Pacific International Journal, Vol. 5(4), 82-88 ; 2022
ISSN (Print) 2663-8991, ISSN (Online) 2616-4825
DOI: 10.55014/pij.v5i4.222
https://rclss.com/index.php/pij

A Flipped Classroom Approach to Improve Nursing Students' Learning Performance, Critical Thinking Skills, and Learning Satisfaction in a Stroke Care Training Course

Xiaoli Hu[1, 2], Qian Zhao [1*]

[1]Shandong Medical College, Jinan, Shandong Province, 250002，China
[2] Philippine Christine University Center for International Education, Manila City, 1006, Philippine
First Author Email: littlefox_24614@163.com

*Corresponding Author Email: amber0629@126.com

Abstract:
The present study explored the effectiveness of presenting a stroke accident training program in three one-hour classes using a flipped classroom approach to traditional classroom teaching to third-year nursing students during their neurological clinical rotation. A quasi-experimental pretest and post-test study is designed to test the flipped classroom's effectiveness in improving learning outcomes. In so doing, eighty diploma nursing and midwifery students in the third-year clinical nursing program were selected from a medical college as the study participants. They were randomly assigned as the control and experimental groups, with 40 and 40 students. During the one-month training program, the control group (the non-flipped classroom) was taught using traditional teaching method.
In contrast, the experimental group (the flipped classroom) was taught in a flipped learning mode. The flipped sessions comprised pre-recorded lectures, online quizzes, and in-class group activities in the course design. Data were collected through a student questionnaire and a knowledge and skill test. Overall, the flipped classroom students did significantly better in learning performance (knowledge and skills), critical thinking and reported higher learning satisfaction ($p<0.05$). It was concluded that flipped classrooms can positively impact multiple factors within the clinical setting. Being better prepared will help newly graduated nurses care for not just stroke patients but for all patients requiring complex care.

Keywords: flipped classroom, stroke patient, clinical education, learning performance, critical thinking.

Introduction

The second most common cause of death and the leading cause of adult disability in China today is a stroke accident [1]. As a result, stroke burden in China has increased over the past 30 years [2]. Stroke patients are challenging and require complex and specialized nursing care. Newly graduated nurses not only in China, but throughout the world, have been shown to have limited stroke care skills and experience as they start their nursing careers [3-4]. Clinical rotations and internships in specialized units such as a neurological unit, provides nursing students opportunities to learn and apply new knowledge and skills to real patient care. Within this setting, students can practice and learn with supervised patient care experiences that facilitate the care and critical thinking and problem solving necessary to care for increasingly complex patients. Preparation for clinical experiences is critical and it is important to explore creative ways to provide the necessary knowledge and opportunities for applying that knowledge. Flipped classroom has been a popular pedagogical strategy since Bergmann and Sams (2012) applied this teaching method in their chemistry course in 2007. Recently, the flipped classroom approach had been adopted widely in the medical education. Various health professionals put this instructional approach into their curricula and found an overwhelming positive outcome from students who attended flipped classroom. It was proven to be an active, student-centered approach to learning that integrates team-based learning and collaboration with active learning, strategies for skill building, and critical thinking development, all important in working with complex patients [5]. The flipped classroom (FC) has been shown to bridge the gap between nursing education and practice. But does using the flipped classroom in health education in the clinical setting really improve the learning outcomes? Research conducted by Ilic showed there was no significance

[Received 03 Oct 2022; Accepted 11 Oct 2022; Published (online) 31 Dec 2022]

difference between the flipped classroom with its traditional counterpart in term of learning scores. [6] Moreover, few studies have investigated FC's effectiveness within a complex or critical care clinical experience on students' learning performance, critical thinking, and learning satisfaction [7]. The uncertainty about the effectiveness of flipped classroom approach over traditional instruction in clinical health education promote more research to be done to provide enough evidence. We opted to evaluate the effectiveness of a flipped classroom approach in clinical nursing education. The following questions were asked:

(1) In a stroke care training program, does the flipped classroom approach improve nursing students' learning performance (knowledge and skills) more than the traditional teaching approach?

(2) In a stroke care training program, does the flipped classroom approach improve nursing students' critical thinking abilities and learning satisfaction more than the traditional teaching approach?

