EVALUATION OF THE DESIGN OF CYCLES OF IMPROVEMENT IN UNDERGRADUATE NURSING STUDENTS DEVELOPED THROUGH PROJECT-BASED LEARNING

EVALUACIÓN DEL DISEÑO DE CICLOS DE MEJORA EN ESTUDIANTES DE ENFERMERÍA DE PREGRADO DESARROLLADOS A TRAVÉS DEL APRENDIZAJE BASADO EN PROYECTOS

AVALIAÇÃO DO DESIGN DOS CICLOS DE MELHORIA DOS ESTUDANTES EM GRADUAÇÃO EM ENFERMAGEM DESENVOLVIDOS ATRAVÉS DE APRENDIZAGEM BASEADA EM PROJETOS

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Abstract: The goal of this article is to describe the level of performance in the final product of fifth and ninth grade nursing students who developed an improvement cycle design under the project-based learning methodology. This quantitative descriptive cross-sectional study was developed according to the reliability of the instrument of evaluation of the final product of the improvement cycle developed through problem-based learning. The level of performance was described according to the level of the student's study plan and the theoretical relationships were analyzed. The final product evaluation tool of the improvement cycle developed by problem-based learning obtained a Cronbach's alpha of 0.852. Statistical analysis of ANOVA (F = 3,155, *P* = 0.057) showed no differences in the level of performance, but the Tukey HSD test indicates that ninth semester students concentrated (M = 121.00, DS = 12.12) have significantly higher performance scores. The conditions for a better performance in the product of the improvement cycle developed through problem-based learning were observed in the following characteristics: higher level in which the students took the course, greater number of tutoring hours, lower number of students per teacher and fewer students per group.

Keywords: Nursing Education Research, Nursing Education, Nursing Students.

Resumen: Este trabajo describe el nivel de desempeño en el producto final de los estudiantes de enfermería de quinto y noveno nivel que desarrollaron un diseño de ciclo de mejora bajo la metodología de aprendizaje basado en proyectos. Se desarrolló un estudio

cuantitativo descriptivo transversal, en el cual se analizó la confiabilidad del instrumento de evaluación del producto final del ciclo de mejora desarrollado a través del aprendizaje basado en problemas, se describió el nivel de desempeño según el nivel del plan de estudio de los estudiantes y se analizaron las relaciones teóricas. En cuanto a los resultados, el instrumento de evaluación del producto final del ciclo de mejora desarrollado por el aprendizaje basado en problemas obtuvo un alfa de Cronbach de 0,852. El test estadístico de ANOVA (F = 3,155, *P* = 0,057) no muestra diferencias en el nivel de desempeño, pero el test Tukey HSD indica que los estudiantes de noveno semestre concentrado (M = 121,00, DS = 12,12) tienen significativamente mayor puntaje de desempeño. Se concluye que las condiciones para un mejor desempeño en el producto del ciclo de mejora desarrollado a través del aprendizaje basado en problemas se observan en las siguientes características: nivel superior en el que los estudiantes cursaron la asignatura, mayor cantidad de horas de tutoría, menor número de estudiantes por profesor y menor cantidad de estudiantes por grupo.

Palabras claves: Investigación en Educación de Enfermería, Educación en Enfermería, Estudiantes de Enfermería.

Resumo: O Objetivo FOI escrever o nível de desempenho no produto final dos estudantes de enfermagem de quinto e nono ano que desenvolveram um projeto de ciclo de melhoria de acordo com a metodologia de aprendizado baseada em projetos. É um estudo transversal descritiva quantitativa foi realizada. Em que se analisou a confiabilidade do instrumento de avaliação do produto final do ciclo de melhoria desenvolvido através de aprendizagem baseada em problemas, o nível de desempenho foi descrito de acordo com o nível do plano de estudo do aluno e as relações teóricas foram analisadas. Resultados: O instrumento obteve alfa de Cronbach de 0,852. A análise estatística de ANOVA (F = 3,155, *P* = 0,057) não mostrou diferenças no nível de desempenho. Mas o teste Tukey HSD indica que os alunos no nono semestre se concentrada (M = 121,00, DS = 12,12) apresentam pontuações de desempenho significativamente maiores. Conclui-se que as condições para um melhor desempenho no produto do ciclo de melhoria desenvolvido através de aprendizagem baseada em problemas foram observadas nas seguintes características: nível superior em que os alunos cursaram o curso, maior número de horas de tutoria, menor número de alunos por professora e menos alunos por grupo.

