

Nexos interdisciplinarios entre Fundamentos de Enfermería I y Matemática

Interdisciplinary links between Fundamentals of Nursing I and Mathematics

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Resumen

Los nexos interdisciplinarios entre varias disciplinas y asignaturas, constituyen una necesidad en la formación integral del estudiante de enfermería, siendo de impacto para el logro de la dimensión instructiva, desarrolladora y educativa. El objetivo del artículo consiste en describir, a través de ejemplos los nexos interdisciplinarios entre Fundamentos de Enfermería I y Matemática en la formación del Técnico Superior del Ciclo Corto en Enfermería. Para ello se realizó una investigación pedagógica con enfoque cualitativo, utilizando métodos teóricos y empíricos. Lo que permitió establecer los nexos interdisciplinarios en los contenidos de Fundamentos de Enfermería I que se imparte en la carrera del Técnico Superior de Ciclo Corto en Enfermería, que guardan relación con la Matemática.

Palabras clave: Interdisciplinariedad; Enfermería; Fundamentos de Enfermería; Matemática.

Summary

The interdisciplinary links between several disciplines and subjects constitute a necessity in the integral formation of the nursing student, being of impact for the achievement of the instructive, developmental and educational dimension. The objective of the article is to describe, through examples, the interdisciplinary links between Fundamentals of Nursing I and Mathematics in the formation of the

Superior Technician of the Short Cycle in Nursing. For this purpose, a pedagogical research with a qualitative approach was carried out, using theoretical and empirical methods. This made it possible to establish the interdisciplinary links in the contents of Fundamentals of Nursing I taught in the career of the Short Cycle Higher Technician in Nursing, which are related to Mathematics.

Key words: Interdisciplinarity; Nursing; Nursing Fundamentals; Mathematics.

Introduction

The interdisciplinary links between several disciplines and subjects are a necessity in the integral formation of the nursing student, being of impact for the achievement of the instructive, developmental and educational dimension during the formative process.

The future graduate should acquire a great deal of knowledge and skills that will allow him/her an adequate professional performance.

Interdisciplinarity is approached from the perspective of several authors, for Lenoir (2013), it is the relationship between two or more subjects that act at the same time at curricular, didactic and pedagogical levels, and that leads to establish links of complementarity or cooperation, interpenetrations or reciprocal actions between them in different aspects (objects of study, concepts and notions, learning processes, technical skills, etc.), in order to favor the integration of learning processes and the integration of knowledge.

As can be seen, this is an integrative conception of interdisciplinarity in that it encompasses the learning processes and the application of what has been learned at the theoretical and practical levels.

For its part, Rubio et al. (2018), referring to the subject, states that this, in addition to conceptualization and interaction between concepts and theories, between contents of two or more disciplines, requires research methodological transformations that allow mutual exchange. This is important, since it promotes research at the methodological level of the teaching collectives in order to allow the relationship and integration of contents.

Almidón López (2019), states that:

(...) consists of a common work bearing in mind the interaction of scientific disciplines, their concepts, guidelines, methodology, procedures, data and organization of teaching and also

constitutes a didactic condition and a requirement for the fulfillment of the scientific nature of teaching. (p.2)

Villamar and Guerrero (2018), understand interdisciplinarity in the educational field as the joint work between two or more disciplines that revolve around a common thread, which is what allows students to acquire knowledge and generate new conclusions regarding what they have learned.

In the analysis carried out on interdisciplinarity in the pedagogical process, it is evident that there is convergence of ideas in that it expresses links that are established to achieve common objectives among different disciplines.

It is a process where different theories, information, methodologies and techniques of scientific disciplines are integrated; they are links of interrelation in the way of thinking, qualities, values and points of view that should enhance the different disciplines in common actions; it will favor the integration of knowledge and of the teaching and learning process.

The above criteria are assumed by the authors as theoretical support for the research.

When referring to the importance of interdisciplinarity, Muñoz (2018) and Caldevilla (2021), agree that interdisciplinarity is important because it will allow the application of techniques and methods in the teaching and learning process to be more effective, from the link of the contents of the subjects of the specialty, in addition to promoting relationships between modes of action and establishing links to achieve common goals between different scientific disciplines and raise the quality of the educational teaching process.

The development of Nursing as a science, and the complexity of the problems that arise today, require that the solution be through different scientific disciplines during the teaching and learning process so that the student can easily understand the facts and phenomena of reality. Interdisciplinary relations are the most effective way to provide solutions to the complex problems taught in the medical sciences.

