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Task system for integrating the contents of laboratory diagnosis IV into the training of clinical bio analysis healthcare technologists

Abstract

Clinical Bio analysis is a fundamental field within the healthcare field, with a significant impact worldwide. Integrating the contents of Laboratory Diagnosis IV into the training of clinical bio analysis healthcare technologists is essential for this professional's development. The objective of the work is to develop a system of tasks for the integration of the contents of Laboratory Diagnosis IV, in the training of the health technologist of Clinical Bio analysis with their corresponding objectives, actions, operations and their evaluation, through the principle of education at work as a guiding principle in training, for this work the viability and relevance of the proposal was assessed and was corroborated by the Delphi method which makes possible from statistics, the calculation of the numerical ray, and the location of the different tasks and their structure, in the numerical range of excellence, corroborated through the statistical method W of Kendall, through the assessment of a group of expert specialists in the subject, previously selected by their level of competence on the study.

Keywords: task system, content integration, chemical bio analysis, Delphi method, systems validatio

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Introduction

Tasks are activities intended for professionals to perform in their training. They involve the search for and acquisition of knowledge, the development of skills, and the comprehensive development of their personality.[1]

It is proposed that tasks, whose solution requires an interdisciplinary analysis, facilitate professional learning by integrating content and simultaneously revealing the connection between the different levels at which they are organized. Tasks must define the actions to be performed by professionals to achieve the objective intended for their training. Each task must define the content to be considered in the assessment, encouraging self-assessment and peer assessment.[2]

The actions and operations presented in each task must express the conditions necessary for the professional to carry out the actions contained in the task and thus achieve the objective, which is the integration of the content, given the reality being studied.[3]

Tasks must be designed to include the necessary guidelines for achieving the objective (obtaining new content) and the level of preparation and development of the professionals. These tasks should reflect, whenever possible, the broad possibilities for applying science to life, without forgetting that needs and interests in learning science can be awakened by the applications of the tasks in daily life.[4]

Several authors have classified tasks. Zhuikov S.F., placing great importance on the content to which an exercise is applied, classifies tasks into two groups: tasks characteristic of the knowledge and skills acquisition process; and tasks to consolidate the studied content. Grishin D.M., based on the knowledge or lack of knowledge of the result, classified them into cognitive, practical, and creative tasks.[4]

Meanwhile, Iglesias León[2] classifies tasks, based on the level of content assimilation and objectives, into four groups: familiarization, reproduction, production, and creation. These tasks require an independent search for aspects, and their resolution presupposes a problem that professionals cannot solve with the knowledge acquired to date.[2,5]

The tasks must ensure the necessary training of the professional, for the acquisition of skills in the formation of the concept or the application of this given, by the increasing order of complexity, differentiated because they allow attention to diversity and systemic, because they must maintain links between them, some are a precondition for the realization of the others.[6]

Tasks must define the actions to be performed by the professional to achieve the objective, to carry out the execution of the skill they intend to develop. Each task must define the elements to be considered in the evaluation.[2]

Each task is determined by the objectives and duration of the teaching, by the nature of the content, and by the material conditions in which it is carried out. The solution to the task brings about the transformation of the professional and sometimes the object of study. It fulfills certain learning functions and has an intentional aspect (the objective) and an operational aspect (forms and methods).[6]

In this sense, the use of a task system constitutes a way to organize cognitive activity independently and contributes to the fulfillment of the different levels of assimilation: familiarization, reproduction, production, and creation.[2]

A task system is a set of interrelated tasks, whose functioning allows the achievement of certain instructive, developmental, and educational objectives in a given context. The system implementation process has four important phases: design, implementation, evaluation, and feedback.[7]

The task is oriented toward the solution of one or more theoretical, theoretical-practical, and practical problems. They have a system structure in which the content manifests different types of connections; they group different content from one or more disciplines through integration mechanisms and promote the assimilation of knowledge in the form of systems with increasing levels of integrity.[8]