Literature Review

The flipped classroom (FC) is defined as a type of an interactive and autonomous learning method that students gain first exposure to new material outside of class, usually by reviewing assigned readings, lectures, and videos. In 2007, the Flipped Classroom was consolidated by Bergmann and Sams who are chemistry teachers from Colorado(USA). Their goal was to enable the students who had been absent from the class for various reasons to keep up with the pace of the course. To this end, they realized this teaching model allowed the teachers to focus more on the individual learning needs rather than lecturing all the class according to their traditional teaching plan. [8].

A variety of research showed flipped classroom had implemented many strategies or activities that were distributed prior to class, during class time and post-class activities. In the pre-class stage, most instructors provided students with instructional videos as learning material before class. Students come to class prepared to apply that knowledge through strategies such as problem-solving, discussion or debates [9]. It is expected that before coming to the class or to clinical, the student will have reviewed all material and have the knowledge and an understanding about the intended concepts [10]. Once in the class or clinical setting, learning activities focus on applying content by interacting and exchanging ideas through multiple modalities [11]. By being familiar with the educational material before coming to class, teachers can spend more time on active learning activities, problem-solving, evidence-based learning, group discussion, knowledge application, analysis, and synthesis [12]. When used for clinical courses, this student-centered method helps students apply learned knowledge in practice to case studies, clinical scenario, simulations and ultimately to direct patient care [13]. Incorporating the flipped classroom approach into clinical nursing learning experiences helps prepare students to participate in learning activities, and as a result, form their reflective and critical thinking abilities. Dehghanzadeh and Jafaraghaee[14] incorporated a flipped classroom into a musculoskeletal medical-surgical nursing theoretical training course with 120-minute once-a-week sessions for eight successive weeks. Students showed significantly higher critical thinking scores.

The educational outcomes reported in many research normally were academic performances, competencies, and satisfaction. Regarding as academic performances, most of research reported that students demonstrated improvement of performance after having flipped classroom. [15] Learning is a process that develops overtime and is influenced by previous experiences, motivation, and quality of learning experiences. Having knowledge and comprehension leads to application, critical thinking, mastery, and performance. For nursing students learning performance includes not only evaluating what they know, but how well they apply what they know by observing behaviors in clinical settings [16]. Critical thinking (CT) is an essential skill for clinical practice [17]. Critical thinking is recognized as the most highly valued outcome criterion in nursing education for its importance in identifying patients' needs and implementing best practice in complex clinical situations [18]. It is during their clinical experiences that nursing students are able to use, apply, and master critical concepts into the real world. Learning satisfaction is closely related to motivation and is seen as a "spontaneous experience" that accompanies an intrinsically motivated behavior of the student as well as learning environmental variables [19]. Satisfaction is related to opportunities for the student to interact with others including their instructors and other students [20]. Students who had higher levels of participation in their courses also reported high levels of satisfaction [21]. Overall, studies show learning satisfaction correlates positively with learning performance [22]. However, some research revealed students complained of keeping up with pre-class work, even though the homework did not differ from the previous courses assignments in the traditional teaching [23].

Preparing nursing students to care for a complex stroke patient is challenging. A flipped classroom approach introduces a different teaching method that brings the pre-learned knowledge to a place that can be immediately applied to a clinical scenario, simulation or direct patient care.

Methods

1. Design and Sample

This quasi-experimental pretest and post-test design used two equivalent groups from a large metropolitan hospital in the Shandong Province, China. The sample included all third-year diploma nursing and midwifery students assigned to the neurological unit. All students follow the same clinical rotations that include three one-hour classes on stroke care and three

weeks of caring for stroke patients. For this study two sequential clinical groups were compared. The first, control group, were taught using a traditional classroom (TC) approach. The second, experimental group, were taught using a flipped classroom (FC) approach. Students and the instructors were informed in advance about the research study and all data were collected anonymously.

2.Intervention

All students participated in a three-part stroke training course once a week for one hour over three consecutive weeks. Course content included three general topics: mobility difficulties for the stroke patient; swallowing difficulties for the stroke patient; and mental issues for the stroke patient. Learning materials included the key points of patient care activities and short videos showing real hospital clinical scenarios. Students then participated in a weekly class discussion using a stroke clinical scenario guided by the instructor. During the rest of the week students did direct patient care in the neurological unit.

The control group were taught weekly in a traditional style classroom. Students had pre-class required reading to complete, but each week in the classroom important content was presented in a 50-minute lecture format by an instructor. This lecture was followed by a case study reflecting the material covered for that day. Students were expected to participate in the discussion. The experimental group were given the same lecture material on recorded sound files and using PowerPoint presentations put into an electronic format compatible with student's mobile devises. This electronic content and related study materials were made available one week before the class session the university's internet platform. It was expected that students would come to each class having reviewed the contents. In class they were provided a clinical case study related to the care covered in that week's course and they were expected to participate.