Hence, the objective of the article is to describe through examples the interdisciplinary links between Fundamentals of Nursing I and Mathematics in the formation of the Superior Technician of the Short Cycle in Nursing.

Development

Methodology used

A developmental research was conducted at the Teaching Community Polyclinic "Francisco Castro Ceruto" in El Salvador municipality, Guantánamo province, during the 2022-2023 school year. For the research, the documentary review of bibliographies, pedagogical research located in Cuban medical journals of the Virtual Health Library in Cuba, published in the SciELO database and the Ministry of Higher Education, in addition to articles in international journals, master's theses, papers presented at congresses and the Study Plan D of the Nursing Short Cycle Higher Technician Career, which in its general guidelines refers to the importance of establishing interdisciplinarity.

In addition to the Ministerial Resolution 47/2022, the syllabus of the subject Fundamentals of Nursing I and the Mathematics syllabus received in Higher Secondary Education. Theoretical research methods and empirical methods were also used.

The MES (2022), in its Ministerial Resolution 47, states that methodological work in interdisciplinary groups in a career is carried out with the purpose of achieving coherent approaches in the integration and systematization of contents from different disciplines, or from other needs that arise in the development of the training process.

The description of some examples made it possible to highlight the interdisciplinary relationships existing between the subjects Fundamentals of Nursing I and Mathematics.

In our National Education System, Mathematics becomes a priority, since it allows students a cognitive performance at higher levels for the development of cognitive independence and creativity, reflection to provide solutions to increasingly complex tasks.

In several real and modeled situations, health professionals need to perform calculations and estimates according to the performance scenarios in which they find themselves.

Higher Education in Cuba, since the 20th century, has undergone transformations, evidencing the tendency to increase coverage for the entry of the largest number of people and to meet the demands of a scientifically growing society.

In order to comply with the standards demanded by higher education at international level and its diversification, especially as proposed by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Bank, study plans and programs are being redesigned.

The Ministry of Public Health (MINSAP), as a training agency, is not oblivious to these transformations, and in order to meet the demand for attention to the population, user of nursing services, initiates the design and proposes the curriculum of the Short Cycle Superior Technician in Nursing.

In this research, three of the didactic principles proposed by Addine (2004) are assumed, which are listed below:

- Principle of the unity of the scientific and ideological character of the pedagogical process.

When we assume an interdisciplinary conception between the contents of various subjects or disciplines, this is one of the tools that teachers have for the analysis of the unity of science, which becomes an instructive, educational and developmental learning.

- Principle of the unity of the instructive, educational and developmental.

It is fulfilled by proposing to teachers the methodological ways to establish links between different subjects and disciplines, as well as in the search for solving problems from various sciences.

- Principle of unity between activity, oral communication and personality.

To carry out the interdisciplinary relationship, the exchange of knowledge must be achieved through assertive communication, that teachers take into account that when preparing the classes, together with the students, they occupy the dual role of transmitter and receiver, where the student is the fundamental pillar for the fulfillment of interdisciplinarity.

Results

Nursing as an interdisciplinary science shares with bioethics, psychology, sociology, mathematics and other disciplines. The subject that was chosen is Fundamentals of Nursing I, which is taught in the first semester of the first year of the career, within the selected contents we find the administration of medications by perfusion (venoclysis), calculation of the duration time of venoclysis known as the drip,

conversion of units to tenths and tenths to units, administration of drugs per kilogram of weight based on the relationship between weight and body surface area, administration of drugs by converting milligrams to grams, which are related to mathematics.

Authors such as Fajardo and Caicedo (2021), emphasize the importance of using innovative and effective teaching methods during the training process, since they must develop mathematical skills so that they do not have obstacles with the calculation of medication doses, which is one of the functions that must be developed during the clinical activities of the nursing professional, and whose mistake could jeopardize the safety and life of the patient.

The following are some examples of interdisciplinary links.

Example 1. Calculation of the venoclysis drip with the hours of duration known

The nursing staff, when administering medications by perfusion (venoclysis), must take into account that there is a general formula that allows a quick method of calculating with what speed you can get the number of drops per minute that must pass for a given time, as well as demonstrating that the speed depends on the height at which the venoclysis is placed with respect to the level of the vein canalization, regardless of the needle gauges and that the drip is adjusted with the control loops, as Cuesta (2017) makes known.

To explain this method, we show the following example:

1 ml syringe = 20 drops in 1 minute C= Time (t) = 1 hour = 60 minutes.