The logical structure of the content relates to new and previously acquired content based on the objectives, closely linked to the results of the diagnosis. It is presented in the form of contradictions through the formulation of problematic questions, combining various forms of didactic work, and applying it to all stages of cognitive activity: orientation, execution, control, and evaluation.[3]

The tasks, organized according to the levels of assimilation of the content according to the objectives, allow for a more comprehensive view of the object of study and an understanding of the essence of the problem-solving process in everyday life. This can be achieved by integrating various content areas in a single academic year or through vertical integration, which links content.[9,10]

This proposal embraces the concept proposed by Iglesias León, where the common thread is the integration of knowledge, know-how, and know-how, for the integration of the contents of Laboratory Diagnosis IV into the training of the health technologist in Clinical Bioanalysis.[2]

The Delphi expert consultation method was used to validate the task system. This method takes into account the experience and knowledge of the selected experts on the topic. Through systematic consultation and the calculation of statistical tables, the numerical ray determines confidence intervals to place the activities within a range of Very Adequate, Fairly Adequate, Adequate, Slightly Adequate, and Inadequate. This is verified using the Kendall W statistical method to determine the experts' agreement.[11, 12]

Methods

i Historical-logical approach allowed for understanding the logic of the content in Laboratory Diagnosis IV in Clinical Bio analysis.

ii Analytical and Synthetic: To analyze different authors who have contributed to the integration of content, specifically in the content of Laboratory Diagnosis IV in Clinical Bio analysis.

iii Inductive-Deductive approach to determine the integration of content in Laboratory Diagnosis IV in Clinical Bio analysis.

iv Systemic approach: To develop the system of tasks that integrates the content of Laboratory Diagnosis IV in Clinical Bio analysis.

Empirical level

Expert criteria using the Delphi method to validate the integrative task system developed.

Mathematical level approach

Statistical analysis of the results, application of the Delphi method for experts.

Discussion

The task system is presented according to the requirements of the Clinical Bio analyst. This professional is a health technologist with a broad field of professional practice, trained to work within the healthcare team at all three levels of care within the National Health System. Therefore, they contribute through the analysis of biological samples and contribute to understanding the health status of the population, as well as to the diagnosis, prevention, control, and treatment of diseases based on scientific research.

The task system is made up of eight tasks with different levels of assimilation, organized into two topics related to the integration of the content that this professional needs to know and apply in their practice. Each task is identified by its level of content assimilation based on the objectives of the profession. These tasks encompass the essential content of Laboratory Diagnosis IV in Clinical Bio analysis.

Laboratory Diagnosis IV addresses the need for a comprehensive approach to diagnosis, with a systemic focus. It is vitally important for Clinical Bio analysis professionals, allowing for an integrated view of the health-disease process in the laboratory, including communicable and non-communicable diseases, comprehensively by organ system and clinical syndromes. It explores morph physiology and includes the semiology and pathophysiology of diseases of the central nervous system and metabolic endocrine system. This approach provides professionals with a level of preparation that allows them to operate at all three levels of care (primary, secondary, and tertiary).[13]

The structure of the tasks is presented, along with the system of actions, operations, and evaluations specific to the content to be trained by this professional, based on the diagnosis obtained with the scientific methods used.

The validation of the task system for integrating content in clinical bio analysis laboratory diagnosis IV using the Delphi method is presented

Validation using the Delphi Method

Some authors, such as Crespo[14] and Cortés[15] argue that critical analysis, within a collective or group of experts, represents a fundamental element in the validation process of scientific research. In this research, the Delphi Method was used to validate the task system for integrating content in Clinical Bio analysis Laboratory Diagnosis IV.