All students at the beginning of their clinical rotations completed a demographic survey, a 50-item multiple choice learning performance (knowledge) test about stroke and a 12-item survey that measures critical thinking. At the completion of the clinical rotations, students completed the same 50-item knowledge test and a 26-item survey that included critical thinking and learning satisfaction questions. In addition, instructors evaluated students in the clinical setting while caring for a stroke patient using a clinical skills checklist.

3.Outcome measures

Knowledge performance was evaluated using a 50-item multiple choice knowledge test that covers weekly class content relating to stroke care. Clinical skill performance was evaluated by their clinical instructor using a clinical skills checklist. Basic skills as well as problem-solving techniques to address a real patient problem were evaluated. Both tools were constructed by three nursing instructors certified by the Ministry of Health of the People's Republic of China.

Critical thinking, motivation and student satisfaction were measured at the end of the clinical rotation using a 26-item survey that used a five-point Likert rating scale that had a Cronbach's alpha value of 0.78-0.89. This survey included eight items from a critical thinking scale developed by Chai, Deng, Tsai, Koh, and Tsai (2015). The seven learning satisfaction questions were adapted from items developed by Hwang, Sung, Hung, Yang. and Huang (2013b). The procedure of the experiment is shown in Figure 1.

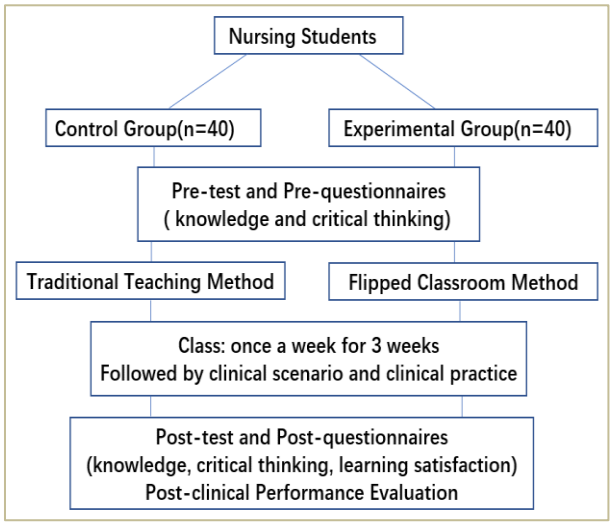

Figure 1. Experimental Procedure

4.Data Collection and Analysis

All students before the clinical rotation completed the same a demographic survey, a 30-item multiple-choice knowledge pretest about stroke care, and a 26-item pretest that measured critical thinking and learning satisfaction. During the last week of the clinical rotation all students took the same final 30-item knowledge test, the 26-item posttest survey, and were evaluated in the clinical setting using a clinical skills checklist. The 30-item multiple choice pretest-posttest knowledge test covered weekly class content. The clinical evaluation included basic skills as well as problem-solving techniques to address a real patient problem.

The collected data was analyzed using the SPSS software (V. 19.0), using primarily descriptive and inferential statistics. All tests were verified that the assumption of homogeneity of regression was not violated. All students took the pretest and then they were assigned to either the control (TL) or experimental (FC) group.

Results

In all 80 students completed the study: 40 in the control group (traditional learning) and 40 in the experimental (flipped classroom) groups. The mean age is 21. There are 8 males and 72 females. Both group's demographic, academic, and critical thinking were compared showing no significant difference between groups.

1. Learning performance

Knowledge scores were compared using a one-way analysis of covariance (ANCOVA) by using the pretest scores of learning performance as the covariate, while the post-test scores of the learning performance were the dependent variable respectively. The independent samples t-test compared the means between the control and experimental groups on pre-exiting levels of factual knowledge revealed no statistically significant difference on the preexisting levels of factual knowledge between the two student groups (t=0.62, P>0.05).

