Think Pair Share: A teaching Learning Strategy to Enhance Students' Critical Thinking

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This study investigated the change in critical thinking (CT) skills of baccalaureate nursing students who were educated using a Think-Pair-Share (TPS) or an equivalent Non-Think-Pair-Share (Non-TPS) teaching method. Critical thinking has been an essential outcome of nursing students to prepare them to provide effective and safe quality care for patients. Think-Pair-Share is a cooperative discussion strategy that provides students with adequate time to think in order to increase their quality of responses. Students become actively involved in thinking about the concepts presented in their discussion. Ninety one students participated in this study. Forty six (50%) of the participants were included in the control group (Non-TPS) and 45 (50%) were included in the experimental group (TPS). The participants were sophomore-level generic accelerated baccalaureate nursing students enrolled in the same Health Assessment nursing course. The HESI critical thinking test was the tool used before (Pretest) and after (posttest) the course to collect data about student's CT skills. The study used a quasi experimental design. The independent sample t test and Mann-Whitney test were used to analyze the data. Findings revealed a significant increase in CT over time, throughout the 17-week course, with the use of TPS teaching/learning strategy. The results suggest that TPS is an effective strategy to foster CT of nursing students and could be used by educators to foster learners' CT in their courses. The study has significant implications on education, nursing practice, and research.

Introduction

Critical thinking (CT) is an essential quality that is crucial in nursing students in order to prepare them to provide safe and appropriate patient care in a variety of settings (Riddell, 2007). Colleges of nursing have strived to address the need

for developing CT in nursing students by making it one of the essential outcomes and core competencies for nurses in the 21st century, as identified by the National League for Nursing Accreditation Commission (NLNAC, 2005). To refine CT in classroom, many techniques may be used including active and cooperative learning. Critical thinking is promoted by active learning strategies because of their cognitive triggering processes (Nelson, 2006). In effect, active learning processes and CT development are closely related. Students who are actively engaged in guided discussions and group work are more likely to develop CT skills (Nelson, 2006). Nurse educators are challenged to make use of teaching strategies that provide nursing students with the opportunity to foster their CT skills. One method that educators might use to promote learners' CT is Think-Pair-Share (TPS).

Think-Pair-Share is a cooperative discussion strategy that was first developed by Professor Frank Lyman and his colleagues at the University of Maryland in 1981. It has been adopted by many writers in the field of cooperative learning since then. It gets its name from the three stages of student action, with an emphasis on what students are to be doing at each of those stages (Marzano & Pickering, 2005). This teaching-learning strategy works in three phases: (1) Think. The teacher provokes students' thinking with a question, prompt, or observation. The students should take a few minutes just to THINK about the question; (2) Pair. Using a partner or a desk-mate, students PAIR up to talk about the answer each came up with. They compare their mental or written notes and identify the answers they think are best, most convincing, or most unique; (3) Share. After students talk in pairs for a few minutes, the teacher calls for pairs to SHARE their thinking with the rest of the class (Robertson, 2006).

Purpose

The purpose of this study was to explore the effect of Think-Pair-Share, as a teaching-learning strategy on the CT skills of baccalaureate nursing students in their Health Assessment course. The study strived to answer the following research question: Does Think-Pair-Share teaching-learning strategy have an impact on the CT skills of nursing students in generic accelerated baccalaureate program throughout their Health Assessment course?

The research hypothesis for this study was as follows: "The CT skills of generic accelerated baccalaureate nursing students educated using the TPS teaching-learning strategy will change when compared with those homogeneous students of the control group, who were not educated using the TPS teaching-learning strategy".

