchers to determine the competence according to self-perception of graduating nursing students in Pharmacology E-learning, while examining the relationship between the demographic profile of the respondents and their self-perceived competence based on their knowledge, skills, and attitude. As far as the study is concerned, the characteristics of quantitative design are the most appropriate for the sample processing of quantitative data related to this study.

2.2 Population/Sample and Sampling Technique

The population of this study, the researchers aimed to collect data from the graduating nursing students. The sample population was drawn from the fourth (4th) year students of Bachelor of Science in Nursing (BSN) batch 2022–2023 at one College in Manila who completed their Pharmacology class through E-learning set-up during the school year 2020 to 2021. It is only composed of one (1) section, forty-one (41) students, thirty-eight (38) of them are females and three (3) are males. Upon distribution of the survey questionnaire, forty-one (41) graduating nursing students who are currently enrolled according to the list of enrollees from the nursing department agreed to participate voluntarily.

This study utilized the purposive sampling method for choosing the respondents where the graduating nursing students of Emilio Aguinaldo College - Manila were chosen considering their qualities fit as the sample's criteria. Moreover, this sampling technique enabled the researchers to use their judgment to decide the participants for the study.

3. RESULTS AND DISCUSSION

The profile of the respondents are grouped according to age ranges from twenty (20) years old and below to twenty-one (21) years old and above, with places of origin in rural and urban areas, including Pharmacology semestral grades; and their significant relationship were interpreted in terms of their knowledge, skills, and attitude of the graduating nursing students' competence after completion of their Pharmacology E-learning class in S.Y. 2020 to 2021 at Emilio Aguinaldo College - Manila.

Table 1. Profiles of the respondents grouped according to age

Age	Frequency	Percentage
20 yrs. old and below	0	0.00%
21 yrs. old and above	41	100.00%
Observations	41	100.00%

Table 1 reveals that out of the forty-one (41) respondents who are fourth-year BS Nursing Students at Emilio Aguinaldo College - Manila, the majority, comprising 100% of the sample study, were aged twenty-one (21) years old and above. Since there is only one group of data, the result in this table plainly suggests that substantial relationships cannot be done, and the result of interpretation is not significant. To support this finding, Toledo [10] argued that due to the Commission of Higher Education's (CHED) implementation of K-12, students from the batch academic year 2020 up to present may graduate at the age of 21-22, which is the optimal age of graduating students.

Table 2. Distribution of respondents according to place of origin

Place of Origin	Frequency	Percentage
Urban	30	73. 17%
Rural	11	26.83 %
Observations	41	100.00%

Under Table 2. it indicates that 73. 17 % (30 students) of the participants live in urban areas, while 26. 83 % (11 students) are from rural areas. The sample size consisted of forty-one (41) graduating nursing students. To support this finding, the geographical location of the college affected the chosen school of the respondents since it is readily accessible and located in the urban area. Also, according to Schiess & Rotherham [11], students who live in rural areas may be less prepared for college than their non-

rural peers, which may lead them to decide not to enroll in college yet.

Table 3. The Pharmacology course grade of graduating nursing students in pharmacology class through E-learning set-up (S.Y. 2020-2021)

Pharmacology Semestral Grade	Frequency	Percentage
1-1.24 (Excellent)	8	19.51%
1.25-1.49 (Superior)	10	24.39%
1.50-1.74 (Very Good)	4	9.75%
1.75-1.99 (Good)	3	7.32%
2-2.24 (Very Satisfactory)	12	29.27%
2.25-2.49 (Satisfactory)	2	4.88%
2.75-2.99 (Fair)	1	2.44%
3-4.99 (Pass)	1	2.44%
Observations	41	100.00%

