Individual versus Team-Based responses to Script Concordance Test in Teaching Clinical Reasoning

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Abstract

Introduction: Although clinical competence is multi-dimensional and should be acquired by each medical student, but most students learn clinical reasoning skills informally in clinical rotations. Accordingly, A prospective quasi-experimental study was conducted aiming to evaluate the merging of Script Concordance Test (SCT) and Team Based Learning (TBL) as a teaching/learning approach in clinical setting for medical students.

Methodology: The study ran in three phases. Phase 1 (preparatory phase) involved students' preparation and preparation of SCT. Phase 2 (implementation phase) included application of individual and team SCT (iSCT and tSCT respectively). Phase 3 (evaluation phase) compared score results and obtained students' feedback.

Results: Significant differences existed when comparing individual students' response or students' teams' responses with experts scores. However, the use of the SCT/TBL approach had improved the clinical reasoning skills of the students in some vignettes and helped the lower achievers through the tSCT. The students found the approach appropriate for teaching or formatively assessing clinical reasoning. It helped them to discuss, correct their mistakes and improve their problem solving and reasoning skills.

Conclusion: team-based learning improved students' responses, especially the lower achievers, to script concordance test. SCT/TBL approach can be used to teach clinical reasoning for undergraduate students.

Introduction

The medical educators are facing major challenges during teaching clinical competence. First, the clinical competence is a multi-dimensional, complex construct, representing the ability of a professional to use clinical judgment and reasoning skills that should be acquired by all medical professions [1]. Second, problems encountered during the professional practice do not always have straightforward algorithmic solutions but require judgment and insight which can't be taught or measured by conventional tools [2]. However, most students learn clinical reasoning skills informally in clinical rotations with varying quality of supervision. In addition, the ever- increasing class size and associated high student-to faculty ratios in medical education have led to the need for innovative ways to promote student engagement and facilitate learning.

The Script Concordance Test (SCT) is a reliable and valid pedagogical tool. It can discriminate the levels of practice between medical students, residents, and medical doctors. SCT can effectively evaluate the progression and skills of clinical reasoning [3,4]. It can be administered online, in multicentric centres, at a national or international level [5]. It allows testing on real-life situations that are not adequately measured with current tests through probing multiple judgments for clinical reasoning process. Scoring reflects the degree of concordance of these judgments to those of a panel of reference experts [6]. SCT is based on script theory [7]. Script theory posits higher level thinking skills originate from cognitive scripts,

knowledge, and previous experiences [8]. Script concordance tests have been employed in a number of medical specialties, such as urology, otorhinolaryngology, surgery, neurology, paediatrics, radiology and other health sciences, such as Dentistry, Pharmacy, Optometry, veterinary medicine and nursing. However, there is no study that has been published to develop and validate a script concordance test for the field of ophthalmology [9–11].

On other hand, Team-based learning (TBL) is a form of cooperative learning that creates an environment that allows learners to develop higher levels of learning (ie, application, analysis, evaluation, creativity). It is a structured form of small group learning that emphasizes student preparation out of class and application of knowledge in class [12]. TBL has been reported to improve student performance and increased student engagement and satisfaction. The same research also recommended that TBL as a method of instruction should be considered for comprehensive application in medical education [13]. Another study demonstrates that TBL can be an effective active learning approaches especially among low academic performers [14]. TBL also ensures to build collaborative, teamwork skills and achievement during the group sessions [15].

Accordingly, it seems as TBL and SCT are matching in several aspects such as being student-centred approach, following the constructivist learning theory and ensuring active learning through helping students to develop their own mental scripts which in turn will improve their clinical reasoning skills.

The purpose of this study is to evaluate the merging of Script Concordance Test method with the TBL approach as a teaching/learning strategy to medical students during clinical clerkship. The study raised three research questions:

- What are the students' perceptions of the merging of Script Concordance Test approach with the TBL approach as a teaching/learning strategy in clinical setting?
- Is there a difference between the students' scores in the individual SCT (iSCT) and the team SCT (tSCT)?
- Does the use of the Script Concordance Test differentiate the clinical reasoning skills between of the medical students and experts?