Literature Review

Critical thinking is a concept that has been defined in various ways by researchers and still it has no specific agreed upon definition. Because of the continual increase in research, the concept of CT has shaped the field of education for decades and can be viewed as a forerunner of the more current usage of the term CT. According to Laird (2008), CT was described to include behaviors such as truth seeking, open mindedness, analytical propensity, systematic tendencies, inquisitiveness, and cognitive maturity. According to Facione (2006), CT is a purposeful, self-regulatory judgment, which results in interpretation, analysis, evaluation and inference as well as the explanation of the evidential, conceptual, methodological, contextual consideration upon which judgment is based. Giancarlo and Facione (2007) described CT as a disciplined, self-directed cognitive process leading to high quality decisions and judgments through the analysis, assessment and reformulation of thinking. Allen, Rubenfeld, and Scheffer (2007) believed that the skills of CT in nursing consist of

analyzing, applying standards, discriminating, information seeking logical reasoning, and predicting and transforming knowledge.

In the recent climate of nursing education, there has been a growing focus on how the concept of CT can be transformed into teaching methodologies for promoting CT throughout the nursing curriculum. The need for CT in nursing has been accentuated in nursing curricula to help nursing students use their knowledge of higher-quality patient care and to prepare them to think critically in order to use the appropriate knowledge and skilled judgments in delivering patient care (Brunt, 2005). A teaching strategy that provides an opportunity for students to share their thinking with at least one other student is Think Pair Share (TPS).

Robertson (2006) asserted that in TPS, students are given time to think through their own responses to question(s) before the questions are answered by other peers and the discussion moves on. Students also have the opportunity to think aloud with other student about their responses before being asked to share their ideas publicly to the entire class. As a cooperative learning strategy, TPS benefits students in the areas of peer acceptance, peer support, academic achievement, self-esteem, and increased interest in learning and students (Robertson, 2006).

By using TPS as a cooperative learning approach, instructors provide students with activities that promote interaction and require accountability (Kagan, 2001). Such interaction aims at triggering CT skills of students. To increase individual accountability in TPS, students are asked to jot down their ideas before turning to a partner to discuss them. The teacher can walk around the room and look at what students are writing to see who understands the concept. This keeps students from adopting the attitude that they will just sit back and let their classmates do all the thinking (Kagan, 2001).

Think Pair Share teaching strategy helps promote students' team work and problem solving skills that Lochhead and Whimbey (1987) referred to as thinking aloud paired problem solving skills. This problem-solving collaborative structure was described by these authors as a means to encourage problem-solving skills by verbalizing to a listener one's problem-solving thoughts. The idea behind this strategy is that presenting aloud the problem-solving process helps analytical reasoning skills. Students are paired and given a series of problems. The two students are given specific roles that switch with each problem; problem solver and listener. The problem solver reads the problem aloud and talks through the solution to the problem. The listener follows all of the problem solver's steps and catches any errors that occur. For the listener to be effective, he or she must also understand the reasoning process behind the steps. These authors theorized that the impact of their intervention was due to the dyadic exchange of pair problem-solving, where pairs of students alternated as critical listeners and problem-solver. (Lochhead & Whimbey, 1987). This teaching learning strategy may require the listener to ask questions if the thought process of the problem solver becomes unclear. The questions asked, however, should not guide the problem solver to a solution nor should they explicitly highlight a specific error except to comment that an error has been made (Lochhead & Whimbey, 1987).

According to Marzano and Pickering (2005), TPS has the following advantages: It is quick; it doesn't take much preparation time; the personal interaction motivates many students with little intrinsic interest in the topic; the teacher can ask different questions; and it engages the entire class and allows quiet students to answer questions without having to stand out from their classmates. Students are more willing to participate in TPS since they don't feel the peer pressure involved in responding to questions in front of the whole

class (McKeachie & Svinicki, 2010). This active teaching-learning strategy not only fosters students' engagement in their own learning. It motivates them to think first and share their thoughts with their peers to develop and validate their CT process and gain further knowledge from many perspectives (Robertson, 2006).