Table 3., shows the result shows the distribution of Pharmacology Semestral Grades of forty-one (41) fourth-year nursing students from Pharmacology class. The grades are divided into different categories based on the range of scores. However, the top 3 higher marks that the students had, are the following: twelve (12) students got a grade of 2-2.24, which is Very Satisfactory. This category has a weighted mean of 29.27%, showing that these students performed very satisfactorily in the subject. Next, ten (10) students got a grade of 1.25-1.49, which is labeled as Superior, and this category has a mean of 24.39%, showing that these students performed superiorly in the subject. Then, eight (8) students got a grade of 1-1.24, which is Excellent, and this category has a mean of 19.51%, indicating that the group performed excellently in this subject. Moreover, the result shows that most of the students performed Very Satisfactory. Additionally, there are no students who received failing grades, indicating that the teaching and learning process in the Pharmacology class were effective. Furthermore, Emilio Aguinaldo College - Manila's Student Handbook [12] supports that most of the respondents performed very satisfactory in the Pharmacology subject based on the respondent's final point grade while being matched in the handbook's equivalent and description of the semestral grades.

Table 4 shows the results show that Self-perceived competence were divided into three categories which are knowledge, skills and attitude to determine the performance of graduating nursing students. The results show that the Knowledge component has a mean score of 2.7982, indicating that students perceive their understanding of pharmacological concepts to be on average consistent with this score. This aspect constitutes around one-third (32.67%) of the comprehensive score for self-perceived competence. Furthermore, the mean value of 2.9269 attributed to the Skills Component suggests that students at this level possess practical pharmacology skills, encompassing tasks such as medication administration and hands-on application. This aspect constitutes about one-third (34.17%) of the comprehensive self-perceived competence score. Lastly, the mean score of 2.8402 reflects students' attitudes toward pharmacology. The importance of this aspect becomes apparent due to its contribution of approximately one-third (33.16%) to the broader evaluation of self-perceived competence. Upon aggregating these three components (2.7982 + 2.9269 + 2.8402), the total self-perceived competence score amounts to 8.5652, equivalent to 100%.

Table 4. The Self-perceived competence results of graduating nursing students in pharmacology E-learning

Self-perceived competence	Mean	Percentage
Knowledge	2.7982	32.67%
Skills	2.9269	34.17%
Attitude	2.8402	33.16%
Total	8.5652	100%

Overall, the table indicates that, within the framework of Pharmacology E-learning, graduating nursing students perceive their competence most prominently in the Skills, followed by Attitude and Knowledge. The cumulative 100% total represents a thorough assessment of their self-perceived competency across these critical criteria. To support this finding, a research conducted at Visayas State University (2023) highlights that a considerable portion of Filipino nursing students affirmed a substantial positive influence of online learning platforms on their perceived essential skills. This observation corresponds with the outcomes of the present study.

Table 5. The significant relationship on the self-perceived competence of graduating nursing students in pharmacology E-learning according to place of origin

Results	r Value	p Value	Decision	Interpretation
K: Rural vs Urban	0.2419	0.3946	Retain Ho	Not Significant
S: Rural vs Urban	0.1795	0.3567	Retain Ho	Not Significant
A: Rural vs Urban	0.2781	0.1625	Retain Ho	Not Significant
Overall KSA: Rural vs Urban	0.1977	0.1625	Retain Ho	Not Significant

Table 6. The significant relationship on the self-perceived competence of graduating nursing students in pharmacology E-learning according to course grade

Results	r Value	p Value	Decision	Interpretation
Course Grade and K	-0.0696	0.0000	Reject Ho	Significant
Course Grade and S	-0.1208	0.0000	Reject Ho	Significant
Course Grade and A	-0.0271	0.0000	Reject Ho	Significant
Overall Semestral Grade and KSA	-0.0757	0.0000	Reject Ho	Significant

Table 5, presents the result indicates that at a 0.05 significance level, it concluded that no significant relationship between the means of rural and urban areas has shown on their self-perceived competence in Pharmacology E-learning in terms of their knowledge, skills, and attitude. This implies that the self-perceived competence of the respondents is not related and affected by the place of origin they are coming from.

To support the findings, there was a study in 2018 which showed that students from the University of Louisville's Cardinal Covenant program were evaluated using data from the survey and performance and revealed no significant relationship between urban and rural students.