Palavras chaves: Pesquisa em Educação de Enfermagem, Educação em Enfermagem, Estudantes de Enfermagem.

INTRODUCTION

Since its beginning, nursing has sought its professional and disciplinary position that has made it travel through different paradigms, configuring in this way what we know as current nursing (professional-discipline). This journey has led to the development of different educational models permeated by the discipline and prevailing paradigm at the time (1). From the Carper's efforts in her knowledge patterns or those of a curriculum

based on the caring science proposed by Watson, they show the constant need to innovate and improve the teaching-learning processes in nursing education (2, 3).
In turn, from theorization in education about learning, as a proposal, we can accept the one described by Pylyshyn, which proposes transiting from a level of syntactic explanation to a semantic one (with meaning), which is achieved through the conceptualization and can be developed only if there is a context that allows a located teaching-learning process (4).
From the above, to achieve the development of this teaching-learning process we can determine the following three taxonomic levels: a) the conceptualization, the development of operational schemes that allow you to act in the context (or situation) to the student, b) the transfer, what the student must be able to apply what has been learned in a context, and c) the creation, in which the student in different contexts can respond to the problems with innovative, original and creative productions (5).

In relation to the above mentioned, it is necessary to have teaching tools that can respond to the different taxonomic levels developed in the previous point. Problem-based learning (PBL) or project-oriented learning (POL) is focused on the creation as a didactic tool for the formation of a graduate program in nursing.
The PBL can be described as a student-centered approach where the search for solutions to contextual problems is privileged, through inquiry, debating ideas, generating predictions, designing plans, receiving and analysing data, drawing conclusions, communicating their findings, generating new questions and products. In addition, the collaborative work of the students acquires real relevance when it is contextualized in an issue which entails the development of research from the real world and from an inclusive view towards interdisciplinarity (6).

The main characteristics of the project-based approach are: a) learning by doing: characterized by the idea that learning is more effective when the theory is put into practice, b) real-world problems: they are central to the development of the PBL, since achieving the connection of the academy and the external environment generates and sustains the motivation and interest on the part of the students, c) the tutor's "a guide to the side": the role of the teacher is described as a facilitator or mentor, changing their traditional role from a knowledge distributor to a process manager, essentially a supervisor and moderator, d) interdisciplinarity: emphasis is placed on it, since the complexity of social problems poses a challenge for adaptability and Critical thinking, putting in check the approach to the topics only from the discipline, e) Collaboration and teamwork: the process of teamwork and the skills and qualities that this generates are part of the learning outcomes of the PBL, and f) a final product: it is distinctive for the methodology since the generation of a quality product drives the planning, production and evaluation of the project (7).

On the other hand, the Improvement Cycle (IC) was born as a tool in the management of quality in the context of the health system that has a multidisciplinary perspective, since this methodology was born in engineering and it has been permeating the disciplines of the health sciences, and especially nursing, over the years (8). The IC was born from the look

posed by Deming and his PDCA cycle (Plan - Do - Check - Act). It seeks to quantitatively systematize the decision making and objectify the improvement in the quality of care (9). It has been defined as a systematic methodology with structured and well-defined stages, which supports clinical management in different areas such as the clinical management of patients in different contexts. As examples of the versatility of this tool we can list the following studies: a) Salinas et al applied the method in patients with pancreatitis in hospitalized patients, b) Patón Villar et al intervened in the management of pressure ulcers in hospitalized patients, c) Machuca Contreras evaluated and improved the maintenance of donor potential in the context of organ transplantation in a critical patient unit and d) Calle-Urra et al improved clinical records in hospitals (10-13). In this way, the improvement cycle and its structure achieve the pursuit of objectives for improvement opportunities to intervene, with a positive impact on continuous improvement.

When exploring the tools and stages that are developed in the improvement cycles, the currents that have been developed are diverse, but there is consensus on minimum elements that must be established. A proposal of these elements that can be used for the design of the improvement cycle consists of four stages: the situational diagnosis, the identification of the opportunity to improve, the first measurement of the level of quality and the design of the intervention. These four stages of the improvement plan design correspond to the Plan stage in the PCDA cycle (9, 14).

