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ORIGINALES

Active and collaborative Anatomy learning with scenarios and videos, a new experience for first year nursing students

Aprendizaje colaborativo de Anatomía facilitado con escenarios y videos, una nueva experiencia para los estudiantes del primer año de Enfermería

M.A Gari [1]
N.F Nonkelela [2]

[1] MD. Associate Professor. Human Biology Department. Faculty of Health Sciences. Walter Sisulu University. South Africa
[2] PhD. Senior Lecturer. Nursing Department. Faculty of Health Sciences. Walter Sisulu University. South Africa

E-mail: mgari@wsu.ac.za

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ABSTRACT:

Learning Basic Sciences can be a challenge for first year nursing students. At Walter Sisulu University (South Africa), learning Anatomy is lecture-based in the first semester, but active and collaborative in the second semester. This paper investigated how students assessed their Anatomy learning environment of the second semester, as well as explored the possibility to group the variables studied. A questionnaire with 16 items was handed to all students at the end of academic years 2014-16, and 80.7% (n=168) of the total, was included in this study. Descriptive statistic of the variables was calculated and exploratory factor analysis with maximum likelihood extraction was the mean to explore the dimensionality of the scale. Participants satisfactorily assessed items related to attributes of the individual, attributes of the other members of her/his group, as well as the design of the course. Variables could be grouped into two dimensions: the first dimension being related to the cognitive strategies and skills that the individual as an agent displayed maximizing the learning opportunities afforded by the course, and, the other dimension related to the social relations and interactions that unfold among students when they learn in collaboration.

Keywords: collaborative learning; Anatomy; Bio-sciences; Nursing; higher education; South-Africa.

RESUMEN:

Las Ciencias Básicas pueden ser un reto para los estudiantes en los primeros años de la carrera de Enfermería. En la Universidad Walter Sisulu, África del Sur, la conferencia es el método de enseñanza de la Anatomía en el primer semestre, mientras que en el segundo, los alumnos aprenden esta materia de modo activo y en grupos de colaboración. El propósito de este trabajo fue investigar la evaluación que los estudiantes hicieron de variables que impactan en su nuevo ambiente de aprendizaje, así como incursionar en la relación que pueda existir entre ellas para su interpretación. Todos los estudiantes

que finalizaron el primer año en los cursos 2014-16 recibieron un cuestionario con 16 ítems, y el 80.7% (n=168) de las encuestas entregadas fue incluido en este trabajo. Se calculó la estadística descriptiva de las 16 variables y el análisis factorial exploratorio con extracción de factores comunes y rotación oblimin. Los participantes evaluaron satisfactoriamente atributos sobre ellos mismos, sobre el resto de los integrantes de su grupo y acerca del diseño del curso. El análisis factorial exploratorio permitió agrupar las variables en dos dimensiones, una relacionada con las habilidades cognitivas del individuo y la regulación de su aprendizaje, y otra segunda dimensión referida a las relaciones e inter-acciones sociales que se despliegan entre los individuos cuando aprenden en colaboración.
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Palabras clave: aprendizaje colaborativo; Anatomía; Bio-ciencias; Enfermería; enseñanza universitaria; África del Sur