Whimbey and Lochhead (1986) proposed that this pedagogical method can be a lively alternative to traditional modes of teaching that have been normally employed by teachers through didactic lectures. They asserted that this active technique of instruction is extremely useful whenever there is a need to reach a deeper understanding of some form of analysis. They postulated that not only will this strategy encourage students to think carefully about what they are doing; it will also provide them and the teacher with an opportunity to listen in and possibly discover the cause of the most serious problems. This allows students to concentrate on the talking-listening process and not get too caught up in the issues of reaching a correct solution. The ability to analyze complex material and solve problems is a skill, just like any other skill such as the ability to play golf or the ability to drive an automobile. However, there is a difficulty involved in teaching analytical skills as in contrast to playing golf, analyzing complex material is an activity which is generally done inside the learner's head. This makes it somewhat difficult for a teacher to teach and for a learner to learn (Whimbey & Lochhead, 1986). According to Lochhead and Whimbey (1987), this teaching strategy is an effective approach that develops students' CT abilities.

Despite the expectation that TPS will foster students' CT, there has been very little research on the implementation of this strategy. Strikingly, to date, no studies could be found on the use of TPS with nursing students, specifically its impact on students' CT skills. Therefore, this study was conducted to investigate whether the TPS approach enhances

CT of nursing students throughout the Health Assessment course. The study findings would inform teachers on educational approaches in their classes that may promote the development of CT in learners.

Method

Design

This quantitative study used a quasi-experimental pretest-posttest design to investigate the change in CT skills of generic accelerated baccalaureate nursing students who were educated using TPS or were not educated using the TPS teaching-learning strategy. All students were enrolled in the same course, but in two separate sections that used different teaching strategies.

Sample and Setting

The study used a convenience sample of 86 sophomore nursing students enrolled in a Health Assessment course, which is the first nursing course offered September-December in the fall semester of their 32-month generic accelerated baccalaureate nursing program. The study took place in a Northeastern college, which has the only school of nursing in the US that offers a generic accelerated baccalaureate nursing program. The program is called generic because students are enrolled in it after completing high school. It is called accelerated because all the other schools of nursing offer a bachelor degree for students enrolled after high school in a minimum of four years; however, this program is only 32 months. The participants who were in two homogeneous classes were selected as the experimental group and the control group. Both groups were equivalent according to age, gender, term of study, and academic performance. Yet, they were only different with regard to the teaching strategies used by their instructor. The two separate classes were taught by the same instructor at different

meeting time. Each class had almost the same number of students. By flipping a coin, one class was chosen as the experimental group (TPS), while the other class was regarded as the control group (Non-TPS). Hence, the only difference between the two classes was the teaching learning strategy; TPS was used by the students in the experimental group but not by the students in the control group.

Treatment

TPS was the teaching learning approach used in class for only the experimental group in this study. All of the students voluntarily participated in the study. The course was taught for the two groups over 17 weeks. The same content, course syllabus, and tests were used for both classes. The same instructional methods were used for the two groups of students. These methods included didactic lecturing using PowerPoint presentations. The only difference between the two groups was that TPS was incorporated as an additional teaching-learning strategy only in one section (the experimental group) but not in the other (control group). Neither group had any exposure to TPS prior to the conduction of this study.

Instrument

The HESI CT test was the tool used in this study. It is a standardized computerized exam developed by Health Education Systems, Inc (HESI), to assess nursing students' CT skills. It is a multiple-choice test that has 30-item, and each item has four choices, only one of which is the right answer. The students did not get a score for any question that was answered incorrectly. This tool is a nationwide standardized test for nursing students, and it has been widely used by nursing schools. It was selected for this study because it is designed to assess CT skills related to specific nursing

content. Each student receives a personalized overall CT score in addition to a score on each of the following CT subscales; analysis, argument, prioritization, problem solving, and resolution. Possible scores on the HESI CT test range from 0-1000 (Morrison et al., 2008).