The design of the IC can be characterized with the following aspects: a) situational diagnosis: it is the starting point of the improvement cycle, the information is collected from the stages of the administrative process and the tools that accompany it, b) identification of the opportunity for improvement: after the information has been collected, the decision is made regarding the improvement opportunity (OM), different tools are used for the prioritization and description of OM, c) the first measurement of the quality level: the quantification of OM is proposed, translating it into a quantitative indicator, and d) design of the intervention: this is the proposal of interventions with the activities to be carried out, the objectives to be met, the evaluation proposals and the expected results. In addition, a theoretical support is built and demonstrates the effectiveness of the interventions (14, 15).

As mentioned above, this IC is methodologically compatible with the use of PBL as a teaching strategy for the teaching-learning process from the taxonomic level of creation. This is because the IC seeks to solve a problem of clinical practice (for nursing) and quantify this improvement; in addition to this, the PBL has a similar objective since it seeks to attain meaningful learning from doing through mentoring in a controlled environment which results in the creation of a product. In addition, since both methodologies have a sequential process with clear and defined stages, they can be complemented to achieve the final product, which in this case is the design of an IC (16, 17).
On the other hand, not only is it necessary to monitor the impact of the implementation of the PBL as a didactic strategy in the undergraduate training of nursing students, but also to

add the IC as a tool that helps in decision making in the management of care nursing of these nurses in training.

It is for this reason that in this study the use of an instrument that measures the level of student performance around the final product of the PBL is a practical way of evaluating the IC implementation based on PBL. Considering the above, this study was developed with the objective of describing the level of performance of the fifth and ninth grade nursing students who developed a better cycle design under the project-based learning methodology.

METHODOLOGY

Regarding the design of the study, it was developed under a cross-sectional descriptive quantitative design in a university setting in Santiago, Chile. It was considered an intentional convenience sample of 33 groups (with a total of 183 undergraduate students of the nursing program involved in the study). Participants took courses in the administration of health services (study plan I) and quality in the management of care (study plan II) during the first semester (March - July) of the year 2017, which corresponds to the ninth and fifth semester respectively in their study plans (with a biannual workload of 108 hours in the study plan I and 36 hours in the study plan II).

These students studied their subjects whose character is theoretical. The structure of these subjects was dynamized with a theoretical concentration of 9 weeks and 9 weeks for the development of the design of an improvement cycle. In the case of students who had their subject in a concentrated modality, both (theory and design) were carried out in parallel. In the nine weeks of the improvement cycle development, the didactic strategy of the project-based learning with structured phases was incorporated so as to facilitate the theoretical construction, through tutoring for the application in the problem case that was delivered to the beginning of the process, generating working groups for this purpose.

For this study, three levels were determined, corresponding to the semester and modality in which the subject was studied: a) Fifth semester: corresponds to the students who studied their subject in the fifth semester of their curriculum, b) Ninth Semester Regular: Corresponds to the students who took their subject in the ninth semester of their curriculum and in the 18 academic weeks, and c) Ninth semester concentrated: corresponds to the students who studied their subject in the ninth semester of their curriculum and in 9 academic weeks.

Likewise, the teams that the students formed were determined as working groups in order to be able to develop the IC design through the PBL. The inclusion criteria for the groups were: a) having taken the courses in a regular manner (18 academic weeks) or concentrated (9 academic weeks) during the first semester of 2017, b) having formed working groups of at least four members, and c) having completed the total tutoring process for the improvement cycle.

The instrument is an evaluation guideline that was designed by the author as part of the evaluation tools of the subjects described above. The evaluation guideline corresponds to a seven-point Likert type rating scale, composed of seven evaluation criteria: a) General Aspects, b) Introduction, c) Situational Diagnosis, d) Identification of the Opportunity for Improvement, e) Design of the intervention, f) Conclusion, and, g) References. Of these seven evaluation criteria, the 19 items were screened as indicators.
In turn, these seven criteria are divided into four dimensions: a) Academic Writing: with 8 items that correspond to the criteria: General Aspects (2 items), Introduction (2 items), Conclusion (2 items) and References (2) items), b) Situational diagnosis: comprising the situational diagnostic criterion with 2 items, c) Identification of the improvement opportunity corresponding to the criterion of the same name that includes 3 items, and d) Design of the intervention bearing the same name of the criterion that is made up of 6 items. Thus, the instrument (evaluation guideline) containing 19 items can vary from 19 points (lower performance) to 133 points (higher performance), taking into account that the higher score is considered a greater performance in the design of a cycle of improvement.
The data for this study was collected from the evaluation guidelines applied to the final products of each working group during the month of July 2017 in the subjects of quality in the management of care and administration of health services as part of the finalization of the improvement cycle design. The scale of appreciation was applied by the same observer for the 33 cases and the secondary analysis of the data of the instrument was developed from them.

