Significant Learning in Biostatistics: Discipline Analysis in a Nursing Course

ORIGINAL

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Abstract

We aimed to evaluate Biostatistics teaching planning in a Nursing undergraduation course through the identification of methodological approaches that promote a significant learning. This is a documental research with comparison between educational planning documents and a didactical-pedagogical verification form, which was applied from April to May 2014, in Ceará State, Brazil. The results were organized in charts. The learning objectives followed the teaching proposal; however, the verbs used were distant from the competency-based teaching planning. The teaching strategies were traditional, although they had some advances with regard to group discussions and activities integrated in seminars. The written tests method had more prevalence in evaluations, and bibliographical references were taken from books whose years were obsolete. The teaching planning could be reorganized considering the addition of active methodologies based on critical pedagogy, which would contribute to professional formation.

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Keywords

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Introduction

The education sector has the challenge of making skilled citizens to work as professors. Based on this idea, professionals should be stimulated to develop skills of comprehending the reality; at the same time they should try to indicate solutions for the daily situations they live in order to provide a new meaning for 'knowing'. [1].

Given the processes of change in the education of health professionals and the need of new teaching methodologies that promote “learning to teach” in the universities, it is fundamental the investigation of how the Nursing professional formation is developed if we wish to work in a network of action and services in the country.

There has been an increasing interest in competency-based education in the last decades. This happens mainly because it is a sophisticated strategy of curricular planning, whose approach is focused on the student and supports the trend for a higher teaching responsibility and quality assurance [2].

Changes happened during the last few years regarding Nursing teaching, supported by the Brazilian National Curricular Guidelines (*Diretrizes Curriculares Nacionais*, in Portuguese), which have enabled some advances to avoid fragmentation of the worked knowledge, as well as to make learning significant and contextualized.

In the Nursing course, Biostatistics is among the disciplines provided in the curricular matrix, but it is not in the set of professionalizing disciplines; thus, teachers have the challenge of motivating their students in their learning. Teaching statistics helps students to answer questions and problems. This can give them a better reality comprehension, because it allows developing an investigative perspective to establish relations in the development of processes needed to solve reality problems [3].

Hence, studying Biostatistics might offer subsidies not only for the scientific research, but also for the development of an investigational reflexive and critical posture by the student, who could be favored in a competency-based education process.

In order to develop competencies, we need to work with complex tasks and challenges that stimulate students to mobilize their knowledge and, in a certain amount, complete them. This hypothesizes active processes in a cooperation between student and professor [4].

Thus, we found the need of evaluating Biostatistics education planning documents of the Nursing course, with the aim of assessing if the methodological approaches promote the significant learning of the person being educated, in an attempt to improve the association between theory and practice.

The questions that guided this study were: What conception of learning was perceptible after teaching planning analysis? Were the planning objectives competency-based? In the pedagogical proposal, were active methodologies for the involvement of student body included in the learning process?

It is worth noting the discomfort with how students incoherently notice the use of Biostatistics discipline knowledge in the practice of Nursing professionals.

We also had the aim of contributing with reflections about the applicability of Biostatistics tools in the Nursing professional practice, in order to take benefits of the comprehension of its use to plan actions as strategies of labor accomplishment.

This study had the purpose of evaluating a Biostatistics discipline teaching planning through the identification of methodological approaches that promote students' significant learning.

Method

This is a documental research with secondary sources about the evaluation of a Biostatistics teaching planning using a didactical-pedagogical verification form. The instrument was developed as a teaching method of the Higher Education Methodology discipline from the Nursing academic master's degree course of *Universidade Regional do Cariri*, to evaluate the Biostatistics discipline teaching planning from the Nursing Undergraduation Course in a public university in Ceará countryside.

Data collection took place from April to May 2014. Firstly, the Biostatistics teaching planning was requested to the coordination of the Nursing course,

and then a careful evaluation of the items included in the planning and in the didactical-pedagogical verification was carried out.

Results were organized in charts and presented according to the elements seen in the form: syllabus, content, objectives, teaching strategies, available resources, evaluation process and criteria, and bibliography.

The teaching planning analysis, as well as criticisms and suggestions, was based on literature on the theme, such as the Brazilian National Curricular Guidelines from the Nursing course supported by the theoretical referential of Bloom's taxonomy, which is an instrument that has the aim of contributing to the planning, organization and control of learning objectives.

Bloom's taxonomy is an instrument that has the purpose of subsidizing the identification and de-

finition of objectives regarding the cognitive development, which implies empirical and scientific knowledge processes, thus it involves an objective analysis that is able to evaluate skills [5]. In such case, it involves the evaluation of Biostatistics teaching planning, competency-based to facilitate the teaching and learning process planning.

The study preparation followed the ethical standards on documental researches. It used the trustee document from the study institution.

Results

Chart 1 presents the aspects discussed in the evaluation process with regard to the syllabus, contents and objectives, as well as criticisms and suggestions to Biostatistics discipline teaching planning from the Nursing course.