Material And Methods

Study setting

This study was conducted as a Quazi experimental study at the Faculty of Medicine, Suez Canal University after being approved by our Research Ethics Committee (REC) no 4253.

Study Participants

Reference panel

The reference panel consisted of 10 subject matter experts, to ensure score reliability and develop the key score. The experts were selected according to their familiarity with the students, the curriculum and have at least six years in practice. They were requested to answer the test individually.

Students

Fifty-five 5th year medical students, who attended the Ophthalmology clerkship during the first term in the academic year 2019-2020, were enrolled in the study. They were randomly divided into small teams of 5 members. The purpose of the study was clearly communicated to the students.

All participants were voluntarily involved in the study. They had the right to refuse or withdraw from the study at any point without any consequences. Approval from research Ethics Committee, faculty of medicine Suez Canal University was taken before starting data collection.

Study intervention

This study ran into three phases: Preparatory, Implementation and Evaluation phases.

Preparatory phase:

This stage involved preparation of the students for the in-class TBL session and preparation of the script concordance test.

Students preparation

Announcement about SCT started 5 – 7 days before the test day. All students were encouraged to review the whole course objectives during this period to be ready for the SCT/TBL session. Students were also announced that the SCT will review the whole course through specific and new question format.

Script concordance test

- a. Structure and format: An Ophthalmology version of the SC test was developed based on the core objectives of 5th year curriculum in the Faculty of Medicine. The relevance, appropriateness, and quality of the items developed for the SC test was completed through written and verbal consultations with both ophthalmologist and medical educationist. The resulting was a 17 item, 57 questions SC test. Fifteen vignettes were measuring the students' abilities to diagnose common clinical presentations, four were used to identify appropriate laboratory tests for confirmation of diagnoses and choose appropriate treatment or management options then the last vignette was to measure biomedical ethics. The test was administered in English language.
- b. Validation: A group of subject matter experts, different from the reference panel, reviewed the SC test for both face and content validity by using an evaluation form that asked about the scenarios, questions and the panel reference. Questions were selected according to relevance to the curriculum, fairness for the level of candidate, and appropriateness and clarity of language.

c. Scoring: Unlike multiple-choice questions, a question on the script concordance test does not elicit a single 'correct' answer. The aggregate method was used to develop the key score in which participants' answers are compared to those given by a reference panel. The score for each question is obtained according to the proportion of reference panel choosing each possible answer. **Table 1** shows how each answer's score was calculated. For each question, one point was assigned to the answer chosen most often by the members of the reference panel (the modal response). Partial scores were attributed to the other answers, depending on the number of members on the reference panel who chose these answers. An answer not chosen by any reference panel member was given score zero. The total score for the script concordance test was then calculated using the sum of credits obtained for each question, divided by the total obtainable credit for the script concordance test. This total was multiplied by 100 to yield the result as a percentage [16].

Implementation phase:

The students were requested to complete the SC test individually within one-hour frame. This test is called Individual Script Concordance Test (iSCT) that represents the individual readiness assurance test in this session. Hence, the students' teams were asked to answer the same set of questions as in the iSCT but as a team within an additional hour. The team tests are known as the team Script Concordance Test which represents the team Readiness Assurance Tests in the session (tSCT). Team discussion was encouraged to reach a consensus and select one answer. Within the next 30 minutes, all the responses were discussed with the students and the instructor. Analysis of each patient scenario and application of critical thinking concepts to reach the suitable diagnosis, clinical features, and management plan. Instructor was keen on probing the rationale of each student for the selection of one answer. Then the instructor announced the most appropriate answer according to the expert's opinions. Our TBL approach was based on Michaelsen [17] description for team-based learning.

Evaluation phase:

The scores students' responses of iSCT and tSCT were analyzed and compared. The low achiever students (students scored than less than 20 in the ISCT and mean score 0.2/0.3) were identified and their responses were compared to the responses of their corresponding teams. Students' perception towards the whole experience was assessed by using anonymous questionnaire. The questionnaire involved 28 items distributed into three sections: SCT, SCT/TBL and Teamwork. Students completed the questionnaire at the end of the session using a 5-point Likert-type scale from strongly disagree (1) to strongly agree (5).