Table 6 presents the results indicate that at a -0.0757 of significance, there is no sufficient evidence that there is a significant relationship between the Pharmacology semestral grade and knowledge, the Pharmacology semestral grade and skills, the Pharmacology semestral grade and attitude, and the Pharmacology semestral grade and overall knowledge, skills, and attitude. In addition, it clearly shows that the self-perceived competence of the respondents in pharmacology can be significantly seen in their final point grade. It reflects how well the respondents perform in their Pharmacology class and having good grades signal the ability to learn [68-74].

The findings were further supported by a study conducted at the College of Education at the Polytechnic University of the Philippines. The study's finding implies that there is no significant relationship between the students' GWA and their performance in academic year. Hence, according to the result, there is no significant relationship on the self-perceived competence of graduating nursing students in Pharmacology under E-learning when grouped according to Pharmacology semestral grade in terms of knowledge, skills, and attitude.

Table 7 presents the Overall Rural vs Urban and KSA, it shows that there is no significant relationship between the self-perceived competence and place of origin of graduating nursing students in Pharmacology E-learning as it has r Value of 0.1977 and p Value of 0.1625 which is interpreted as Negligible Correlation in statistics.

Table 7. The significant relationship on the self-perceived competence of graduating nursing students in pharmacology E-learning according to place of origin and pharmacology course grade

Overall	r Value	p Value	Decision	Interpretation
Overall Rural vs Urban and KSA	0.1977	0.1625	Retain Ho	No Significant
Overall Course Grade and KSA	-0.0757	0.000	Retain Ho	No Significant

The Overall course Grade and Self-perceived Competence in terms of Knowledge, Skills, and Attitude were presented in the second row of Table 7, indicating that there is no significant relationship between the self-perceived competence and semestral grade as it has a r Value of –0.0757 and p Value of 0.000 which is interpreted as Negligible Correlation in statistics. These results implicate that the place of origin and semestral grade have no relations and effects on graduating nursing students' self-perceived competence in Pharmacology E-learning setting.

4. CONCLUSION

The study revealed that the majority of the respondents, consisting of forty-one (41) fourth-year BS Nursing students at Emilio Aguinaldo College - Manila, was twenty-one (21) years old and above, with 73.17% living in urban areas and 26.83% from rural regions. The students performed well in their Pharmacology subject, with most of them received Excellent to Very Satisfactory grade range and no failing grades indicating that the teaching and learning process of the subject was implemented effectively and competently patterned from the mandates of Commission on Higher Education's (CHED) E-learning implementation. Statistical analysis revealed a significant relationship between the Pharmacology semestral grade and self-perceived competence in terms of knowledge, skills attitude, and overall self-perceived competence. The self-perceived competence of graduating nursing students in Pharmacology under E-learning set-up was significantly determined through Pharmacology semestral grade but not by age and place of origin. The study supported the alternative hypothesis, indicating significant relationship in the self-perceived competence of graduating nursing students in Pharmacology under E-learning based on their Pharmacology semestral grade. Overall, it shows that the self-perceived competence of the graduating nursing students can be determined primarily by objective data, which is their pharmacology semester grade that was checked formally with the consent to correspond the credibility of the data.

5. IMPLICATION

E-learning in Pharmacology courses enhance student learning competency. The study highlights the importance of Pharmacology course grades as a critical factor in determining the self-perceived competence of graduating nursing students in Pharmacology. The study shows that age and place of origin do not significantly affect the self-perceived competence of graduating nursing students in Pharmacology under E-learning set-up. It underscore the importance of Pharmacology E-learning, monitoring Pharmacology semestral grades, and designing curricula that meet the needs of a diverse student population in Emilian nursing education.