Table 1 shows that, after excluding the impact of the pretest scores on the posttest, the learning performance for the two groups was statistically significantly different (F= 11.96, P< 0.05, η2=0.17). That is, the flipped classroom approach had significantly better effects (Mean=76.90; SD=16.06) on nursing students' learning performance than did the traditional teaching approach (Mean=62.42; SD=18.38). **Table 2 shows the learning performance on skills for the two groups was also significantly different (P<0.001).**

Table 1. Results of ANCOVA on nursing students' learning performance on knowledge

Variable	Group	N	Mean	SD	Adjusted Mean	SD	F-value	η^2	P
Learning(Knowledge)	**Control**	40	63.63	17.28	62.15	2.98	11.96**	0.17	0.01
	Experimental	40	76.90	16.06	77.21	3.17			

*P<0.05

Table 2. Results of T-test on nursing students' learning performance on skill

Variable	Group	N	Mean	SD	T	P
Learning(Skill)	**control**	40	72.00	7.03	-8.26***	0.000
	Experimental	40	86.50	5.08		

***P<0.001

The significantly better score of the experimental group suggests that students who learned with the flipped classroom approach have better learning performance in terms in both the overall STROKE patient care knowledge and skills when caring for real patients than those who learn with the traditional teaching approach.

2.Critical thinking compatibility

After verifying that the assumption of homogeneity of regression was not violated with F=1.180 (p>0.05), the post-test scores of the two groups were analyzed using ANCOVA. As shown in Table 3, it was found that there was significant difference between the two groups (F= 25.36, p<0.001). The flipped classroom approach had significant effects (Mean=25.02; SD=2.14) on nursing students' critical thinking in comparison with the traditional teaching approach (Mean=21.82; SD=2.80). Besides, the effect size (η2=0.29) higher than 0.04 implying that the flipped classroom approach had a moderate effect on nursing students' learning achievement.

Table 3. Results of ANCOVA on nursing students' critical thinking

Variable	Group	N	Mean	SD	Adjusted Mean	SD	F value	η^2	P
Critical Thinking	Control	40	21.82	2.80	21.80	0.44	25.36***	0.29	0.000
	Experimental	40	25.00	2.14	25.02	0.47			

***P<0.001

3.Learning satisfaction

After verifying that the assumption of homogeneity of regression was not violated with F=0.028 (p>0.05), the post-test scores of the two groups were analyzed via ANCOVA. As shown in Table 5, it was found that there was significant difference between two groups (F=8.28, p<0.01). That is, the flipped classroom approach had significant effects (Mean=21.90; SD8=2.77) on nursing students' learning satisfaction in comparison with the traditional teaching approach (Mean=19.65; SD=0.49). Besides, the correlation coefficient (η2=0.12) is higher than 0.04 implying that the flipped classroom approach had a moderate effect on nursing students' learning satisfaction.

Table 4. Results of ANCOVA on nursing students' learning satisfaction

Variable	**Group**	**N**	**Mean**	**SD**	**Adjusted Mean**	**SD**	**F value**	**η^2**	**p**
Learning Attitudes	**Control**	40	19.49	2.91	19.65	0.49	8.28**	0.12	0.001
	Experimental	40	21.90	2.77	21.74	0.52			

**P<0.01

Discussion

The majority of studies that have looked at the flipped classroom approach have looked at its use in a traditional classroom setting, often focusing on improved knowledge performance as the outcome. This study looked at the effect of a FC in a clinical setting with a focus on nursing care of a complex stroke patient and on learning performance, critical thinking, and learning satisfaction of nursing students. This study provides important evidence that supports the value of a flipped classroom as an important creative and effective learning approach.

6.1 Implications for student success

It is recognized that students must have the fundamental knowledge, skills, and opportunity to apply what they know to develop critical thinking and mastery of complex patient care skills. Overall, test and skills performance scores for both groups increased, but the FC scores were significantly higher than for the control group, even though both groups were exposed to the same content, participated in the same patient scenarios, and spent a similar amount of clinical time in same clinical setting with the same instructors. However, the FC students were expected to review all of the learning materials before coming to class choosing how and when to prepare. There is a time for processing and reflecting on what they have learned before being expected to apply it. The control group on the other hand, may do some required reading before class, but all of the other focused learning material is presented in a traditional classroom format. There is little opportunity to review or reflect about the new material. The lower knowledge scores of the control group also reflects a difference in basic knowledge, making it more difficult for the students to make the connections between the learning and the clinical scenario application.

The significantly higher critical thinking scores may be a reflection of the mastery of content. The FC students come to class better prepared to apply what they have learned and have reflected on. This allows them to be more active participants and team members in a clinical scenario and ultimately in their patient care. They are able to make connections between what they have learned and what they are now doing. Results from this study support other studies that flipped classrooms can improve student's critical thinking skills [24].