Ethical considerations: the management of the information was carried out only by the researcher following the precepts of Ezequiel Emanuel, through informed consent, ensuring confidentiality and anonymity. In turn, given the nature of the collection and analysis of information that is of a secondary nature, the risk in which the participant could be affected in the development of their subject was considered as low, since the data collection started with the evaluation process completely closed. In the same way, prior to the beginning of the study, the students had the opportunity to know the result of their evaluation and the adequate feedback of it (18).

The statistical package IBM SPSS Statics in version 23.0.0.2 was used for the statistical analysis. Descriptive statistics were applied for the analysis of demographic characteristics and distribution by level. The Cronbach's alpha was calculated as a statistical test of internal consistency to establish the reliability of the instrument, considering an alpha value ≥ 0.70 acceptable (19, 20). To test the theoretical relationships, a one-way analysis of variance (ANOVA) was performed, together with a post hoc analysis with the Tukey HSD test. Values of P less than 0.05 are considered significant (21, 22).

RESULTS

The mean number of members per group was 5.5, with the highest ratio of students per group to the ninth regular level (M = 7.1). More than half of the students belonged to the

fifth level (53.6%), while 27.3% and 19.1% correspond to the ninth regular and concentrated level, respectively. The majority of the students were women (83.4%) and all the levels received the same percentage of hours (33%) of tutoring in relation to their attendance hours for the subjects (see Table 1). The Cronbach's alpha calculated for the whole scale was 0.852, Cronbach's lower alpha being if item 15 were eliminated (0.835). At the same time, Cronbach's highest alpha if an item was eliminated was for item 9 (0.865), these indicate a good internal consistency (see Table 2).

Table 1. Demographic characteristics and distribution by level

Table 1 Demographic and distribution characteristics by level (students n = 183, groups n = 33)

Demographics	*Mean*
Members by group	5,5
Fifth semester	5,2
Ninth semester (regular)	7,1
Ninth semester (concentrated)	5,0

	n	*%*
Gender		
Female	153	83,6
Male	30	16,4
Level		
Fifth semester	98	53,6
Ninth semester (regular)	50	27,3
Ninth semester (concentrated)	35	19,1
Groups		
Fifth semester	19	57,6
Ninth semester (regular)	7	21,2
Ninth semester (concentrated)	7	21,2
Class hours real tutoring		
Fifth semester	12	33,3
Ninth semester (regular)	36	33,3
Ninth semester (concentrated)	36	33,3

Source: Personal Collection (2017)

El alfa de Cronbach calculado para toda la escala fue de 0,852, siendo el menor alfa de Cronbach si el ítem 15 fuese eliminado (0,835). A su, vez el mayor alfa de Cronbach si un ítem fuese eliminado fue para el ítem 9 (0,865), estos nos indican una buena consistencia interna.

Table 2. Mean, standard deviation for each item.

Table 2 Mean, standard deviation for each item and Cronbach's α if the item was eliminated (n = 33)