General formula (obtaining the constant R= 1/3). $R = \frac{v}{t}$

The general formula is obtained when we ask ourselves how many drops per minute the venoclysis should be administered and we use the following expression:

$$Gt = \frac{Vol.(t)}{T} \cdot R = \frac{Vol.(t)}{T} \cdot \frac{1}{3}$$

Patient HDF, arrives at the emergency room with pain in the right iliac fossa, suspected to be an appendicitis, the physician indicates to administer a 1000 ml venoclysis to last 12 h. How many drops should be administered?

Transaction data

$$Vol. (t) = 1000 \text{ ml } Gt = \frac{Vol.(t)}{T} \cdot \frac{1}{3} = \frac{1000 \text{ ml}}{12} \cdot \frac{1}{3} = \frac{1000}{36} = 27,7 \text{ gotas / min}$$

T= 12 horas

$$R=\frac{1}{3}$$

Gt/min=?

R/ It should pass 27.7 drops /min.

When the result is in fractional figures, the nurse must make an assessment of whether to administer 27 drops for a defect or 28 drops for an excess.

Example 2. Calculation of the duration time of venoclysis known drip

Patient RBD in bed18, in the medical indication a venoclysis of 1000 ml should be administered at 30 drops/min. How long should it last?

Operation data

$$\text{Vol. (t)} = 1000\text{ml} \quad \text{Gt/min} = \frac{\text{Vol. (t)}}{T} \quad R = \frac{\text{Vol. (t)}}{T} \cdot \frac{1}{3}$$

Gt/min=30 gotas

Despejando en función del tiempo

$$T=? \quad T = \frac{\text{Vol. (t)}}{\text{Gt}} \cdot \frac{1}{3} = \frac{1000\text{ml}}{30} \cdot \frac{1}{3} = \frac{100}{9} = 11 \frac{1}{9} \text{ horas}$$

$$R=\frac{1}{3}$$

When calculating the time, if the expression is not exact, it should not be expressed in decimals, but in fractions to facilitate obtaining the minutes and seconds by multiplying the fraction by 60 minutes or by 60 seconds.

In this case, the time is equal to 11 hours and the 1/9 hours is obtained from the following expression:

$$1/9 \cdot 60 = 160/9 = 18 \text{ minutes.}$$

R/ The time that should last is 11 hours and 18 minutes.

Example 3. Conversion of units to tenths of units

There are different types of syringes, of 1 milliliter (ml), according to their graduation and scale: $J_{100} = 1\text{ml} = 100 \text{ units}$, $J_{80} = 1\text{ml} = 80 \text{ units}$, $J_{40} = 1\text{ml} = 40 \text{ units}$, $J_{20} = 1\text{ml} = 20 \text{ units}$.

Tuberculin syringe is graduated in tenths. Insulin syringe is graduated in units. Keep in mind that 10 dc is a constant value that represents the number of tenths contained in the 1 ml syringe.

When it is necessary to administer medication in units, and there is no insulin syringe, other types of syringes can be substituted by the following operation:

From units to tenth is divided 2 times.

A patient comes to the on-call department of the Policlínico Docente Rolando Perez Quintosa and the doctor indicates 5 units of substance F and there is only a tuberculin syringe. How many tenths should we administer?

$J_{100} = 1\text{ml} = 100 \text{ units}$ $100/10 = 10 \text{ units}$ which is equivalent to 1 tenth $5/10 = 0.5 \text{ dc}$

$J_{80} = 1\text{ml} = 80 \text{ units}$ $80/10 = 8 \text{ units}$ which is equivalent to 1 tenth $8/10 = 0.8 \text{ dc}$

$J_{40} = 1\text{ml} = 40 \text{ units}$ $40/10 = 4 \text{ units}$ which is equivalent to 1 tenth $4/10 = 0.4 \text{ dc}$

$J_{20} = 1\text{ml} = 20 \text{ units}$ $20/10 = 2 \text{ units}$ which is equivalent to 1 tenth $2/10 = 0.2 \text{ dc}$

Example 4. Conversion from tenths to units

When it is necessary to administer drugs in tenths and there is no tuberculin syringe, other types of syringes can be substituted by the following operation:

From tenths to units divide and then multiply.

Patient APM arriving at office # 36 with a medical indication to administer 10 dc of vaccine. What would you do according to the syringe you have?