CONSENT AND ETHICAL APPROVAL

The researcher undergone ethics review from Davao Doctors College Incorporation. Informed consent was given, and confidentiality of data is strictly applied.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Katowa-Mukwato P, Andrews B, Maimbolwa M, Lakhi S, Michelo C, Mulla Y et al. Medical students' clerkship experiences and self-perceived competence in clinical skills. Afr J Health Prof Educ. 2014;6(2):155-60.
DOI: 10.7196/ajhpe.358, PMID 29607210.
2. Jamshidi N, Molazem Z, Sharif F, Torabizadeh C, Najafi Kalyani M. The challenges of nursing students in the clinical learning environment: A qualitative study. ScientificWorldJournal. 2016;2016: 1846178.
DOI: 10.1155/2016/1846178, PMID 27366787.
3. Kim KJ, Lee YJ, Lee MJ, Kim YH. E-learning for enhancement of medical student performance at the objective structured clinical examination (OSCE). Plos One. 2021;16(7):e0253860.
DOI: 10.1371/journal.pone.0253860
4. Mukasa J, Otim M, Monaco B, Al Marzouqi A, Breitener P, Jawahar L. Nursing students' perspectives and readiness to transition to e-learning during COVID-19 in the UAE: A cross-sectional study. Adv Med Educ Pract. 2021;12:1505-12.
DOI: 10.2147/AMEP.S335578
5. Ayorinde MO, Alabi PI. Perception and contributing factors to medication administration errors among nurses in Nigeria. Int J Afr Nurs Sci. 2019;11.

DOI: 10.1016/j.ijans.2019.100153.

6. Toney-Butler TJ, Wilcox L. Dose calculation desired over have formula method. Stat Pearls. Stat; 2020.

7. Institute of Health and Nursing Australia. 10 reasons why medication calculation is essential for nurses. Institute of Health and Nursing Australia; 2022.
Available:
https://www.ihna.edu.au/blog/2017/02/10-reasons-medication-calculation-essential-nurses/.

8. Lazare M. The lived experiences of undergraduate nursing students learning drug dosage calculation. Research gate; 2018.
Available:https://www.researchgate.net/publication/330207516_The_Lived_Experiences_of_Undergraduate_Nursing_Students_Learning_Drug_Dosage_Calculation.

9. Creswell JW. Research design: Qualitative, quantitative, and mixed methods approaches. 5th ed. Sage publications; 2019.

10. Toledo M. From college to career; 2021. Philstar.com.
Available: https://www.philstar.com/other-sections/newsmakers/2021/06/01/2102125/college-career.

11. Schiess J, Rotherham AJ. Big country: how variations in high school graduation plans impact rural students; 2015.
Available:
http://www.rociidaho.org/wpcontent/uploads/2015/10/ROCI_HSRigor_Final.pdf.

12. Emilio Aguinaldo College – Manila Development Committee. Student manual. 2017 ed. Manila: Emilio Aguinaldo College; 2017;66.

13. Alteren J, Nerdal L. Relationship between high school mathematics grade and number of attempts required to pass the medication calculation test in nurse education: An explorative study. Multidisciplinary Digital Publishing Institute; 2015.
Available: https://www.mdpi.com/2227-9032/3/2/351/pdf.

14. AlSaif HI, AlDhayan AZ, Alosaimi MM, Alanazi AZ, Alamri MN, Alshehri BA et al. Willingness and self-perceived competence of final-year medical students to work as part of the healthcare workforce during the COVID-19 pandemic. Int J Gen Med. 2020;13:653-61.
DOI: 10.2147/IJGM.S272316, PMID 32982382.

15. Batch-Wilson W. Practice preparedness in new graduates: exploring the education practice gap. Available: https://scholarworks.waldenu.edu/dissertations/2341/ [doctoral dissertation]. Walden University; 2016.

16. Baticulon RE, Alberto NRI, Barón MCR, Mabulay REC, Rizada LGT, Sy JJ et al. Barriers to e-learning in the time of COVID-19: A national survey of medical students in the Philippines. MedRxiv. Cold Spring Harbor Laboratory; 2020.
DOI: 10.1101/2020.07.16.20155747.

17. Belo-Delariarte RG, Oducado RMF, Penuela AC. Terminal assessment of core nursing knowledge in a state university. Asia Pac J Multidiscip Res. 2018;6(2):10-7.

18. Biology dictionary; n.d. Pharmacology – Definition, history, major and career. Available from: https://biologydictionary.net/Pharmacology.