Authors such as Cortés[15] state that among the Delphi Method modalities, there is the Delphi method to validate or evaluate criteria or alternatives given by a group of carefully selected experts. This has been characterized as a shorter variant of the Delphi Method for creating criteria or alternatives. The procedure is primarily carried out in one round, but can be extended to others. Experts rate each given criterion or alternative according to a Liker scale list of five categories, where the experts rated one of the established evaluative categories: "Very adequate," "fairly adequate," "adequate," "slightly adequate," "inadequate" for each task in the Task System. The Delphi method is considered mixed because it uses qualitative and quantitative elements through statistical processes to classify the criteria or alternatives on a so-called numerical ray, which gives the intervals for each evaluation criterion and where the tasks are located in each interval according to their N-P value. These elements will be explained in this work. The criteria for assessing the application of the Delphi method were feasibility, relevance, relevance, sustainability, and transferability; these were determined based on the author's ideas, based on the concepts of López[16] that have been used in the work of Suárez,[17] Rodríguez,[18] and Milián.[19]

Feasibility is defined as the possibility of applying it in practice; relevance is related to suitability with respect to professional requirements; relevance is associated with improving the professional's training; and finally, transferability refers to the possibility of using it in other contexts for the same purpose. Several authors agree that experts must meet the following requirements:

i At least five years of work experience.

ii Show interest in the work and demonstrate creative thinking.

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iii Be reflective and decisive.

iv Defend their points of view; do not embrace just any opinion unless they are convinced of its validity.

v Have no personal interest in the system being developed.

vi Be available and willing to participate.

vii Have teaching and research experience.

viii Have scientific publications.

ix Be knowledgeable about the topic being evaluated.

Application of the Delphi method

The assessment was conducted in three stages: in the first, experts were selected according to established criteria, knowledge, and argumentation; in the second, opinion questionnaires were developed and administered; and in the third, the results of the assessments were statistically processed, obtaining the location of each task on the numerical ray. Finally, Kendall's W coefficient was used to verify the consistency of the results provided by the experts.[14]

Thirteen experts were selected: 6 physicians (38%), 3 graduates in education (23%), 1 health technician (8%), and 3 nurses (23%). Regarding teaching categories, 5 tenured (38%) and 8 assistants (62%), 5 are PhDs (38%), and 8 are MSCs (62%). The average years of service are 27 years, the minimum is 13 years, and the maximum is 30 years, coinciding with the mode. The experts' publications average 23, with 100% publishing. The minimum number of publications is 15, and the maximum is 38, with a mode of 28 publications. Their level of knowledge (knowledge coefficient Cc) and argumentation (argumentation coefficient Ca) regarding the integration of the contents of Laboratory Diagnosis IV in Clinical Bio analysis were assessed. The knowledge and argumentation coefficients were calculated by evaluating the surveys sent to them.

The experts evaluated the 101 tasks in the Task System for the Integration of Laboratory Diagnosis IV in Clinical Bio analysis.

Table for calculating the knowledge coefficient Cc (Table 1) with questions to answer based on the range of knowledge (High, Medium, Low). Each square has a pre-calculated value.[11]

Table 1 Knowledge coefficient

Knowledge coefficient	High	Medium	Low
Integrated teaching of laboratory diagnostics in different contexts.	0.25	0.2	0.15
The role of Comprehensive Laboratory Diagnostics in the Clinical Bio analysis curriculum.	0.25	0.2	0.15
Content treatment with an integrative approach in "Laboratory Diagnostics IV".	0.25	0.2	0.15
The use of tasks for content integration in "Laboratory Diagnostics IV".	0.25	0.2	0.15

Table for calculating the argumentation coefficient Ca (Table 2). This table is provided by the method itself:

Table 2 Argumentation coefficient

Sources of argumentation	High	Medium	Low
Theoretical analysis conducted by you	0.3	0.2	0.1
Experience gained	0.5	0.4	0.2
Works by national authors you know	0.05	0.04	0.03
Works by foreign authors you know	0.05	0.04	0.03
Own knowledge of the state of the subject	0.05	0.04	0.03
Your intuition	0.05	0.04	0.03

Experts are expected to present a criterion or Competence Coefficient (Ccomp) that shows the experts' results regarding their level of knowledge and argumentation about the problem. This coefficient is based on the formula:

$$Ccomp = 1/2\ (Cc + Ca)$$

As also expressed by Cortés and Iglesias,[11] this coefficient is calculated from a general questionnaire where:

Cc: Knowledge Coefficient: Obtained as the sum of the values of the questions about their knowledge of the topic, according to the established scale.