INTRODUCTION

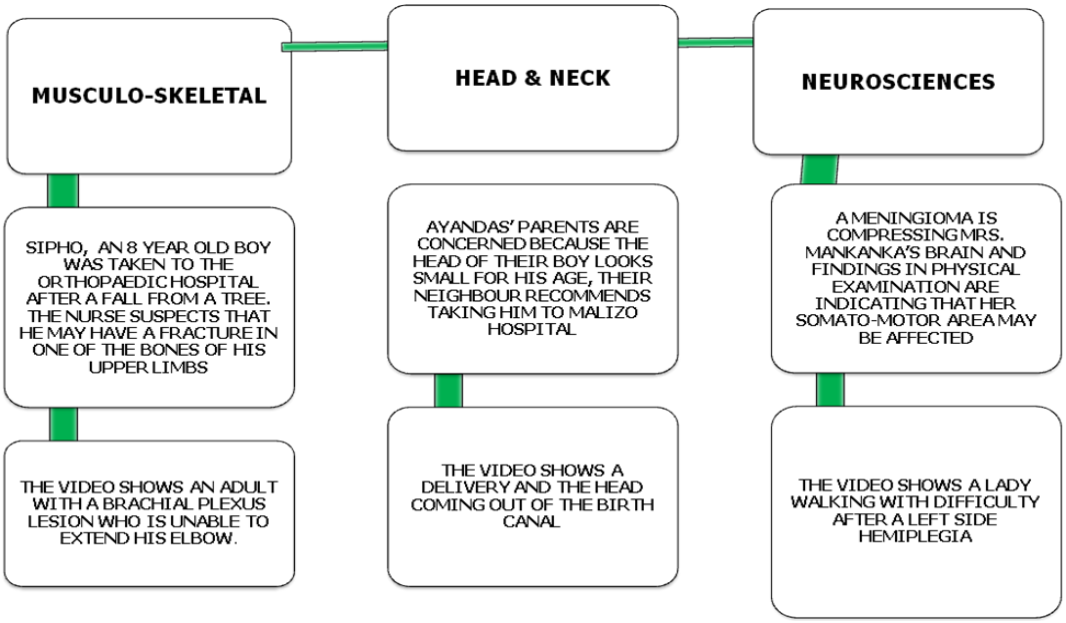
To be able to deliver an efficient and high quality job performance, nursing professionals must apply content that belongs to the field of biological sciences or bio-sciences (B-Sc). The relevance of this knowledge application, underpinning standard procedures of the profession, has led to their inclusion in the post-graduate education programme [(1)].

In under-graduate education, the B-Sc offerings are usually incorporated into the curriculum of the first years, and learning these subjects is challenging for students who do not have a solid foundation in science [(2-4)]. The organization and sequence of the B-Sc contents in the syllabi, the time available in the curriculum, and the teaching methods, also impact the quality of the students' learning processes [(5)].

Although lectures remain a universal method of teaching the B-Sc [(6)], there is an increase in the use of active, learner-centered methods, which are appreciated by both students and teachers [(7, 8)]. Arguments in favor of the use of active and collaborative methods are: preferences of the younger generation to perceive information using more than one sensory channel [(9, 10)], enjoyment of socialization, the ability to execute more than one task simultaneously and, skill in the use of technology [(11).] All these qualities favorably complement such approaches. However, the design of collaborative learning environments has its challenges, and research findings show that organizing students in groups to resolve a task does not guarantee enhanced learning [(12)]. In collaborative environments, students are exposed to socio-emotional, motivational and cognitive conflicts, which, if not solved, hinder the functioning of the group and compromise the construction of meaningful learning [(13)].

At the Walter Sisulu University (WSU), South Africa, Nursing students learn Anatomy during the first year of the degree. The other subjects that are part of the first year curriculum are: Nursing and Community Nursing Sciences, Psychology, Sociology, Biophysics and Biochemistry. Anatomy contents are organized in six blocks all with a functional-regional-systemic approach. This approach introduces vertical integration with Physiology that will be learned in the second year. In the first semester Anatomy lectures are through the delivery method which serves as orientation to the subject, while in the second semester, active methods are introduced. The three Anatomy blocks of the second semester are presented through case scenarios that reflect the cultural context of the students (annex). These scenarios are expected to motivate students to search for the relevant information, and learning objectives should help in this quest.

Annex: Learning blocks with examples of scenarios and topics of videos.



At the beginning of the second semester students receive a manual organized into three sections, which contains scenarios, learning objectives and anatomical images with no labeling. The class is divided into groups of 6 to 8 members, selected at random, but with academic heterogeneity. Each group chooses a leader and a co-leader, and they have autonomy in deciding the rules that its members will adopt and also the strategy that they will follow in the search for the information that is relevant to the scenarios.