Learning satisfaction is an overall sense of feeling good about the learning activities and the outcomes and comes from a learning environment in which students benefit [20]. Increased levels of learning autonomy and group relatedness reflect the student's ability to actively participate and collaborate with peers and instructors within the classroom and clinical settings. Perceived competence is more than skills and knowledge. It includes experiences, attitudes, understanding and more. With every experience all student's competency level grew [25-27].

2.Implications for nursing education

This study clearly adds to the increasing evidence of the advantages of the flipped classroom approach for clinical student learning. Clinical settings provide valuable learning experiences and opportunities to not only apply what has been learned, but to critically think, problem solve, and adapt to changing conditions and situations. Focusing on one type of critically ill patients such as the stroke patient provides real life experiences. It is expected that these same skills and abilities can then be applied to other clinical settings. This will ultimately better prepare these students for their first and lifetime work as nurses. This study demonstrates that a flipped classroom approach is an easy methodology to adapt to an already developed

course in a clinical setting.

Conclusion

This study examined the effect of the flipped classroom method/approach on nursing students' ability to manage complex care of stroke patients. While all students improved in all areas, the results from this study show that the nursing students who learned with the flipped classroom method gained better learning performance, critical thinking skills and learning satisfaction scores than those who learned from the traditional teaching method. These results strongly suggest that a flipped classroom method impacts positively multiple factors that will help prepare nursing students for not just stroke patients but for all patients requiring complex care. and

Author Contributions

Xiaoli Hu conceived, designed, and supervised the study. Xiaoli Hu also responsible for the design of the questionnaire. Qian Zhao collected and organized the data. Qian Zhao were responsible for understanding the current progress of flipped classroom as presented in the literature. All authors reviewed and approved of the final version of the manuscript.

Conflicts of Interest

The authors report no conflicts of interest.

Ackowledgements

This study was supported by the [Shandong Education and Research Leading Group Office, China] under grand (No. 2018VC12003).

Ethical approval

Shandong Education and Research Leading Group Office, China

REFERENCES

[1]. Norrving, B. (2017). Global stroke initiative. *Journal of the Neurological Sciences, 381*, 25. https:// doi: 10.1016/j.jns.2017.08.110.

[2]. Wang, W.Z., Jiang, B., Sun, H, X., Ru, X, J., Sun, D, L., Wang, L, H.,Feigin, V, L. (2017). Prevalence, Incidence, and Mortality of Stroke in China. *Circulation, 135*(8), 759-771. https://doi:10.1161/circulationaha.116.025250

[3]. Das, S., & Das, S.K. (2013) Knowledge, attitude and practice of stroke in India versus other developed and developing countries. *Annals of Indian Academy of Neurology, 16*(4), 488-493. https:// doi: 10.4103/0972-2327.120431

[4]. Islam, S., Geum Oh, E., Lee, T. & Kim, S. (2017). Stroke Management Awareness and Behavior among Nursing Students in Bangladesh. *Open Journal of Nursing*, *07*(01), 1-14.

[5]. Gayef, A. (2020). Flipped classroom in medical education. *INTED Proceedings*. https://doi.org/10.21125/inted.2020.0985

[6] Ilic D, Nordin RB, Glasziou P, Tilson JK, Villanueva EA. (2015). Randomised controlled trial of a blended learning evaluation intervention for teaching evidence-based medicine. *BMC Med Educ.* 15:39.

[7]. Best, D.K., & Naber, J. (2016). Is a flipped classroom an effective educational method to meet nursing students' learning needs? *Madridge Journal of Nursing, 1*, 7-10. http://doi.org/10.18689/mjn.2016-102

[8]. Bergmann, J., & Sams, A. (2015). *Flipped learning: Gateway to student engagement*. Hawker Brownlow.