19. Bifftu BB, Dachew BA, Tadesse Tiruneh B, Mekonnen Kelkay M, Bayu NH. Perceived clinical competence among undergraduate nursing students in the university of Gondar and Bahir Dar University, Northwest, Ethiopia: A cross-sectional institution based study. Adv Nurs. 2016;2016:1-7.
DOI: 10.1155/2016/9294673.

20. Borghans L, Golsteyn BH, Heckman JJ, Humphries JE. What grades and achievement tests measure. Proc Natl Acad Sci U S A. 2016;113(47):13354-9.
DOI: 10.1073/pnas.1601135113

21. Brod G, Shing YL. Are there age-related differences in the effects of prior knowledge on learning? Insights gained from the memory congruency effect. Mind Brain Educ. 2022;16(2):89-98.
DOI: 10.1111/mbe.12320.

22. Brown RA, Crookes PA. What level of competency do experienced nurses expect from a newly graduated registered nurse? Results of an Australian modified Delphi study. BMC Nurs. 2016;15(45):45.
DOI: 10.1186/s12912-016-0166-2

23. Cambridge dictionary. E-Learning | English meaning. n.d.

24. Cascella M, Rajnik M, Aleem A, Dulebohn S, Napoli R. Features, evaluation, and treatment of coronavirus (COVID-19); 2023.
Available:https://www.ncbi.nlm.nih.gov/books/NBK554776/.

25. Chavda MD, Trivedi BS. Impact of age on skills development in different groups of

students. Int J Inf Educ Technol. 2015;5 (1):55-9.
DOI: 10.7763/IJIET.2015.V5.476.

26. Cheng CY, Tsai HM, Chang CH, Liou SR. New graduate nurses' clinical competence, clinical stress, and intention to leave: A longitudinal study in Taiwan. ScientificWorldJournal. 2014;2014:748389.
DOI: 10.1155/2014/748389

27. Cowen KJ, Hubbard LJ, Hancock DC. Expectations and experiences of nursing students in clinical courses: A descriptive study. Nurse Educ Today. 2018;67:15-20.
DOI: 10.1016/j.nedt.2018.04.024

28. Feliciano EE, Boshra AY, Mejia PCG, Feliciano AZ, Maniago JD, Alsharyah et al. Pearson correlation coefficient: definition, formula & calculation, and examples. QuestionPro; 2023. Available: https://www.questionpro.com/blog/pearson-correlation-coefficient/.

29. Hcsuper. Grading vs. assessment: which One is Better? | Resilient educator. Resilient educator; 2020.
Available:https://resilienteducator.com/classroom-resources/grading-vs-assessment-whats-the-difference/.

30. Malabanan HM, MC, Osman A. Understanding Philippines nurses' competency in the delivery of healthcare services. J Patient Care. 2019;5(1):146.
DOI: 10.4172/2573-4598.1000146.

31. Florentino M, Benlot ZT, Fiestada N, Jane F. The social factors and the academic performance as perceived by the first year College of Education students. ResearchGate; 2014.
Available:https://www.researchgate.net/publication/338764297_The_Social_Factors_And_The_Academic_Performance_As_Perceived_By_The_First_Year_College_Of_Education_Students.

32. Frost J. Null hypothesis: definition, rejecting & examples. Statistics by Jim; 2022.
Available:https://statisticsbyjim.com/hypothesis-testing/null-hypothesis/.

33. Fukada M. Nursing competency: definition, structure and development. Yonago Acta Med. 2018;61(1):1-7.
DOI: 10.33160/YAM.2018.03.001, PMID 29599616.

34. Gerrish, Boxer, Kluge 2000. Simonsen et al. Medication competence of nursing students in Finland. University or Turku; 2014.

Available:https://www.utupub.fi/bitstream/handle/10024/124032/Annales

35. Harper. Collins publishers Ltd.; n.d. Academic definition and meaning: Collins English dictionary. Academic definition and meaning | Collins English Dictionary.
Available:https://www.collinsdictionary.com/dictionary/english/academic.

36. Harper. Collins publishers Ltd.; n.d. Knowledge definition and meaning: Collins English dictionary. Knowledge definition and meaning | Collins English Dictionary.
Available:https://www.collinsdictionary.com/dictionary/english/knowledge.