The sequence of scenarios guides the learning path, and in each session, randomly, scenarios are assigned to groups of students that will present them to the class. During these presentations, the use of various sensory channels (e.g. one student speaks, others show the images in the manual, textbook and anatomical model, and another palpates his/her own body) encourage all members of the group to participate in these presentations, and with Socratic questions the teacher involves members of other groups to participate as well. When the presentations that are common to a topic are finalized, a summary is facilitated with the help of short videos obtained from the Internet. The initial projection of the videos, without audio, sets the opportunity for each group to discuss what they infer from the observed images. These inferences are later analyzed in the class and are followed by the projection of the same video but with audio.

The purpose of the present paper was to investigate the students' evaluation of variables that impact the quality of their learning environment, as well as to explore the relationship that might exist among these variables for their interpretation.

METHODS

The survey was developed using opinions expressed voluntarily and anonymously by 58 students (93% of the total) who studied Anatomy in the academic year of 2013. The participants expressed (in writing) their pleasure or displeasure regarding their Anatomy learning environment of the second semester. They gave examples of

situations they faced in their groups and also of personal skills desired or acquired. The initial questionnaire included 18 items, and after its analysis by three experts, two items were eliminated and four were modified. This instrument with 16 variables was given to all students (208) who finished the second semester in the years 2014-16; and showed their decision to participate anonymously when returning 86.4% of the survey distributed, 168 of them were useful (80.7 %).

Each variable could be assessed from 1 to 10; the number 1 denoted that the skill or situation was nonexistent or of poor quality, while 10 indicated exceptional quality. Demographic variables as well as means and standard deviations (SD) of the scores were calculated; the reliability of the responses to the items of the scale was estimated with the Cronbach's alpha coefficient. Exploratory factor analysis with maximum likelihood extraction and oblimin's rotation was the mean to investigate the dimensionality of the scale. This extraction assumes that there is shared variance among the variables [(14)]. The Kaiser Rule and sedimentation graph were the criteria for selection of factors. The software used for the analysis was the Statistical Package for Social Sciences (SPSS version 18.0). The ethics committee of the Faculty of Health Sciences approved the implementation of this project and verbal informed consent was obtained from all participants.

RESULTS

The average age of the 168 participants was 21.4 years (SD = 4.06), 66.7% of them females. The internal consistency reliability of the responses in the surveyed population yielded an alpha coefficient of 0.930. The majority of the mean's results are higher than 7 and their typical deviations in the range between 1.86 and 2.40 (table I). Self-evaluation of her/his professional behavior (item 3), syllabus enjoyment (7) and learning in groups (8) were the means that scored the highest; while the responsibility of peers (6), the interactions of the individual (10 and 11) and interactions of the rest of the group members (12) were the items with the lowest mean's measures. The wide range of responses is reflected in the scores of the standard deviations; only three items (3, 13 and 15) had a SD < 2.

Table I: Means and standard deviations of the sixteen items of the survey.

Item	Mean	St Dev
1. Strategies to study Anatomy	7.91	2.11
2. Search for information in books and other sources	7.93	2.16
3. My professional behavior	8.26	1.92
4. Team members professional behavior	7.30	2.15
5. My responsibilities towards the goals/deadlines of the team	7.61	2.03
6. Team members responsibilities towards the goals and deadlines	6.99	2.37
7. Enjoyed the way the syllabus was presented	8.18	2.25
8. Enjoyed learning in small group	8.13	2.32
9. Aid from materials/resources included in the course	7.86	2.40

10. Quality of my interactions in the group	7.30	2.10
11. Quantity of my interactions in the group	7.23	2.16
12. Team members interactions	7.33	2.16
13. Awareness of my strong and weak areas	7.99	1.99
14. Assistance received from my team members	7.49	2.37
15. Understanding of the subject contents	7.87	1.86
16. Communication skills using anatomical terminology	7.55	2.11

The exploratory factor analysis (Table II) offered a factorial solution of two factors which explain 57.09% of the variance. The first factor rests on six variables (1, 2, 3, 7, 9 and 15), three of them with a significant factorial load (> 0.5) and the other three with a relevant factorial load (> 0.7). The second factor also grouped six variables, four of them with significant factorial weight (6, 10, 11 and 12) and two with relevant load (4 and 14). There are four items with a factorial load of minimum contribution (> 3 <5) to the bi-factorial model, two of them (13 and 16) loading in the first factor, the third (8) in the second factor and item 5 in both factors.