[9]. Oliver, R., & Luther, L. (2020). Flipping the graduate nursing classroom: An integrative review. *Journal of Nursing Education*, *59*(6), 305–310. https://doi.org/10.3928/01484834-20200520-02

[10]. Jensen, J.L., Kummer, T.A., & Godoy, P.D.D.M. (2015). Improvements from a flipped classroom may simply be the fruits of active learning. *CBE-Life Sciences Education., 14* (1), 1- 12 https://doi.org/10.1187/cbe.14-08-0129

[11]. Hatmanti, N. mawarda, & Septianingrum, Y. (2020). Flipped classroom applying flipped classroom based family nursing care learning model to learning outcome in nursing institution. *Journal of Health Sciences*, *13*(2). https://doi.org/10.33086/jhs.v13i2.1405

[12].McLaughlin,J.E., Roth,M.T., Glatt,D.M. ,Gharkholonarehe,N., Davidson, C.A., Griffin,L.M.,…Mumper, R.J. (2014).The flipped classroom: a course redesign to foster learning and engagement in a health professions school. *Acad Med, 89*(2), 236-243. https:// doi: 10.1097/ACM.0000000000000086

[13]. Betihavas, V., Bridgman, H., Kornhaber, R., & Cross, M. (2016).The evidence for 'flipping out': a systematic review of the flipped classroom in nursing education. *Nurse Education Today, 38, 15*-21, https://doi.org/10.1016/j.nedt.2015.12.010

[14]. Dehghanzadeh, S., & Jafaraghaee, F. (2018). Comparing the effects of traditional lecture and flipped classroom on nursing students' critical thinking disposition: A quasi-experimental study. *Nursing Education Today. 71*,151-156.https://doi.org/10.1016/j.nedt.2018.09.027
[15].Oliver, R., & Luther, L. (2020). Flipping the graduate nursing classroom: An integrative review. *Journal of Nursing Education, 59*(6), 305–310. https://doi.org/10.3928/01484834-20200520-02
[16].Li, B.-Z., Cao, N.-W., Ren, C.-X., Chu, X.-J., Zhou, H.-Y., & Guo, B. (2020). Flipped classroom improves nursing students' theoretical learning in China: A meta-analysis. *PLOS ONE*, *15*(8). https://doi.org/10.1371/journal.pone.0237926
[17]. Kaya, H., Şenyuva, E., & Bodur, G. (2017). Developing critical thinking disposition and emotional intelligence of nursing students: a longitudinal research. *Nurse Education Today, 48,* 72-77. https://doi.org/10.1016/j.nedt.2016.09.011
[18]. Kaddoura, M., Van-Dyke, O., & Yang, Q. (2016). Impact of a concept map teaching approach on nursing students' critical thinking skills. *Nursing & Health Sciences, 18*(3), 350-354. http://doi.org/10.1111/nhs.12277
[19]. Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227-268. http://doi.org/ 10.1207/S15327965PLI1104_01
[20]. Papastavrou, E., Dimitriadou, M., Tsangari, H., & Andreou, C. (2016). Nursing students' satisfaction of the clinical learning environment: a research study. *BMC nursing, 15*(44), 1-10. https://doi.org/10.1186/s12912-016-0164-4
[21]. Brown, T., Williams, B., McKenna, L., Palermo, C., McCall, L., Roller, L., Aldabah, L. (2011). Practice education learning environments: The mismatch between perceived and preferred expectations of undergraduate health students. *Nurse Education Today, 31*(8), 22–28. https://doi.org/10.1016/j.nedt.2010.11.013
[22]. Xu, P., Chen, Y., Nie, W., Wang, Y., Song, T., Li, H., Li, J., Yi, J., & Zhao, L. (2019). The effectiveness of a flipped classroom on the development of Chinese nursing students' skill competence: A systematic review and meta-analysis. *Nurse Education Today*, *80*, 67–77. https://doi.org/10.1016/j.nedt.2019.06.005
[23]. Oliver, R., & Luther, L. (2020). Flipping the graduate nursing classroom: An integrative review. *Journal of Nursing Education, 59*(6), 305–310. https://doi.org/10.3928/01484834-20200520-02
[24]. Horn, M., (2013). The transformational potential of flipped classrooms. *Education Next. 13* (3), 78–79.
[25]. Cassidy, S. (2009). Interpretation of competence in student assessment. *Nursing Standard, 23*, 39-45. http://dx.doi.org/10.1590/S0004-282X2007000400007
[26]. Lejonqvist, G., Eriksson, K., & Meretoja, R. (2015). Evaluating clinical competence during nursing education: A comprehensive integrative literature review. *International Journal of Nursing Practice, 22*(2), 142-151. https://doi.org/10.1111/ijn.12406
[27]. Nehrir, B., Vanaki, Z., Nouri, J.M., Khademolhosseini, S.M., & Ebadi, A. (2016). Competency in nursing students: a systematic review. *International Journal of Travel Medicine and Global Health*, *4*(1), 3-11. https://doi.org/10.20286/ijtmgh-04013