Items of the scale	*Mean ± SD*	*Cronbach's α if the item was eliminated*
15. Perform bibliographic search and build a theoretical framework determining the level of evidence to justify its intervention formulated	5,94 ± 1,67	0,835
14. It assumes how the indicators should progress after the intervention	5,18 ± 2,37	0,837
12. Use indicators with a clear structure	5,30 ± 2,08	0,837
13. Determine the verification points and obtaining the information for the construction of the indicators	5,91 ± 2,07	0,841
10. Make design of an intervention using a tool	6,42 ± 1,16	0,841
11. Determine goals, purpose, components and activities	6,48 ± 1,05	0,841
19. Insert references in the text as determined by the format	4,85 ± 2,40	0,841
16. Make a conclusion based on the questions and objectives stated in the introduction	6,09 ± 1,05	0,843
3. It proposes an introduction that allows the reader to have an overview of the development of the report	5,88 ± 1,49	0,843
18. Use References in Vancouver style	4,91 ± 2,33	0,844
4. Determine a clear objective that is related to the work that exposes	5,03 ± 2,41	0,846
17. It concludes based on your experience of your work, based on the initial questions or objectives and on the usefulness of this tool in your training and professional future	6,27 ± 0,93	0,848
6. Use the SWOT to analyze the information collected and determine possible lines of action	6,03 ± 1,29	0,848
8. Realizes deployment of the factors that are involved in the prioritized improvement opportunity	6,39 ± 1,28	0,850
7. With the situational diagnosis makes a prioritization of the improvement opportunity to develop	6,33 ± 1,32	0,850
2. It has a clear wording and spelling, which allows effective reader understanding	6,00 ± 1,04	0,851
5. Performs administrative assessment using the stages of the administrative process, identifying their tools and elements necessary for the situational diagnosis	3,12 ± 2,68	0,854
1. It has a format in which it includes an academic layout	5,88 ± 1,32	0,855
9. Determines the first level of quality with a quantitative indicator	5,24 ± 2,42	0,865

Source: Personal Collection (2017)

The bivariate analysis of the overall performance score can be seen in Table 3. The performance score does not vary in a statistically significant way as observed in the ANOVA statistical test (F = 3.155, P = 0.057). But the Tukey HSD test indicates that students in the ninth concentrated semester (M = 121.00, DS = 12.12) have significantly higher performance scores than fifth-semester students (M = 102.11, DS = 18.58, P = 0.045), not presenting this way with the students of the ninth regular semester (M = 107, 57, DS = 16, 29, P = 0,316).

Table 3. Differences in the overall performance score by level (n=33)

Table 3 Differences in the overall performance score by level (n = 33)

Demographics		*Performance score Mean ± SD*	*Statistical test*	*P*
Nivel				
Fifth semester		102,11 ± 18,58	$F = 3,155$	0,057
Ninth semester (regular)		107,57 ± 16,29		
Ninth semester (concentrated)		121,00 ± 12,12		
(i) Nivel	(j) Nivel			
Ninth semester (concentrated)	Fifth semester		$\mu_i - \mu_j = 18,895$	0,045*
	Ninth semester (regular)		$\mu_i - \mu_j = 13,429$	0,316

*. The differences in means is significant at the 0.05 level

Source: Personal Collection (2017)

Extending the bivariate analysis for each item for the ANOVA test, statistically significant performance scores were obtained in item 1 (F = 4.175, P = 0.025), item 5 (F = 27, 217, P <0.001), and item 12 (F = 5.650, P = 0.008). Similarly, the Tukey HSD test shows the following detail of significance for each item described above: a) In item 1, fifth grade students have a significantly higher performance score (M = 6.37, SD = 0.895) than those of the ninth regular semester (M = 4.86, DS = 2.035), b) for item 5: there is a lower performance in fifth-grade students (M = 1.32, DS = 1.376) than in ninth grade students regular level (M = 4.86, DS = 2.734, P <0.001) and ninth concentrated level (M = 6.29, DS = 0.951, P < 0.001), respectively, and c) in item 12 the students of the fifth level have lower performance scores than students of the ninth level (P = 0.031) and ninth level of concentration (P = 0.031).

DISCUSSION

The findings of this study suggest that the higher level in which students completed their subject, the better performance results they obtained. These can be linked to the results of Robinson's study in which the greatest commitment to the development of the project, which is demonstrated by the students through elements such as attendance, previous experiences and maturity of the group, generates better performances (23). In turn, this view can be complemented in that this greater commitment is an indicator of the self-regulation of the apprenticeship, in which the figure of the teacher's direction is gradually displaced by the self-regulation of the group and the knowledge that it achieves in an autonomous way (24).