Table II: Exploratory factor analysis with maximum likelihood extraction and oblimin rotation.

	Factor	
	1	2
1. Strategies to study Anatomy	**.666****	.062
2. Search for information in books and other sources	**.918*****	-.124
3. My professional behavior	**.704*****	-.021
4. Team members professional behavior	-.040	**.763*****
5. My responsibilities towards the goals/deadlines of the team	.461*	.330*
6. Team members responsibilities towards the goals and deadlines	.098	**.672****
7. Enjoyed the way the syllabus was presented	**.641****	.052
8. Enjoyed learning in small groups	.258	.445*
9. Aid from materials/resources included in the course	**.723*****	-.058
10. Quality of my interactions in the group	.232	**.541****
11. Quantity of my interactions in the group	.016	**.695****
12. Team members interactions	.176	**.656****

13. Awareness of my strong and weak areas	.471*	.170
14. Assistance received from my team members	-.112	**.797*** **
15. Understanding of the subject contents	**.596 ** **	.180
16. Communication skills using anatomical terminology	.423*	.285

* factor load >0.3 ** factor load > 0.5 *** factor load >0.7

DISCUSSION

The verbal interactions that take place among the members of a group seem to have a positive effect on long-term memory. Therefore students who participated or observed others interacting, remember more information compared to those who did not [15]. However, similar outcome has not been found when the assessment just follows the instructional intervention [16, 17]. Whenever exploring the effect that collaborative learning may have on assessment grades, it is wise also to consider the cognitive effort required to reach those grades. If the same score is obtained with less individual effort, this would reflect a greater efficiency in the cognitive processing of the group [18] which adds value to the collaborative environment. To build meta-cognitive regulations among the members of a group, Khoza and Volet [19] recommend engaging students in team- building activities and also exposing them to examples of high-quality cognitive interaction where group members are able to construct the meaning of what they learn.

Learning in collaboration is not limited to the mastery of scientific information but also to create an environment where human values and professional-social skills could be developed among the members of the group. On the latter, a survey that collected information from four health centers revealed that poor teamwork is one of the causes that most frequently leads to unsatisfactory care of clients [20]. Some studies that explored students' opinions regarding their collaborative learning experience reflect satisfaction with this type of educational environment [17, 21], although it is no less true that the majority prefer, because they are accustomed to, that the teacher plays an active role, and with her/his actions help them to regulate their learning [22]. In cases where students dislike working in groups, exploring their dissatisfaction may assist in redesigning the environment, and subsequently find convergence between the teacher's aim and the expected benefits towards the students learning process [23].

The WSU's survey revealed that many of the participants were happy to learn in their groups and satisfactorily evaluated skills they had the opportunity to practice. These skills, relevant for their training in "learning how to learn", yielded in a process that, though facilitated by the teacher, is regulated in intra- and inter-group interactions. However, the fact that 19.3% of the students did not return the survey, could be the expression of their displeasure. Some reasons that could account for this displeasure with the learning approach could be: lack of explanation from the teacher to initiate their learning and consequently an increase in study time, poor skills of peers presenting the case scenarios and inability to emphasize what is "important" from their presentations, among others [24].

In the WSU's class management, the teacher balanced the poor ability of some presenters with the inclusion of Socratic questions whose answers stimulate participation. These questions aim to scaffold lesser prepared students and improve the quality of presentations with the voluntary involvement of participants. This additional participation offers opportunities for self-regulation and regulating others in content areas that were not initially addressed with the expected standard by the presenters. In addition, the closing sessions with the videos create opportunities to apply knowledge in new contexts, and in the discussion group members improve their communication skills with regard to learning anatomy and consolidate what has been learned. Videos as teaching aids have become a valuable tool to stimulate perceptual channels; often used, with success, at the end of lectures to summarize the topics explained [25].