$J_{100} = 1\text{ml} = 100 \text{ units}$ $100/10 = 10 \text{ units}$ which is equal to 1 tenth $10 \times 10 = 100 \text{ units}$

$J_{80} = 1\text{ml} = 80 \text{ units}$ $80/10 = 8 \text{ units}$ which is equivalent to 1 tenth $8 \times 10 = 80 \text{ units}$

$J_{40} = 1\text{ml} = 40 \text{ units}$ $40/10 = 4 \text{ units}$ which is equivalent to 1 tenth $4 \times 10 = 40 \text{ units}$

$J_{20} = 1\text{ml} = 20 \text{ units}$ $20/10 = 2 \text{ units}$ which is equivalent to 1 tenth $2 \times 10 = 20 \text{ units}$

Example 5. Drug administration per kilogram of weight based on the ratio of weight to body surface area

According to Lamanier, et al. (2017), in the International System of Units and conversions, elementary units are usually atoms, molecules, ions or electrons.

Below we list the units of measurement and some of the most commonly used conversions in conversions.

Units of mass

The most commonly used units of mass are the kilogram, gram and milligram.

When converting a smaller unit to a larger unit, the operation to be performed is to divide.

When converting a larger unit to a smaller unit, the operation to perform is to multiply.

Larger units

Minor units

Multiples of grams

Submultiples of grams

Kilogram (kg) 1000 grams

Decigram (dg) 0.1 of a gram

Hectogram (hg) 100 grams

Centigram (cg) 0.01 of a gram

Decagram (dag) 10 grams

Milligram (mg) 0.001 of the gram

Administration of drugs by converting milligrams into grams

These problems, according to Cuesta (2017), are solved by working the whole problem in milligrams and at the end the conversion of milligrams to grams is performed, based on the relationship that exists between the two.

HDF patient weighing 66 pounds is indicated to administer 5 milligrams per kilogram of weight of a substance D; ampoule D has 40 mg in 1 milliliter.

a) How many milligrams are administered?

b) Express the milligrams in grams?

The first thing to do is to convert the weight to kilogram.

Simple operation: rule of three

Operation Data

1kg=2.2 lb 1kg_____2.2 lb

Patient weight=66 lb X kg_____ 66lb

Weight in kg= ¿? X kg==

X kg=

R/ The patient weighs 30 kg

The second step is to calculate the total milligrams administered.

Data Operation

1kg= 5mg 1kg_____5 mg

Patient weight =30 kg 30 kg 30 kg_____ X mg

X mg= ? X mg==150mg

R/ 150 mg should be administered

Convert milligrams to grams

Data Operation

1g= 1000 mg 1 g _____1000 mg

150mg= ? X g _____ 150 mg

Xg== 0.15g

R/ 0.15 g should be administered.

The study plan for the formation of the Short Cycle Superior Technician in Nursing is based on two principles, fundamental pillars of the formation of health professionals in Cuba: the unity of education and instruction and the linking of study with work, which is concretized in the education at work as a fundamental organizational form of the formative process. Hence, the implementation of these exercises in the group that is formed as, in the Teaching Community Polyclinic "Francisco Castro Ceruto" in El Salvador municipality, Guantánamo province, contributed to motivate students towards

the knowledge of Mathematics, to systematize what was learned in this Discipline in the preceding educational levels, to value the importance of it for their professional performance.

It also allowed providing them with knowledge, skills and values that allow an adequate professional performance at work.

Cuban higher medical education is living new paradigms, new ways of doing, and society demands once again that nursing personnel possess a high capacity, based on a deep scientific and human preparation.

The interdisciplinary practice in the formation of nursing students is necessary for the interaction of knowledge in the production of new knowledge with common objectives and interests of several disciplines.

Interdisciplinarity is of importance in the formative process, it allows the teacher and the student to learn, to have a broader vision of the contents, how to apply them to different situations, avoids repeating the contents and facilitates group work.

According to Angulo (2016), during the training of the Higher Technician in Nursing, it is necessary to perfect the interdisciplinary approach from the teaching and learning process, which contributes to the improvement of this future professional, integrating the basic contents with knowledge, skills, feelings and values.

Conclusions

The examples shown are essential contents in the training of students of the Short Cycle Nursing Superior Technician career, and constitute for the teaching staff a tool to solve the problems of nursing science from an interdisciplinary approach. The sources consulted made it possible to elaborate the proposal, to broaden the knowledge of the subjects in question and to understand the importance of interdisciplinarity in the training process of the health professional. The professional training subjects should have a high content of practical skills and an integrating character with other scientific disciplines; interdisciplinarity should be ensured so that students appropriate the skills at each level and demonstrate it in the solution of practical problems for their future professional performance.

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