The environment, as a whole, is an element that must be dealt with by the student and the

teacher during the development of the PBL, a context in which an environment conducive to a constant formative evaluation is generated in which feedback is a key point of the process and especially in the initial stages (24). This environment is characterized as a challenge for the teacher and student, in which the preference of traditional styles of teaching students and the new role of facilitator teacher is stressed, the time and resources elements that facilitate or hinder the process (7). Given the above, coinciding with the results of this study, the greater number of real tutoring hours and the smaller number of students per teacher have better performances in the PBL product.

In relation to the number of students per group, it is not described in the literature reviewed that there is a specific number of members with whom the groups must be formed. But as can be seen in the findings of Lee et al. and Notari et al. it has been seen that the social capacities that are necessary for the development of activities must be high, since it is a constant collaborative process and within this there may be conflicts within each group (25, 26). The characteristics of the group, such as the number of students, the conformation strategy and the maturity they can achieve, are key factors in the success of the task.

On the other hand, some limitations have been recognized in this study. First, although the instrument has an initial reliability analysis with internal consistency through Cronbach's alpha, it becomes necessary in later studies to develop other psychometric methods to establish the instrument's validity and reliability. Second, in spite of the fact that the study seeks to evaluate the impact of the implementation of the strategy, it only considers the performance of the final product, which limits the perception and development of the didactic strategy, for which it would be necessary to develop inquiries to complement these results. Third, the sample is reduced (n = 33), so the trends have this limitation for statistical analysis and may distort the results. However, despite the limitations described, the study is a contribution to quantify the phenomenon of study and describe innovative practices in the field of nursing education in undergraduate students, serving as a basis to continue exploring the use of PBL and IC in future investigations.

CONCLUSIONS

The results showed that the instrument (evaluation guideline) that was used in this study has a good reliability for the evaluation of the products of the IC designs. For the evaluation of performance, good results were obtained, but some characteristics were established. They show that the higher-level students (ninth semester), who had a higher number of tutoring hours (36 hours) and fewer students per group (5 students), obtained better results in relation to the rest. Based on the findings, it would be recommended to continue using the instrument for the evaluation of the IC designs and to generate strategies to comply with the characteristics profile that makes the quality of IC products more successful through PBL.

BIBLIOGRAPHICAL REFERENCES

1. Cabal VE, Guarnizo T. M. Enfermería como disciplina. Revista Colombiana de Enfermería. 2016; 6(6):73-81.

2. Machuca Contreras F, Medero Loyola K, Zapata Aqueveque C. Cuidados al final de la vida: Una reflexión a partir de los patrones del conocimiento. Cuidado de Enfermería y Educación en Salud. 2015; 2(1):63-83.
3. Hills M, Watson J. Creating a caring science curriculum: an emancipatory pedagogy for nursing. New York: Springer; 2011. 310 p.
4. Pylyshyn ZW, LePore E. What is cognitive science? [Internet]. Blackwell; 1999 [cited 23 Jul de 2017]. Available from: http://www.cs.ox.ac.uk/ieg/e-library/sources/ruccsbook.pdf
5. Lagos Coutiño R, Cárdenas Mas G, Formandoy Morales F, Guerrero Villalba R, Lastra Cid L, Pajkuric Vitezic LE. Manual de técnicas didácticas para el desarrollo de competencias. Primera. Concepción, Chile: Instituto Profesional Virginio Gómez; 2015. 88 p.
6. Biasutti M, EL-Deghaidy H. Interdisciplinary project-based learning: an online wiki experience in teacher education. Technology, Pedagogy and Education. 2015; 24(3):339-55.
7. Harmer N, Strokes A. The benefits and challenge of project-based learning. A review of the literature [Internet]. United Kingdom: Plymouth University; 2014 [cited 24 Jul de 2017] p. 38. (PedRIO). Report No.: 6. Available from: https://www1.plymouth.ac.uk/research/pedrio/Documents/PedRIO%20Paper%206.pdf
8. Cabadas Avión R. La calidad asistencial: ¿de qué estamos hablando? Cirugía Mayor Ambulatoria. 2015; 20(2):79-82.
9. Rodríguez Pérez MP, Grande Arnesto M. Calidad asistencial: Concepto, dimensiones y desarrollo operativo [Internet]. Madrid, España: Escuela Nacional de Sanidad; 2014 [cited 25 de Jul de 2017] p. 35. Available from: http://e-spacio.uned.es/fez/eserv/bibliuned:500957/n14-1_Calidad_asistencial.pdf
10. Salinas M, Flores E, López-Garrigós M, Díaz E, Esteban P, Leiva-Salinas C. Aplicación de un método de mejora continua para la selección de los marcadores diagnóstico de pancreatitis aguda en un servicio de urgencias. Emergencias. 2017; 29:113-6.
11. Patón Villar F, Lorente Granados G, Fernández-Lasquetty Blanc B, Hernández Martínez A, Escot Higueras S, Quero Palomino M, et al. Plan de mejora continua en prevención-tratamiento de úlceras por presión según el ciclo de Deming. Gerokomos. 2013; 24(3):125-31.
12. Machuca Contreras F. Evaluación y Mejora del Mantenimiento del Potencial Donante en la Unidad de Cuidados Intensivos Adultos del Hospital San Pablo de Coquimbo, Chile. Cuidado de Enfermería y Educación en Salud. 2014; 1(1):16-24.
13. Calle-Urra JE, Parra-Hidalgo P, Saturno-Hernández P, Fonseca-Miranda Y, Martínez-Martínez M. Evaluación y mejora de la calidad de los documentos de consentimiento informado en nueve hospitales del servicio murciano de salud. Revista Española de Salud Pública. 2015; 89(3):307-19.
14. Saturno Hernández PJ. Gestión de la Calidad. Concepto y componentes de un programa de gestión de la calidad. 2a ed. Murcia, España: Universidad de Murcia;