The higher a student's score the better is his/her ability to think critically within the discipline of nursing. Students are presented with health-oriented scenarios in these questions that have various types of responses reflected in the correct answer set. The correct answer demonstrates the highest level of CT applied to the scenario in the question, while the other three options in the question reflect plausible responses to the scenario, but actions that do not demonstrate as high a level of CT scored as incorrect answers (Morrison, et al., 2008).

HESI determines the reliability of HESI exam by conducting an item analysis on each exam that is administered and returned to the company for a composite report of the aggregate data. Discrimination data are obtained for each test item by calculating a bi-serial correlation coefficient. As a measure of the test's overall reliability, a Kuder Richardson Formula 20 is calculated for every HESI CT test administered. Thus, the HESI CT test has been shown to be reliable with reliability coefficient ranging from 0.86 to 0.99 (Morrison et al., 2008). The most current evidence of validity for HESI CT test is determined through an assessment of content validity, construct validity, and criterion-related validity (Morrison et al., 2008). Content validity refers to the effectiveness of the test items in measuring the basic nursing knowledge and skills of students. Expert nurse educators and clinicians establish content validity for each HESI test item by evaluating the relevance of the content to entry-level nursing practice. This evaluation is conducted periodically to determine their continued relevance to current nursing practice. HESI uses the National Council

Licensure Examination (NCLEX) test blueprints to define the content for the HESI exam, which is reviewed and changed as necessary to mimic the NCLEX that uses CT as its framework (Morrison et al., 2008).

Construct validity refers to the extent to which a test measures specified attributes at an abstract level. HESI exams measure constructs that are essential to entry-level nursing practice. These constructs, which are reflected in the NCLEX test blueprints are defined by nursing faculties and recently graduated nurses. The increased use of HESI exams may indicate that faculties trust the data reported by these exams and find the HESI exam worthwhile evaluation tools for measuring student outcomes, with a specific focus on CT, within nursing courses. Such confidence provides a further indication of construct validity for the test (Morrison et al., 2008).

Criterion-related validity refers to inferences made from analyses of test scores for the purpose of predicting student outcomes on another criterion of interest, such as performance in an entry-level nursing position or success on the NCLEX. HESI scores are used to make inferences about students' nursing content knowledge and their ability to apply concepts to nursing problems. Evidence for criterion-related validity for the HESI test was obtained from four annual validity studies conducted to determine the accuracy of this exam in predicting the outcomes of MCLEX that is based on CT. Validity can also be evaluated by examining evidence of the consequence of meaning given to the test. Increasing numbers of

nursing schools are establishing policies that incorporate HESI exams as a benchmark for students' progression and remediation (Morrison et al., 2008)

Ethical considerations

Prior to collecting the data for this study, an institutional review board (IRB) approval from the college was obtained. All participants voluntarily took part in the study and signed an informed consent prior to the administration of the pretest. Participants were reassured that the data was confidential. Codes were given to participants who used them in the demographic survey, CT pretest and posttest to ensure confidentiality of data. Only the researcher has access to the names of the participants related to their respective codes. Neither the researcher nor the research assistant who collected the data was involved in teaching the Health Assessment course.

Participants were provided with detailed verbal and written explanation of the study and their voluntarily choice of participating and withdrawing from the study at any time. Instructions for completing the CT test were also given to the participants by the research assistant.

Data Collection and Analysis

The data were collected for this study by using a demographic questionnaire that was developed by the researcher to gather background information from the participants related to their age, gender, and ethnicity. Additionally, the same HESI CT test was used to collect data about the student's CT skills at the beginning and end of their Health Assessment nursing course.

The data were analyzed by using the statistical package for social sciences (SPSS 19.0), specifically descriptive statistics and the Independent Sample t test and Mann Whitney test. Assumptions for both tests were tested and validated. The independent variable was the type of teaching-learning strategy, which has two levels: Think-Pair-Share (TPS) and Non-TPS. The dependent variable consisted of scores of the overall CT and the five CT subscales.