Chart 1. Syllabus, contents and objectives of the Biostatistics discipline according to the Brazilian National Curricular Guidelines.

What will be analyzed	Identified aspects	Analysis and suggestions
Syllabus	Descriptive statistics; introduction to statistics, tabular and graphic representation, measures of central tendency, of dispersion, separatrices, asymmetry and kurtosis; notions of probability and probabilistic distribution; notions of statistical inference; sampling distribution, estimation and test	The nurse can make use of new information technologies, working in different scenarios and considering the presuppositions of clinical and epidemiological models
Contents	Descriptive statistics; measures of central tendency, of dispersion, separatrices, asymmetry and kurtosis; notions of probability; probabilistic distribution; notions of statistical inference	The curricular contents that must be assimilated and acquired should confer academic terminality and capacity
Objectives	General: "endow" the student with the comprehension of statistical techniques Specific: give the student the possibility of a professional future, the use of statistics as a work tool; make the use of this statistical technique feasible to thorough studies and researches in the area of biology through data measurement	At the end of the discipline, the student might be able to "build" theoretical and practical knowledge about statistics applied to health Specifics: use statistical techniques as a work tool to plan health actions; make Nursing formation feasible with emphasis on aid, teaching, management and research using Biostatistics

Source: Brasil [6].

Chart 2. Teaching strategies, evaluation systems, available resources and bibliography of the Biostatistics teaching planning from the Brazilian National Curricular Guidelines.

What will be analyzed	Identified aspects	Analysis and suggestions
Teaching strategies	<ul style="list-style-type: none"> – Theoretical-expositional classes – Practical classes using the software – Discussion in small groups and debates – Integrated activities/seminars 	<ul style="list-style-type: none"> – Dialogued expositional classes – Case studies (analysis case and problem case) – Discussion in small groups – Problem solution – Workshops (laboratory) – Directed study
Evaluation system	<ul style="list-style-type: none"> – A written evaluation – Two written evaluations – Evaluation criteria are not described in the planning – The teaching planning does not describe the evaluation process 	The evaluation process shall be competency-based, which should use methodologies and criteria for follow-up and evaluation of the teaching and learning processes
Available resources	They partially include the available resources in the university (computing laboratory and multimedia projector)	Explore all available resources in the university
Bibliography	Bibliography (books between 1974 and 2004)	Use of articles from national databases applied in the health sector, working experience or exploratory descriptive (in the last 5 years)
Source: Brasil [6] and Anastasiou and Alves [7].		

Chart 2 presents the aspects discussed during the evaluation process about teaching strategies, evaluation systems, available resources and bibliography, as well as criticism and suggestions to the Biostatistics discipline teaching planning from the Nursing course.

Discussion

In general, the objectives follow the proposal in the evaluated discipline; however, the use of identified verbs ("endow", "enable" and "make feasible") is distant from the competency-based approach planning, because, according to Bloom's taxonomy verbs, learning objectives separate the student from the cognitive, skill and affective domains.

Bloom's taxonomy found three learning domains (cognitive, affective and psychomotor), and the objectives to be reached are defined in each stage. The cognitive domain refers to mental skills (knowledge); the affective refers to growth in feelings or emotional areas; and the psychomotor domain concerns

manual or physical skills. This is associated with the learning process, including the domain and acquisition of knowledge and with the development of intellectual skills [8].

Subjects that understand without a meaning have more odds of forgetting it during the learning process. This happens because without comprehension, it is hard to use information for a future thought. Even though learning is a teaching product, it not always has a place only because an instructor teaches it. As professors understand, learning influences on how they teach and how their students learn [9].

According to the American Association of Colleges of Nursing, learning process results can be obtained through a variety of content approaches, and the possible content can evolve throughout time with the development of new knowledge. These pieces of information can be used as a guide to plan other themes or to elucidate the nature of the essential, which is associated with the content that is listed [10].

Therefore, the development of objectives with well-established instructional contents is fundamental, and they should include cognitive, attitudinal and competency aspects, which should be previously done in the beginning of the teaching planning. However, “unfortunately, some of these objectives may not be well-established and others might be implicit in the learning process and, many times, they are (re)cognized only by the educator”¹ [11; 421].

Through this learning process association in the formation of Nursing undergraduation courses, we found in the Brazilian National Curricular Guidelines, for the formation of this professional, that the objective is to endow him/her with the necessary knowledge to perform the most varied competencies and general and specific skills, which vary in the comprehension of human nature and in its dimensions [6].

Hence, it is necessary to decide and establish the learning objectives in order to structure the educational planning process, since it is a process associated with “the choice of content, procedures, activities, available resources, strategies, evaluation instruments and methodology that will be adopted for a certain period of time”² [11; 421].

With regard to the methodology included in the teaching planning, we found four tools for traditional teaching, with some advances as to the discussion in small groups, debates and activities integrated in seminars. For students’ learning, considering the methodological approaches as medium and resources used by the professor, it is necessary to establish, more formally, the set of strategies that might enable reaching the objectives provided in the teaching planning [12].