Ca: Argumentation Coefficient: Obtained by summing the values of the degree of influence of each of the sources of argumentation.

i The expert's competence is high if $Ccomp > 0.8$

ii The expert's competence is medium if $0.6 < Ccomp \leq 0.8$

iii The expert's competence is low if $Ccomp \leq 0.6$

It is important to select experts with a medium to high competency coefficient. The Ccomp competency coefficient of the experts is shown. It was determined that the 13 selected experts had a high competency coefficient score (Table 3), so validation will be performed by competent experts.

Table 3 Competency coefficient

Experto No.	Cc	Ca	Ccomp	Classification
1	1	1	1	High
2	0.8	0,8	0.8	Medium
3	0.9	0.9	0.9	High
4	1	1	1	High
5	0.9	0,8	0.85	High
6	0.8	0.7	0.75	Medium
7	1	1	1	High
8	0.8	0.8	0.8	Medium
9	1	1	1	High
10	0.9	0.89	0.89	High
11	0.9	8	0.85	High
12	0.86	0.8	0.83	High
13	0.79	0.8	0.79	Medium

Task system for integrating the content of clinical bio analysis laboratory diagnosis IV

General objective: To design the task system for integrating the content of Clinical Bio analysis Laboratory Diagnosis IV.

Topic 1: Central Nervous System.

Objective: To integrate the contents of the Central Nervous System into the Clinical Bio analysis program.

Task 1: Familiarization. Functioning of the Central Nervous System.

Objective: To familiarize the student with the organization and function of the Central Nervous System: its structure and function in controlling the body.

Actions

i Observe images and diagrams of the CNS.

ii Read introductory material on the structure and function of the CNS.

iii Relate the main components (brain, spinal cord) and their functions.

iv Explore the importance of the CNS in everyday life.

Operations

i Use basic texts on the CNS.

ii Observe anatomical images and educational models.

iii Relate the images to simple graphic diagrams.

Assessment

i Create a descriptive chart about the CNS.

ii Present the activities in class on associating the names of anatomical structures and CNS functions.

Task #2 Reproduction. Cerebrospinal fluid (CSF) and the choroid plexuses: production, circulation, and the importance of their study as a bio analyst.

Objective: To explain the formation, circulation, and function of CSF and its importance in clinical diagnosis from the different modes of practice of the bio analyst.

Actions

i Identify the structures of the ventricular system and the choroid plexuses in anatomical images.

ii Read and analyze texts on CSF production and circulation.

iii Explain the importance of CSF analysis in the diagnosis of neurological diseases from each mode of practice of the bio analyst.

Steps

i Define pathogenic microorganisms in CSF samples.

ii Define microbiological CSF culture media in cases of infectious meningitis.

iii Explain the biochemical composition of CSF and its variations in neurological diseases.

iv Classify CSF test results as normal and pathological.

v Differentiate between normal and abnormal CSF values in laboratory studies.

vi Relate CSF circulation to its absorption in the arachnoid villi and its impact on nervous tissue.

vii Evaluate histological samples of the choroid plexus in CNS pathologies.

Assessment

i Develop a graphic diagram of CSF circulation and its relationship with the choroid plexus.

ii Answer questions about the function and composition of CSF in the context of a clinical laboratory.

iii Analyze CSF results in clinical cases from the perspective of a bio analyst.

Task #3: Production. Apply CSF procedures according to laboratory diagnosis in the different modes of work of the Bio analyst.

Objective: Analyze standardized working procedures in CSF examination laboratories, integrating clinical laboratory, microbiology, and cytohistopathology procedures to facilitate the timely diagnosis of CNS diseases.

Actions

i Interpret CSF examinations performed in each bio analyst role.

ii Identify the physical and chemical parameters evaluated in biochemical, microbiological, and cytohistopathological analyses.

iii Construct a CSF processing protocol from receipt to interpretation of results, taking into account the three phases of laboratory work.