Findings

Descriptive statistics showed that the participants ranged between 20 and 25 years of age with a mean age of 22 years old. Only 15% of the participants were males and 85 % were females. About 62% of the students were White Americans, 13% were African Americans, 18% were Asians, and 7% were Hispanic. Table 1 delineates the means and standard deviations of the HEST CT scores for the experimental group and control group in the pretest and posttest.

Table 1 indicated that both the TPS and Non-TPS groups had an increase in their CT performance from pretest to posttest. A key question is if this increase is solely because of the fact that students are familiar with the CT test or if the TPS teaching method is a factor for this increase in scores.

Table 1. Mean Pretest and Posttest in TPS and Non-TPS groups

Teaching Method Groups	Experimental group (TPS)	Control group (Non-TPS)
Sample size	45	46
Pre-test Mean	796.4	787.17
Post-test Mean	839.3	799.6
Difference in Means (Posttest – Pretest)	42.9	12.43

The researcher compared the differences in the average score gain for both groups. First, a classical independent sample t-test was performed for comparing the mean differences (12.43 for the control group versus 42.9 for the experimental group). The t test establishes that the difference in the score increase, 30.5, is significant ($t = 4.327$, $df = 78$, $p < 0.001$). Hence, it can be concluded that the much higher increase in average CT score among the experimental group students is due not only to the assumed

familiarity with the CT test but also the TPS teaching method. As the histogram showed that the CT scores are slightly deviating from the normal distribution, the researcher performed a non-parametric Mann-Whitney test for difference in the CT score increases to validate the findings. The Mann-Whitney result was consistent with the independent t-test result ($Z = 4.391$, $p < 0.001$).

It appears that there is no significant difference in the pre-test scores between the experimental and control groups. This was confirmed by both an independent sample t-test ($t=0.802$, $df = 89$, $p = 0.425$) and non-parametric Mann-Whitney test ($Z = .593$, $p = 0.553$). Hence, no initial advantage of the abilities of the students from the experimental group was identified. On the other hand, differences in the CT posttest scores, as implied by earlier analysis, were significant. This fact was confirmed by both an independent sample t-test ($t = 3.437$, $df = 89$, $p = 0.001$) and non-parametric Mann-Whitney test ($Z = 3.149$, $p = 0.002$).

The same tests were performed on the five CT subscales. As indicated in table 2, the above mentioned observations (with a very minor exception) were also valid when comparing performance on the subscale scores. The researcher computed the differences in the five subscale scores for both the experimental and control groups and compared them, using both an independent sample t-test and a non-parametric Mann-Whitney test. The results were given in Table 2.

The researcher also compared the five CT subscales performance for the students in both groups (TPS and Non TPS) at the beginning of the semester as indicated by the pretest results. As table 3 revealed, no significant differences were identified. Hence advantage of students from the experimental group was ruled out.

Table 2. Independent Sample t test and Mann-Whitney test for the five CT subscales

	Experimental Group	Control group	t-test	Mann-Whitney test
Analysis (Post-Pre)	32.24	7.09	t=3.32, df=89, p=0.001	Z=2.84,p=0.005
Argument(Post-Pre)	50.22	13.70	t=16.09, df=89, p<0.001	Z=8.24,p<0.001
Prioritization (Post-Pre)	27.60	3.07	t=3.45, df=89, p=0.001	Z=3.66,p<0.001
Problem Solving (Post-Pre)	37.62	0.76	t=9.39, df=89, p<0.001	Z=6.98,p<0.001
Resolution (Post-Pre)	38.73	2.22	t=5.04, df=80, p<0.001	Z=4.31,p<0.001