As to the active methodologies, referring to health professional formation, two kinds of problem-based

learning are used: problematization pedagogy and problem-based learning, and both have the purpose of developing learning and teaching processes in the practice [13].

The active learning is a teaching approach, instead of a single and specific method. It requires student’s active participation in classroom activities that were carefully structured by the professors. In an active learning approach, each student should actively participate in the learning environment and use the developed knowledge, skills and attitudes. Active learning can promote students’ motivation to learn beyond the memorization of disarticulated content or contents focused on specific information, and help them to comprehend important information, which will keep what they have learned in a clear and facilitated way [9].

After analyzing the evaluation system in the teaching planning, we can infer it is comprised only of evaluations in the written modality, and the evaluation criteria were not evidenced. Evaluation is one of the teaching planning topics that requires more attention, considering two main evaluation models: formative and summative. The first is based on observations in a more detailed level, while the second is based on students’ classification, and it is always conducted in the end of a course or teaching unit with a classificatory character [2].

Teaching planning should be understood on two modalities: basic, which includes the materials being studied, read and investigated; and the complementary, presented by the professor and organized according to researches for later studies or as sources for future consultations, which should be of easy access and updated [12]. This is important for professors who want to transcend from a learning and teaching process by simple knowledge that is mechanically

1. Original in Portuguese: “infelizmente alguns desses objetivos podem não ser bem definidos e outros podem ficar implícitos ao processo de aprendizagem e, muitas vezes, são (re)conhecidos apenas pelo educador” [11;421]. Translated by the authors.

2. Original in Portuguese: “escolha do conteúdo, de procedimentos, de atividades, de recursos disponíveis, de estratégias, de instrumentos de avaliação e da metodologia a ser adotados por um determinado período de tempo” [11;421]. Translated by the authors.

memorized to that in which students can develop their learning and apply it upon the use of skills.

Hence, we understand that learning to include knowledge and skill apps can require a substantial change on how teachers understand and approach teaching and learning processes. This transition moves from a teaching format focused on the professor and, many times, based on a lecture, to a teaching format focused on the student, which can include discussion and apps based on cases. It is worth noting that by the time teachers are developed as educators, their teaching and learning perception shall grow throughout this continuum [9]. Thus, the professor is a teaching and learning process mediator by directing him/her to the formation of a citizen-professional, thinking on the student/apprentice in complete with his/her capacities, possibilities, needs, and conditions so that he/she can learn.

Therefore, knowledge evolution does not happen linearly, it should be worked within the conceptual processes that constitute the student's cognitive knowledge, by incorporating new meanings and associating with, understanding the possibility of recognizing ideas and including even more knowledge [14].

In addition to what has been discussed, the development of many ways of teaching and learning is essential in order to achieve a significant learning. Thus, a critical pedagogical planning and the use of tools and resources of creative educational technologies are needed, but there must be a remold of the current educational paradigms, indicating the importance of all subjects involved in this process [15].

Conclusion

It was seen the adoption of the traditional teaching model in the elaboration of the Biostatistics discipline teaching and educational planning. Based on this fact, it is imperative the need of teacher's formation to work in higher education institutions, with the

comprehension of the significant learning approach, in which students and teachers are in charge of the learning process.

Then, the purpose is to allow both the student and the professor's growth, capable of providing the formation of a professional with competency and skills when he/she faces work difficulties.

Thus, we recommend reviewing the evaluation kind that was adopted in the study, with the possibility of listing other evaluation criteria like assiduity, punctuality, student's participation, practical evaluation, deliver and performance on the proposed activities. We also suggest the use of Biostatistics articles from national databases used in the health area, to work on the experience of the last 5 years, since they are updated sources and of easy access.

We find the need of a clear and well-prepared definition of the objectives, given the knowledge acquisition and appropriate competencies to the professional profile that will be formed. This directs the teaching process to a correct choice of strategies, methods and delimitation of content, and to significant learning promotion.

With regard to the use of methods that collaborate with students' motivation, we recommend the addition of strategies that promote a significant learning; in turn, the active methodologies satisfy this presupposition.

In addition, it is worth noting the relevance of teacher's formation that should be directed to the promotion of a significant learning, adopting new teaching practices, breaking the traditional way of transmitting contents and developing the student's critical perception, so that knowledge construction is a builder.

Finally, there is an urgent need of an innovative reform in teaching plans and in the curricular matrices of the Nursing course in the studied institution. This would enable an integrated and competency-based curriculum, in which the student might live all similar disciplines at the same moment, with the

possibility of correlating them and using them according to their existence in the practice.

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Sousa IC and Oliveira AH contributed in the creation, analysis and interpretation of data and article writing. Machado MFAS, Gonçalves Júnior J, Maia ER, Lopes MSV and Cavalcante EGR contributed in the creation and in the project, article writing, data interpretation evaluation, relevant critical review of the intellectual content and final approval of the version that was going to be published.

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