37. Harper. Collins publishers Ltd.; n.d. Skill definition and meaning: Collins English dictionary. Skill definition and meaning | Collins English Dictionary.
Available:https://www.collinsdictionary.com/dictionary/english/skill.

38. Hassankhani H, Hasanzadeh F, Powers KA, Zadeh AD, Rajaie R. Clinical skills performed by Iranian emergency nurses: perceived competency levels and attitudes toward expanding professional roles. Jen Off Publication of the Emergency Department Nurses Association. 2018;44(2):156-63.
DOI: 10.1016/j.jen.2017.06.007

39. Humanistic model; 2019. Nursing Theory.
Available: https://nursing-theory.org/theories-and-models/humanistic-model.php.

40. Institute of Medicine. The future of nursing: leading change, advancing health. National Library of Medicine; n.d.
Available: https://www.ncbi.nlm.nih.gov/books/NBK209885/.

41. Jackson J, Simiyu. An assessment of the effect of age on the academic performance students in secondary school; 2015.
Available:https://iresearchng.com/education/an-assessment-of-the-effect-of-age-on-the-academic-performance-students-in-secondary-school/index.html.

42. Kavanagh JM, Szweda C. A crisis in competency: the strategic and ethical imperative to assessing new graduate nurses' clinical reasoning. Nurs Educ Perspect. 2017;38(2):57-62.
DOI: 10.1097/01.NEP.0000000000000112

43. Keels et al. Salamiel et al. Medication calculation skills of graduating nursing students within European context. J Clin Nurs. 2019 (2013 & 2019); 2013.

44. Keels RN, Williams SD, Cooke J, Ashcroft DM. Causes of medication administration errors in hospitals: A systematic review of quantitative and qualitative evidence – drug safety. SpringerLink; 2013. Available:https://link.springer.com/article/10.1007/s40264-013-0090-2.

45. Kiekkas P, Michalopoulos E, Igoumenidis M, Michalopoulos A, Stefanopoulos N. Factors associated with self-reported competence of graduating nursing students. Collegian. 2019;26(2):267-72. DOI: 10.1016/j.colegn.2018.08.004.

46. Kremer J, Moran A, Walker GC, Craig C. Key concepts in sport psychology. Self-Effic Perceived Competence; 2018. DOI: 10.4135/9781446288702.

47. Laguador JM. Challenges encountered during pandemic in flexible learning among college students living in urban, rural, and suburban areas in the Philippines. Asia Pacific. Educ Perspect; 2021.

48. Leedy PD, Ormrod JE. Practical research: planning and design. 11th ed. Pearson; 2015.

49. Leonardsen AL, Brynhildsen SE, Hansen MT, Grøndahl VA. Nursing supervisors' perspectives on student preparedness before clinical placements- a focus group study. Plos One. 2021;16(5):e0252483. DOI: 10.1371/journal.pone.0252483, PMID 34048493.

50. Macapagal J et al. Challenges of distance education assessment in the health professions during the COVID-19 pandemic: A Philippine reflection in the rapid review of international context. Acta Med Philipp; 2022.

51. Malindog-Uy AR. Blended learning. Available:https://theaseanpost.com/article/blended-learning-virus-hitphilippines. In: Virus-hit Philippines; 2020.

52. Mangubat NRC, Mangahas BT, Matias CJC, Mauleon AJA. Level of competency of new registered nurses as perceived by their nursing supervisors. Cam Res J. 2014;2(1):136-69.

53. Manley KS. Urbanicity in Kentucky: a study on academic achievement in urban versus rural students:Paper 166; 2018. College of Arts & Sciences senior honors theses; 2018. Available:https://ir.library.louisville.edu/honors/166.

54. Melius J. Mathematics anxiety and mathematics self-efficacy in relation to medication calculation performance in nurses. UNT Digital Library; 2012. Available:https://digital.library.unt.edu/ark:/67531/metadc115119/m1/119/.

55. Merriam-Webster. Self-perception definition & meaning. Merriam-Webster; n.d. Available from: https://www.merriam-webster.com/dictionary/self-perception.