Operations

i Evaluate CSF biochemical parameters (glucose, proteins, lactate, and cells).

ii Interpret biochemical alterations associated with neurological pathologies.

iii Detect pathogenic microorganisms in CSF samples through direct examinations and microbiological cultures.

iv Perform identification and antimicrobial testing.

v Analyze CSF cell and tissue samples.

vi Relate histopathological findings to CNS diseases.

Assessment

i Develop a CSF analysis protocol integrating the three bio analyst profiles.

ii Present and discuss a report with interpretation of results in clinical cases.

Task # 4 Creation. CSF results in clinical, microbiological, and cytopathology laboratories.

Objective: To investigate the results obtained from CSF examinations and their correlation with CNS pathologies.

Actions:

i To delve into normal values and abnormalities in CSF for each bio analyst profile.

ii To create patterns of pathological results for infectious and non-infectious CNS diseases.

iii To assess clinical cases based on the clinical picture and CSF results.

Steps

i To evaluate CSF biochemical parameters (glucose, proteins, lactate, cells).

ii To presumptively interpret pathologies in biochemical abnormalities, with neurological pathologies such as meningitis, subarachnoid hemorrhage, and multiple sclerosis.

iii To diagnose pathogenic microorganisms in CSF samples using Gram staining and culture.

iv Interpret and evaluate antimicrobial susceptibility tests.

v Investigate CSF cell and tissue samples in cases of brain tumors and inflammatory diseases.

vi Correlate histopathological findings in CNS diseases such as tuberculosis meningitis and meningeal carcinomatosis.

Assessment

i Prepare and discuss the report with interpretation of the results in clinical cases.

ii Discuss the findings in a clinical and diagnostic context in biomedical laboratories.

Topic 2: Introduction to the Endocrine-Metabolic System.

Objective: To integrate the contents of the Endocrine-Metabolic System into the Clinical Bio analysis program.

Task 1: Familiarization. Anatomical and functional study of the Hypothalamus-Pituitary-Thyroid (HPT) axis.

Objective: To familiarize the student with the structure and physiological function of the HPT axis as a basis for clinical diagnosis.

Actions

i Read introductory material on the function of the endocrine-metabolic system.

ii Study the HPT axis from an anatomical and functional perspective.

iii Relate the main organs (hypothalamus, pituitary, and thyroid).

iv Explore the importance of the endocrine system in metabolic control and homeostasis.

Operations

i Use basic texts on hormonal function.

ii Observe anatomical images and educational models of the endocrine system.

iii Relate it to simple graphic diagrams that represent hormonal interactions.

Assessment

i Create a descriptive table about the main hormones.

ii Present hormone association activities in the classroom.

Task 2: Reproduction Endocrine Regulation: Production, Function, and Analysis of the Different Modes of Clinical Bio analysis.

Objective: To explain the knowledge about the production, regulation, and function of hormones in the endocrine system, highlighting their importance in clinical diagnosis based on the different modes of action of the bio analyst.

Actions

i Identify biochemical samples with hormonal alterations using laboratory techniques.

ii Analyze hormonal feedback and its role in metabolic homeostasis through graphs and simulations.

iii Explain the relationship of the endocrine system in different clinical disorders.

Operations

i Analyze hormonal alterations in biochemical samples.

ii Explain hormonal profiles in cases of endocrine dysfunction (hypothyroidism, hyperthyroidism, hypopituitarism, Cushing's syndrome).

iii Differentiate between normal and altered values in laboratory endocrine studies.

iv Evaluate histological samples of endocrine glands in metabolic pathologies.

Assessments

i Create a graphic diagram of hormonal regulation and its impact on metabolism.

ii Answer questions about hormonal function and composition in the clinical laboratory setting.

iii Interpret the results of hormonal and biochemical analyses in clinical cases from each mode of practice of the bio analyst.

Task 3: Production. Apply hormonal procedures in the clinical laboratory: techniques and interpretation in endocrine diagnosis.

Objective: Design work protocols for hormonal determinations, exploring analytical techniques and their interpretation in the diagnosis of endocrine diseases.