Table 3. Comparison of Pretest CT subscales in TPS and Non-TPS groups

	Experimental Group	Control group	t-test	Mann-Whitney test
Analysis (Pre)	780.02	787.11	t=.51, df=89, p=0.609	Z=.72,p=0.473
Argument(Pre)	776.88	766.74	t=1.21, df=89, p=0.229	Z=0.91. p = 0.362
Prioritization (Pre)	790.00	776.74	t=1.31, df=89, p=0.194	Z=1.53. p = 0.126
Problem Solving (Pre)	788.35	786.39	t=.17, df=89, p=0.866	Z=0.49. p = 0.625
Resolution(Pre)	780.00	765.00	t=.99, df=84, p=0.324	Z=0.88. p = 0.377

Thus far, all observations regarding the five CT subscale scores have been consistent with the observations for the cumulative score. Following the steps applied there the researcher also compared the post-test subscale scores for both groups. All students from the experimental group scored significantly higher than in the control group on the five CT subscales as indicated in table 4. Test results for the post-test subscale scores are summarized in table 4 as follows:

Table 4. Comparison of Posttest CT subscales in TPS and Non-TPS groups

	Experimental Group	Control group	t-test	Mann-Whitney test
Analysis (Post)	812.27	794.12	t=1.41, df=89, p=0.016	Z=1.62. p = 0.104
Argument(Post)	827.11	753.04	t=8.48, df=81, p<0.001	Z=6.62. p < .001
Prioritization (Post)	817.60	772.87	t=4.07, df=89, p<0.001	Z=3.72. p <.001
Problem Solving (Post)	825.97	785.63	t=3.58, df=82, p=0.001	Z=3.37. p = 0.001
Resolution (Post)	818.73	767.22	t=3.86, df=89, p<0.001	Z=3.95. p < 0.001

In summary, the Independent Sample t tests and Mann-Whitney tests were conducted to compare the effectiveness of Think-Pair-Share strategy on the improvement of CT scores of nursing students from pretest to posttest. The tests were performed on the overall CT scores as well as on the five CT subscale scores. The tests revealed that there was a significant difference between the experimental (TPS) and control (Non-TPS groups. Therefore, the research hypothesis was supported. It can be concluded that applying TPS as a teaching-learning strategy appears to be helpful as a suitable approach in education to develop students' CT skills.

Discussion

Based on the findings of this study, Think-Pair-Share was a strategy that contributed to the improvement of CT, analysis, argument, prioritization, problem solving, and resolution skills. The findings conform to Robertson (2006) who asserted that TPS aims at engaging the students in their learning, with a focus of thinking about the answers prior to discussing them with their peers, is an active teaching-learning strategy. They also conform to Ledlow (2001) who affirmed that using TPS when asking questions during a lecture is a great way to get students actively engaged in thinking about their learning, to check for understanding, and to get students to apply new knowledge while CT can be nurtured with this type of active learning. Think-Pair-Share is a low-risk strategy to get many students actively involved in the thinking process related to their learning (Ledlow, 2001).

Active learning techniques are suggested to improve CT development. This study demonstrated that TPS enhanced the CT of participants being taught by this teaching-learning strategy. This is consistent with Nelson (2006) who proposed that CT is promoted by active learning strategies because of their cognitive triggering processes.

These authors concluded that active learning processes and CT development are intimately related. With the research-based rationale behind each activity and strategy, teachers will be able to help students make their thinking visible, gather, process, analyze and apply information, and increase their comprehension by working in cooperative learning groups (Berman, 2008).

Think-Pair-Share is a cooperative learning strategies as in its second phase students are asked to share the answers they had thought about with their peers and then in the third phase they share their knowledge with the entire class. Daodee et al. (2006) examined the impact of cooperative learning strategies on CT skills among baccalaureate nursing students using both qualitative and quantitative methodologies. Five cooperative learning methods were implemented and effectively enhanced students' CT development. These authors found out that cooperative learning had statistically significant effects on the development of CT skills of baccalaureate nursing students. Working in pairs is easiest to organize. It represents the most effective form of interaction and the greatest level of participation with the least social problems. Cooperative learning helps students develop better high-level reasoning and CT skills as well as the ability to see and consider the perspectives of others (McKeachie & Svinicki (2010).