56. Missen K, McKenna L, Beauchamp A. Registered nurses' perceptions of new nursing graduates' clinical competence: A systematic integrative review. Nurs Health Sci. 2016;18(2):143-53. DOI: 10.1111/nhs.12249, PMID 26592371.

57. Mohamadirizi S, Kohan S, Shafei F, Mohamadirizi S. The Relationship between clinical competence and clinical self-efficacy among nursing and midwifery students. Int J Pediatr. 2015;3:(6.2). DOI: 10.22038/ijp.2015.5222.

58. Molanida JEP, Neyra TJA, Norada PMM, Olarte PMS, Palma DDO, Oducado RM. Perceived competence of Filipino nursing students graduating during pandemic. J Ners. 2023;18(1):16-24. DOI: 10.20473/jn.v18i1.41395.

59. Nascimento Jda SG, Siqueira TV, de Oliveira JLG, Alves MG, Regino D, da SG, Dairi MCB. Development of clinical competence in nursing in simulation: The perspective of Bloom's taxonomy. Rev Bras Enferm. 2021;74. DOI: 10.1590/0034-7167-2020-0135.

60. National Geographic Society; n.d. Urbanisation. Available:https://www.nationalgeographic.org/encyclopedia/urbanization/.

61. Njiru MN, Kimani M, Ngaruiya B. Correlate of age influence on student's locus of control and attitude towards academic achievement in public secondary schools Nairobi County, Kenya. Int Acad J Soc Sci Educ (IAJSSE). 2022;2(3):19-39.

62. Oducado RMF, Estoque HV. E-learning in nursing education during the COVID-19 pandemic: Stress, satisfaction, and academic performance. J Nurs Pract. 2021;4(2):143-53. DOI: 10.30994/jnp.v4i2.128.

63. Ohio University. Improving medication dosage calculation proficiency. Online master of science in nursing. Ohio University; 2020. Available:https://onlinemasters.ohio.edu/blog/improving-medication-dosage-calculation-proficiency/E-learning for

beginners: 1. What is E-learning? (2020) Tony Bates.
Available:https://www.tonybates.ca/2016/07/15/online-learning-for-beginners-1-what-is-online-learning/.

64. Orkaizagirre-Gómara A, Sánchez De Miguel M, Ortiz de Elguea J, Ortiz de Elguea A. Testing general self-efficacy, perceived competence, resilience, and stress among nursing students: an integrator evaluation. Nurs Health Sci. 2020;22(3):529-38.
DOI: 10.1111/nhs.12689

65. Oxford Learner's Dictionary (n.d). Calculation noun – Definition, pictures, pronunciation and usage notes. Oxford advanced Learner's dictionary.
Available:https://www.oxfordlearnersdictionaries.com/us/definition/english/calculation.

66. Öztürk H, Güneş Ü. Effect of blended learning on nursing students' medication dosage calculation skills. Teach Learn Nurs. 2023;18(2):263-8.
DOI: 10.1016/j.teln.2022.07.005.

67. Pasco PMD, Caro RM, Cruz CL, Dando NM, Isip-Tan ITC, Panganiban LR, et al. Prevalence of medication errors in admitted patients at the Philippine General Hospital. Acta Med Philipp. 2017;51(2).
DOI: 10.47895/amp.v51i2.577.

68. Pellizzari M, Billari FC. The younger, the better? Age-related differences in academic performance at university. J Popul Econ. 2012;25(2):697-739.
DOI: 10.1007/s00148-011-0379-3.

69. Psych mental health hub; 2022. Josephine Paterson & Loretta Zderad humanistic nursing theory. Psych-mental health hub.
Available:https://pmhealthnp.com/josephine-paterson-loretta-zderad-humanistic-nursing-theory/.

70. Rouleau G, Gagnon MP, Côté J, Payne-Gagnon J, Hudson E, Dubois CA et al. Effects of e-learning in a continuing education context on nursing care: systematic review of systematic qualitative, quantitative, and mixed-studies reviews. J Med Internet Res. 2019;21(10):e15118.
DOI: 10.2196/15118

71. Samuel O. An assessment of the effect of age on the academic performance students in secondary school. Samphina Academy; 2023.
Available: https://samphina.com.ng/effect-age-academic-performance-students-secondary-school/.