The duty to prepare weekly topics adds cognitive load to the students, but also helps to systematically organize the volume of information to be processed along the block. Group members can also share study strategies and useful resources, as well as monitor their capabilities and constraints. It is desirable that if interdependence develops among the members of the group, their interactions could expand from the subject content area to social skills necessary to work in teams. With regard to the items that assessed professional behavior and responsibility to fulfill goals, both assessed individually and to the rest of the group, the assessment of group members scored lower than the self-assessment. This difference in favor of the self could indicate dissatisfaction with the behavior of peers, but also a greater tolerance of self misbehavior. The complexity of the regulatory processes that concurrently display at individual and group levels in collaborative learning environments, are also mediated by the affectivity and emotions of the individuals who are part of a social system which is the Group [26]. Members of collaborative groups have highlighted the positive impact of regulations in their adjustments to learning [21], and, some of the items included in the present survey, point in this direction.

Many students who enrolled at the WSU come from schools with dire shortage of resources, among them electronic devices that might have stimulated their various sensory channels for the receiving of information. The skills for searching of information, writing notes and presenting to the class assist even those who were less prepared or who need more time to process. Just reading their notes and commenting on them, drives the development of meta-cognitive skills. An added argument supporting the selection of this teaching method for this population of the study, is that the language of tuition is not the language students use in their non-academic interactions, so the practice of anatomical terminology in class improves their proficiency in the language of instruction.

Anatomy is the only subject that in the first year follows this method of instruction; consequently students had no previous standards to assess their skills. If this inference is correct, then it could explain the scores of the means and their dispersions in the evaluation of all the items. The anonymity of the survey did not favor the inclusion of other variables that could have provided objective information either at individual or group levels, for example, the quality of their presentations, class attendance and punctuality, or the grades obtained in tests and exams, which are shortcomings of the paper. The alpha coefficient greater than 0.90 could reflect a good reliability of the pattern of responses of the participants, but it also indicates that more than one item measures the same concept of the construct [27], an aspect that should be considered for future applications of the instrument.

The exploratory factor analysis had the aim of investigating if items could be grouped, to enable a better understanding of their impact on this learning environment. The results of the analysis indicate that the observed variables can be related in two dimensions: 1) a factor whose factorial load rests on items that refer to the individual managing her/his learning and, 2) a factor whose load rests on variables that reflect the interactions among the team members and the behavior of the co-learners.

The items grouped in the first factor (search for information, materials / resources included in the course, professional behavior of the individual, study strategies, syllabus presented, comprehension of the content, awareness of strengths and weaknesses and anatomical terminology) are concerned with actions and skills that the agent displayed affording the learning opportunities that the environment offered. On the other hand, items in the second factor referred to the behavior of the rest of the group members, such as professionalism, responsibility and assistance offered to the individual, as well as the contribution that the individual and the rest of the group made to the verbal interactions. Although with minimal load, the enjoyment to learn in the small group also correlates with this second factor. It is interesting to note that the professional behavior of the individual correlates with the first factor while the behavior of the others correlates with the second, what could be interpreted as "my professional behavior influences my learning", while that of "the others influences how the group functions". The responsibility of the individual in the fulfillment of tasks and goals of her/his group has a minimal load on both factors, which is a criterion for its exclusion from the survey, but the role of this item, addressing self-regulation skills, calls for reflection on this decision.

The bi-factorial model explains 57.09 % of the variance, indicating that there are other variables, not explored yet, that are worth pursuing further. Interviews or focus groups with the students, who did not obtain a pass mark in the subject or low quality pass, could bring in ideas and interventions that may favor that group of students. Moreover, comparison of students' performance in Anatomy assessments in both semesters is also of interest. It is true to say that by observing the students along the second semester, the emergence of their skills could be enough to support the choice of this approach, but, it is also important to interrogate whether this novel approach may have any impact on their content performance.

CONCLUSION

Participants satisfactorily evaluated the items included in the survey whose purpose was to explore variables that may impact on the quality of their active and collaborative learning environment. These variables explored attributes of the individual, attributes of the other members of the group, as well as the design of the course.

Variables could be grouped into two dimensions: the first dimension being related to the cognitive strategies and skills that the individual as an agent displayed maximizing the learning opportunities afforded by the course, and, the other dimension related to the social relations and interactions that unfold among students when they learn in collaboration.

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