Actions

i Apply laboratory techniques to measure hormones, TSH, T3, T4 (free and total), and anti-thyroid antibodies.

ii Assess the influence of hormones on metabolism and their regulation in physiological and pathological states.

iii Interpret the results of hormonal determinations in different clinical cases.

Operations

i Calculate hormonal values and analyze their relationship with metabolic diseases.

ii Determine the importance of standardization in hormonal determination techniques by manipulating equipment (centrifuge, auto analyzer, micro plates).

iii Delve into the variability of hormonal values according to age, sex, and clinical conditions.

iv Relate hormonal alterations to their impact on energy metabolism, growth, and homeostasis.

Assessment

i Prepare a comparative table on laboratory hormone determination techniques.

ii Present a report with interpretation of results in clinical cases.

Task 4: Creation. Deepen the understanding of hormonal results in the clinical laboratory.

Objective: Investigate the results obtained from hormonal determinations, correlating them with metabolic pathologies.

Actions

i Define normal and altered hormonal values in the different biochemical profiles.

ii Create hormonal patterns associated with endocrine diseases.

iii Define clinical cases based on analysis of hormonal determinations.

Operations

i Evaluate hormonal parameters such as thyroid hormones.

ii Identify hormonal alterations with pathologies.

iii Identify hormonal variations using techniques such as immunoassay and spectrophotometry.

iv Investigate the histological findings of endocrine glands in cases of metabolic and neoplastic diseases.

v Determine biochemical and hormonal findings based on symptoms and clinical presentations in endocrinology.

Assessment

i Prepare a report interpreting hormonal results in real-life clinical cases.

ii Discuss the pathological findings of different biological samples, taking into account the clinical context in biomedical laboratories.

Each of the 101 elements of the system described above is assigned a 5-criteria Likert scale:

Very Adequate___, Fairly Adequate___, Adequate___, Poorly Appropriate ___, Inadequate___.

The experts are sent a table of observed frequencies and asked to evaluate each element according to the proposed scale. The steps of the Delphi method are applied to the resulting observed frequency table, as described below.[11,14,15]

Results of the validation of the task system using the Delphi method

Once the experts were selected and the results of the survey submitted for evaluation were analyzed, the following steps were followed:

i The observed frequency of all experts who participated in the TRO was calculated.

ii Observed Frequency in Table 4

iii In the observed frequency table, the results provided by the experts show:

iv The Cumulative Frequency (CFR) and the Relative Cumulative Frequency (RCF) are calculated. This is part of the procedure for obtaining the cutoff points (the cumulative frequency divided by the number of experts).

v The Inverse Normal Distribution (IND) is calculated. This is part of the calculation procedure. This table is important because it contains the averages by aspect and the N-P (TN-P Table).

vi Inverse Normal Distribution (Table 5)

vii The PC graph (also called the numerical ray) is calculated (Figure 1), which is obtained from the Inverse Normal Distribution Table.

viii The N-P Table is obtained. This table is obtained from the previous step and provides the value of each aspect to be placed on the numerical ray and to determine the range to which each task in the system belongs.

ix N-P Value Table: The table of N-P values by task has the following characteristics:

Maximum Value = 0.9789 Minimum Value = 0.3704

x Compared with the C4 Value of the numerical ray, the upper limit of the Fairly Adequate category = -1.91, it is concluded that all tasks fall within the Very Adequate (C5) range according to the numerical ray.

xi The Cutoff Points, or the so-called Numerical Ray, allow, by locating the N-P of each task, to determine the region to which they belong according to the experts' criteria.

xii The Kendall W Coefficient is calculated, Kendall Table, (Table 6) this statistical procedure allows to know the agreement of the experts in relation to the results obtained.