72. Shackebaei D. Study skills and their correlation with academic satisfaction and achievement among medical and pharmacy students in Kermanshah University of Medical Sciences. Scinapse; 2015.
DOI: 10.22110/educ.

73. Simonsen O, Daehlin G, Johansson I, Farup P. Improvement of drug dose calculations by classroom teaching or e-learning: A randomised controlled trial in nurses. National Library of Medicine; 2014.
Available:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4212177/.

74. Stake-Nilsson K, Almstedt M, Fransson G, Masoumi D, Elm A, Toratti-Lindgren M et al. Medication Dosage Calculation among Nursing Students: does digital technology make a difference? A literature review. BMC Nurs. 2022;21(1):123.
DOI: 10.1186/s12912-022-00904-3

75. Suantika P, Yusniawati Y. The satisfaction of nursing students with medical-surgical e-learning in Bali.
Available:https://knepublishing.com/index.php/KnE-Life/article/view/10295/16850. The International Virtual Conference on Nursing, KnE Life Sciences; 2022.

76. Sulosaari V, Huupponen R, Hupli M, Puukka P, Torniainen K, Leino-Kilpi H. Factors associated with nursing students' medication competence at the beginning and end of their education – BMC Medical Education. BioMed Central; 2015, December 18.
Available:https://bmcmededuc.biomedcentral.com/articles/10.1186/s12909-015-0513-0.

77. Tariq R, Vashisht R, Sinha A, Scherbak Y. Medication dispensing errors and prevention. National Library of Medicine; 2022.
Available:https://www.ncbi.nlm.nih.gov/books/NBK519065/.

78. Thapa P, Bhandari SL, Pathak S. Nursing students' attitude on the practice of e-learning: A cross-sectional survey amid Covid-19 in Nepal. Plos One. 2021;16 (6):e0253651.
DOI: 10.1371/journal.pone.0253651

79. The Lakes School. Attitude to learning. Lakes School; 2022.
Available: https://thelakesschool.com/the-lakes-school-cumbria/attitude-learning/.

80. US Department of Agriculture. What is rural?; n.d.

Available:https://nal.usda.gov/legacy/ric/what-is-rural.

81. Ubas-Sumagasyay NA, Oducado RMF. Perceived competence and transition experience of new graduate Filipino nurses. J Keperawatan Indones (E-journal). 2020;23(1):48-63.
DOI: 10.7454/jki.v23i1.1071.

82. Utvær BKS, Torbergsen H, Paulsby TE, Haugan G. Nursing students' emotional state and perceived competence during the COVID-19 pandemic: the vital role of teacher and peer support. Front Psychol. 2021;12:793304.
DOI: 10.3389/fpsyg.2021.793304

83. Vickerson TL. The impact of place of residence on the academic achievement and retention of first-time-in-college students at an urban commuter university. Doctor of philosophy (PhD).
Available:https://digitalcommons.odu.edu/urbanservices_education_etds/53 [dissertation]. Old Dominion University; 2003.

DOI: 10.25777/vd0r-5q51.

84. Web MD. Pandemics: definition, prevention, and preparation. WebMD.
Available: https://www.webmd.com/cold-and-flu/what-are-epidemics-pandemics-outbreaks.

85. What is Competence and how is it assessed?; n.d. Government of Western Australia department of mines, industry regulation and safety.
Available:https://www.dmp.wa.gov.au/Safety/What-is-Competence-and-how-is-it-5973.aspx What Is Pharmacology? (n.d.).
Available:https://www.ualberta.ca/Pharmacology/about/what-is-Pharmacology.html.

86. Xie Q. Evaluation of the practical teaching method reform of fundamental nursing in nursing education.
Available:https://webofproceedings.org/proceedings_series/article/artid/6700.html 5th International Workshop on Education, Development and Social Sciences. Vol. 2019; 2019, March 19.