Cooperation is a valuable principle. Research showed that students working together cooperatively learn better and are more successful academically. With cooperation, students are more willing to listen to others' views, share ideas, clarify differences and construct new understandings (Gilles, 2008). Cooperative learning is an effective educational approach that enhances higher level thinking skills, whilst promoting positive cognitive, affective and social outcomes (Nagel, 2008). In TPS, each pair of students works individually before sharing their work and putting together their thoughts. This

strategy promotes individual accountability, equal participation and maximum peer interaction (Tan et al., 2008). Peer interaction during discussion is an active learning strategy that provides students the opportunity to integrate academic information with practical application, as well as promote learners' CT (Walker, 2003) and problem solving abilities (Cortright, 2005).

Implications and Recommendations

The findings of this study have important implications for education, nursing practice, and research. It can be supposed from this study that TPS is a helpful teaching-learning strategy to be applied to education in order to develop students' CT skills. The group of students who was educated using TPS yielded higher scores of CT than the group who were not exposed to TPS teaching-learning strategy in this study. The findings revealed that TPS increased CT during the thinking, pairing and cooperative stages of their learning. The current study has provided empirical evidence supporting the use of TPS to enhance CT, especially during the collaboration of students with each other. The literature proposed that when students incorporate cooperative learning, they can formulate creative solutions to the problems, link ideas and make assumptions. This has implications for nursing practice as when student nurses cooperate with each other to discuss the appropriate decision making pertinent to patients' problems, joint efforts would lead to sound decisions based on CT abilities. By using active teaching strategies such as TPS to enhance CT in academic settings, future nurses can be better prepared to solve various problems faced in clinical practice and hopefully leading to safer and more effective patient care.

TPS was found to be a useful teaching-learning strategy to improve students' CT skills in their Health Assessment course. The improvement in CT scores shows

that using TPS can be very valuable in fostering learners' ability to assess patients and make reasonable decisions about critical situations related to health assessment, thus meeting students' learning objectives and improving their CT skills. The findings have implications for educators to help learners develop insight into the usefulness of cooperative discussions as a means to foster CT in students.

Based on the findings and limitations of this study, recommendations for further research were made for education and nursing practice. Further longitudinal research is needed to study changes in CT over longer periods of time using the TPS teaching learning method to facilitate students' learning in their senior courses. Based on the limitations of this study, conducting a similar study using a larger sample size is recommended. Additionally, it is recommended to conduct a similar study to assess the impact of TPS and other active teaching strategies on students from more than one program.

Limitations

The major limitation of this study was the small sample size. Only 91nursing students participated in the study. The other limitation was the use of only one program, the generic accelerated baccalaureate nursing program. These limitations may not allow the findings of this study to be generalized to all nursing students educated by all nursing programs in the US.

A potential threat to validity associated with adding the CT measure to the course could be a maturation effect, which occurs when changes in a CT score over time are due to naturally occurring internal processes. The researcher believes that the duration of the course, 17 weeks, is not a sufficient time for students' maturation to take place. However, if the students are given the HESI CT test prior to the course and then again at the end of the nursing program,

32 months later, to evaluate the effect of the curriculum on students' CT, the improvements of CT scores could be attributed to the curriculum, but they might simply be due to intellectual maturation that would have occurred to students. The only way the researcher used to know whether the results were due to TPS to both TPS and Non TPS group students.

Conclusions

This study examined the effect of TPS teaching-learning strategy on improving the CT skills of nursing students. The findings supported the hypothesis of the study that students who were educated by TPS developed more CT than homogeneous students who were not educated by the TPS strategy. As the CT scores of the TPS group improved significantly more than the non-TPS group, the findings provided evidence that this teaching-learning strategy is effective in promoting CT in students. Using this approach in teaching may provide opportunities to sharpen students' CT skills. Educators should continue to develop curricula that incorporate active teaching strategies such as TPS in order to enhance learners' CT.

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