2008. 20 p. (Manual del Máster en gestión de la calidad en los servicios de salud; vol. Conceptos básicos. Diseño e implantación de programas de gestión de la calidad en los servicios de salud.).

15. Torres Jaquez ME, Contreras Loera MR. Las organizaciones cooperativas: el proceso administrativo como parte de la gestión directiva. Journal of Intercultural Management. 2013; 5(1):51-61.
16. Rodríguez Reinado C, Blasco Hernández T. Recomendaciones para la buena práctica en la implementación del ciclo de mejora en calidad asistencial. Madrid, España: Instituto de Salud Carlos III; 2013 nov p. 55.
17. Ayala RA, Koch TF, Messing HB. Understanding the prospect of success in professional training: an ethnography into the assessment of problem-based learning. Ethnography and Education. 2017; 0(0):1-19.
18. Emanuel EJ, Wendler D, Grady C. What Makes Clinical Research Ethical? JAMA. mayo de 2000;283(20):2701-11.
19. González Alonso J, Pazmiño Santacruz M. Cálculo e interpretación del Alfa de Cronbach para el caso de validación de la consistencia interna de un cuestionario, con dos posibles escalas tipo Likert. Revista Publicando. 2015; 2(1):62-7.
20. Domínguez-Lara SA. ¿Por qué es importante reportar los intervalos de confianza del coeficiente alfa de Cronbach? Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud. 2015; 13(2):1326-8.
21. Rubio-Hurtado M-J, Berlanga-Silvente V. Com aplicar les proves paramètriques bivariades t de Student i ANOVA en SPSS. Cas pràctic. REIRE Revista d'Innovació i Recerca en Educació. 2012; 5(2):83-100.
22. Keppel G, Wickens TD. Simultaneous comparisons and the control of type I errors. Design and analysis: A researcher's handbook 4th ed Upper Saddle River (NJ): Pearson Prentice Hall p [Internet]. 2004 [cited 23 de Jul de 2017];111-30. Available from: http://www.skidmore.edu/~hfoley/Handouts/K.Ch6.notes.pdf
23. Robinson JK. Project-based learning: improving student engagement and performance in the laboratory. Analytical and Bioanalytical Chemistry [Internet]. 2013; 405(1):7-13.
24. English MC, Kitsantas A. Supporting Student Self-Regulated Learning in Problem- and Project-Based Learning. Interdisciplinary Journal of Problem-Based Learning. 2013; 7(2). 128-50.
25. Lee D, Huh Y, Reigeluth CM. Collaboration, intragroup conflict, and social skills in project-based learning. Instructional Science. 2015; 43(5):561-90.
26. Notari M, Baumgartner A, Herzog W. Social skills as predictors of communication, performance and quality of collaboration in project-based learning: Social skills in project-based learning. Journal of Computer Assisted Learning. 2014 ;30(2):132-47.