Data analysis

Descriptive and Inferential analysis of the data were done using the SPSS 25 software. Item scores and total scores for each participant were computed and statistical analyses were performed. The data used

was divided into three test scores: students (iSCT), teams (tSCT), and panel reference (experts). Descriptive statistics of the participants' scores on the concordance test were performed. Cronbach's alpha reliability coefficient was used to assess the script concordance test's internal consistency. Normality of the distribution was tested using Kolmogorov-Smirnov. Mann-Whitney U test was used to compare the scores of individual students, teams and experts and the Levene's test was used to assess the equality of variances.

Results

The resulting SCT consisted of 17 vignettes, 14 are three-questions vignette, one is four-questions, one is five and one is six-questions vignettes for a total of 57 test item. Cronbach alpha analysis for the 57-item test showed an excellent reliability, 0.879. Kolmogorov-Smirnov analysis revealed that the results to the SCT were normally distributed. The distribution of the test mean scores among the three groups (iSCT, tSCT and panel reference) was shown in **figure 1**. Levene's test showed that the variance between the groups were equal ($p = 0.323, 0.006, 0.192$).

There was a statistically significant difference ($p < 0.05$) between the whole test mean score of either the iSCT or tSCT and experts. However, there were no statistically significant difference between the individual and students' teams test mean scores ($p > 0.05$). Our results revealed that a statistically significant difference ($p < 0.001$) between the mean score of the lower achiever students and the teams' mean scores (tSCT).

Most of the clinical vignettes showed a significance difference ($p < 0.05$) between the mean score of the students and experts except the clinical vignette number 3 and 5. However, non-significant differences existed between the mean score of 9 vignettes when comparing students' teams (tSCT) to experts, **table 2**. The lower achiever students experienced non-significant differences ($p > 0.05$) in the mean score of 8 vignettes when compared to their teams, **table 3**.

Regarding the students' perception towards the SCT, STC/TBL approach and working in a teamwork, **table 4** presented their satisfactions.

Discussion

The main observation of the current study is that SCT/TBL approach can be appropriate for teaching and on training site assessment of the clinical practice. TBL and SCT showed a mutual beneficial relationship, in which, each method helped the students to benefit from the other's advantages and added new advantages. The SCT equipped the approach with a valid and authentic way for assessing and teaching clinical reasoning in uncertainty. Endorsing the TBL approach gives the SCT an interactive nature and fosters active learning, student engagement, teamwork, and collaborative learning.

In the current study, a significance difference existed between the students and experts whole test scores and most of vignettes. This is because the SCT can differentiate between the different level of

experience. However, when the test was solved in teams, 9 out of 17 vignettes scores showed non-significant differences when compared to experts. This points to an improvement in students' scores, despite being non-significant, when they work in teams. Thus, the use of this approach as a teaching tool may help in narrowing the gap between the clinical reasoning of the students and experts. However, this insignificance can be explained as the students were experiencing the SCT for the first time and they were still not familiar with it.

The TBL/SCT allows each student to expose to a real life uncertain clinical case, evaluate the hypothesis, select one hypothesis, discuss this hypothesis, modify the wrong concepts, and reinforce the correct one. These steps are encouraged by the instructor's discussion that address any misconceptions, answer student questions, and provide immediate, corrective feedback. Moreover, the group SCT provides the opportunity for peer teaching [18]. In which, students can listen to their peers' line of reasoning, hypotheses, and explanation. All these steps will help the students to develop their own script that in turn will guide them to use the expert line of reasoning and foster the pattern recognition. As indicated by the students that group discussion helped them to correct their mistakes and they found the group discussion as a useful learning activity. Hence, the TBL/SCT approach helped in individualization of learning despite the group size. As it can be considered as an appropriate clinical reasoning approach for large groups teaching.

Our results found significance differences between the scores of the lower achievers and the teams scores. This indicates that the SCT/TBL helped the lower achievers to get more involved in the learning process and improve their clinical reasoning skills.

All the interactions that results from the TBL approach, provide the SCT with the interactive and the dynamic context that is needed to teach clinical reasoning [19]. The SCT/TBL approach builds up a clinical reasoning that respect the environment and interactions with peers and instructor. As suggested by Torre et al., [20] any clinical reasoning teaching and assessment approach advocate for the raise awareness among educators, enhance their understanding and promote the implementation of a more social cognitive aspects. The TBL/SCT exposed the student capacity to evaluate hypotheses and judge the situation according to the new information [21].