Table 4 Observed frequency table

0.0% for Insufficient tasks
0.0% for Poorly Appropriate tasks
0.99% for Appropriate tasks
41.58% for Fairly Appropriate tasks
57.43% for Very Appropriate tasks

Table 5 Inverse normal distribution

Task	I	PA	A	FA
ST2	-3.09	-3.09	-3.09	-3.09
ST3	-3.09	-3.09	-3.09	-1.42
ST5	-3.09	-3.09	-3.09	-1.42
ST6	-3.09	-1.42	-1.42	-1.02
ST71	-3.09	-3.09	-1.42	-1.02
ST8	-3.09	-3.09	-3.09	-1.42
ST9	-3.09	-3.09	-3.09	-3.09
ST10	-3.09	-3.09	-3.09	-1.42
ST11	-3.09	-3.09	-3.09	-1.42
ST12	-3.09	-3.09	-3.09	-1.42
ST13	-3.09	-3.09	-3.09	-3.09
ST14	-3.09	-3.09	-3.09	-3.09
ST15	-3.09	-3.09	-3.09	-3.09
ST16	-3.09	-3.09	-1.42	-0.73
ST17	-3.09	-3.09	-1.02	-0.73
ST18	-3.09	-3.09	-3.09	-0.5
ST19	-3.09	-3.09	-3.09	-3.09

Table 5 Continued.....

ST20	-3.09	-3.09	-3.09	-0.73
ST21	-3.09	-3.09	-3.09	-3.09
ST22	-3.09	-3.09	-3.09	-0.5
ST23	-3.09	-3.09	-3.09	-3.09
ST24	-3.09	-3.09	-3.09	-1.42
ST25	-3.09	-3.09	-3.09	-3.09
ST26	-3.09	-3.09	-3.09	-3.09
ST27	-3.09	-3.09	-3.09	-3.09
ST28	-3.09	-3.09	-3.09	-3.09
ST29	-3.09	-3.09	-1.42	-0.5
ST30	-3.09	-3.09	-1.02	-0.73
ST31	-3.09	-3.09	-3.09	-3.09
ST32	-3.09	-3.09	-1.02	-0.29
ST33	-3.09	-3.09	-3.09	-3.09
ST34	-3.09	-3.09	-1.42	-1.02
ST35	-3.09	-3.09	-1.42	-1.42
ST36	-3.09	-3.09	-1.42	-1.42
ST37	-3.09	-3.09	-3.09	-1.02
ST38	-3.09	-3.09	-3.09	-3.09
ST39	-3.09	-3.09	-3.09	-3.09
ST40	-3.09	-3.09	-3.09	-3.09
ST41	-3.09	-3.09	-3.09	-3.09
ST42	-3.09	-3.09	-3.09	-3.09
ST43	-3.09	-3.09	-3.09	-1.02
ST44	-3.09	-3.09	-3.09	-3.09
ST45	-3.09	-3.09	-1.42	-0.73
ST46	-3.09	-3.09	-1.42	-1.02
ST47	-3.09	-3.09	-1.42	-1.42
ST49	-3.09	-3.09	-1.42	-0.29
ST50	-3.09	-3.09	-1.42	-1.42
ST51	-3.09	-3.09	-3.09	-3.09
ST52	-3.09	-3.09	-3.09	-3.09
ST53	-3.09	-3.09	-3.09	-3.09
ST54	-3.09	-3.09	-3.09	-3.09
ST55	-3.09	-3.09	-3.09	-3.09
ST56	-3.09	-3.09	-1.02	-1.02
ST57	-3.09	-3.09	-1.42	-0.73
ST58	-3.09	-3.09	-1.02	-0.29
T59	-3.09	-3.09	-1.42	-1.42
TS60	-3.09	-3.09	-1.42	-0.29
TS61	-3.09	-3.09	-1.42	-0.73
TS62	-3.09	-3.09	-1.38	-1.38
TS63	-3.09	-3.09	-0.73	-0.09
TS64	-3.09	-3.09	-1.42	-1.02
TS65	-3.09	-3.09	-3.09	-3.09
TS66	-3.09	-3.09	-3.09	-3.09
TS67	-3.09	-3.09	-3.09	-1.42
TS68	-3.09	-3.09	-3.09	-3.09
TS69	-3.09	-3.09	-3.09	-3.09
TS70	-3.09	-3.09	-3.09	-1.42
TS71	-3.09	-3.09	-3.09	-3.09
TS72	-3.09	-3.09	-3.09	-1.02
TS73	-3.09	-3.09	-1.42	-0.5
TS74	-3.09	-3.09	-3.09	-1.42
TS75	-3.09	-3.09	-1.42	-1.42
TS76	-3.09	-3.09	-3.09	-3.09

Table 5 Continued.....

TS77	-3.09	-3.09	-3.09	-3.09
TS78	-3.09	-3.09	-3.09	-3.09
TS79	-3.09	-3.09	-3.09	-3.09
TS80	-3.09	-3.09	-1.42	-1.02
TS81	-3.09	-3.09	-3.09	-3.09
TS82	-3.09	-3.09	-3.09	-3.09
TS83	-3.09	-3.09	-1.42	-0.73
TS84	-3.09	-3.09	-3.09	-1.02
TS85	-3.09	-3.09	-3.09	-1.42
TS86	-3.09	-3.09	-3.09	-1.42
TS87	-3.09	-3.09	-1.42	-1.02
TS88	-3.09	-3.09	-3.09	-3.09
TS89	-3.09	-3.09	-3.09	-3.09
TS90	-3.09	-3.09	-3.09	-3.09
TS91	-3.09	-3.09	-1.42	-1.42
TS92	-3.09	-3.09	-3.09	-1.42
TS93	-3.09	-3.09	-3.09	-3.09
TS94	-3.09	-3.09	-3.09	-1.02
TS95	-3.09	-3.09	-3.09	-1.42
TS96	-3.09	-3.09	-1.42	-1.02
TS97	-3.09	-3.09	-1.42	-1.02
TS98	-3.09	-3.09	-1.42	-1.42
TS99	-3.09	-3.09	-1.42	-1.02
TS100	-3.09	-3.09	-3.09	-3.09
TS101	-3.09	-3.09	-3.09	-3.09
TS48	-3.09	-3.09	-0.73	-0.73
TS4	-3.09	-3.09	-3.09	-3.09

Table 6 Table Kendall

Ranks	Mean Rank
MA	4,00
BA	2,30
A	2,08
PA	1,62

Test statistics	
N	101
Kendall's Wa	0,832
Chi-Square	252,027
df	3
Asymp. Sig.	0,000

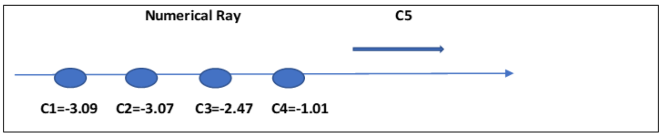

Figure 1 Cut points or numerical ray.

Expert criterion

Delphi results

Performing all the calculations corresponding to the Delphi method for evaluating the criteria, the following conclusions were reached.[15]

From the tables above, all tasks have N-P values, which, when placed on the Numerical Ray or PC Cutoff Points, fall within the higher C5 range of Very Adequate, so the experts evaluate all tasks in the system as Very Adequate.

The Kendall coefficient (W) for expert agreement is calculated using the SPSS 23 software package: The Kendall coefficient shows an agreement of W = 0.832, high and close to 1, with a Two-Sided Sigma value of 0.000, which corroborates the Hypothesis Test that all experts agree with the aforementioned Delphi results. All experts agree that the criteria are Very Adequate.

Conclusion

The content analysis of Clinical Bio analysis Laboratory Diagnosis IV was evaluated. The task system is based on the integration of the content, from the conception of the levels of familiarization, reproduction, production, and creation. The main results of the diagnosis performed using the applied research methods are presented. These methods made it possible to identify the deficiencies in the integration of the content of Clinical Bio analysis Laboratory Diagnosis IV and to develop the task system.

The task system was validated using the DELFHI method, an expert criterion, and was evaluated as highly adequate.

The existence of agreement among experts for the Delphi results was corroborated using the Kendall W method.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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