According to the students' opinions in our study, the approach helped them to solve patients' clinical problems, thinking critically and develop clinical judgment skills. These skills may explain a relatively good relation between SCT and TBL. It may be because these students doubly benefitted from the merge between the advantages of both the SCT and TBL. The SCT can assess the knowledge organization and focus on the process rather than outcome [7] and the TBL enhances effective active learning approaches especially among low academic performers [14].

Additionally, combining SCT and TBL can prepare the students for future life and improve the future practice. It was found that physician's tolerance of uncertainty influences her or his clinical practice and those are more likely to order excessive diagnostic testing and additional empiric treatment [22].

Moreover, adopting the TBL approach may foster active learning and student engagement [23]. This was confirmed by the findings of our study in which students reported that they were attentive during the session. Also, students preferred to have the ISCT before starting the group discussion as it may connect them to the team assignment/application [24]. Moreover, the TBL/SCT approach energizes each student to examine his/her knowledge then explore the different opinions through the tSCT. Finally, the instructor provides the knowledge in an active student-centred approach away from didactic teaching.

The TBL/SCT approach can also foster teamwork and collaborative learning. As reported previously that TBL that can enhance problem-solving skills, ensure that students build collaborative, teamwork skills and achievement during the group sessions [12,15]. This point was approved by our students who confirmed that TBL/SCT approach is an effective way to practice what they have learnt.

The current study declared that students prefer SCT as a teaching method but not as a summative assessment tool and this is in congruence with the study assumption. This can be attributed to the nature of the test that may be challenging but at the same time confusing as it is a first-time experience for undergraduate students. The Likert scale may be sophisticated for their level and it may be better to use three-anchor scale for undergraduate student. Fournier [6] mentioned that if SCT is used as a learning stimulus, it appears that using three-anchor scale is more effective for induction of relevant discussion. Another possible explanation is the students training and familiarity with the test format. This point met agreement with Roberti et al. [25] who suggested that the SCT difficulties in construction of the test and scoring key might make its application unfeasible in units with limited resources [25,26]. Also, Lineberry et al. 2019 [26] reported that SCT can be used as a guide for assessment for learning.

Although the research design of our study does not lack rigor, the study has some limitations. One notable limitation is the study sample may affect the findings. Another limitation is the training of students and unfamiliarity of the students and panel with the SCT format that may affected their responses. However, the current study was a prospective study introducing a new approach for assessing clinical reasoning among undergraduate students.

Conclusion

The use of the SCT/TBL approach improved the clinical reasoning skills of the lower achievers through the tSCT. The tSCT helped the students to correct their mistakes, generate discussion and teamwork. The SCT/TBL approach can be used as an instructional approach to teach and formatively assess clinical reasoning as it may help the improvement of problem solving and clinical judgement for undergraduate medical students. Additionally, the SCT is an appropriate tool for assessing clinical reasoning in onsite training as it discriminates between the students and experts.

Practical Highlights

1. SCT/TBL approach can be used as an instructional approach to teach and formatively assess clinical reasoning for undergraduate medical students.
2. SCT/TBL approach can encourage team learning, correction of mis-concepts and help each student to develop his/her schema or illness scripts.
3. iSCT and tSCT showed statistically significance difference among lower achievers.
4. The SCT/TBL approach builds up a clinical reasoning that respect the environment and interactions with peers and instructor.
5. The approach helped the students to solve patients' clinical problems, thinking critically and develop clinical judgment skills.

Declarations

Authors contributions

EA: The author had made substantial contributions in designing of the work, the acquisition, analysis, interpretation of data. She has drafted the work and substantively revised it. Finally, she has approved the final version of the manuscript.

MS: The author had made substantial contributions in designing of the work, the acquisition, analysis, interpretation of data. He has drafted the work and substantively revised it. Finally, he has approved the final version of the manuscript.

Ethics approval and consent to participate and publish

All the students were voluntarily involved in the study and the purpose of the study was clearly communicated to them. They had the right to refuse or withdraw from the study at any point without any consequences. An informed consent to participate and publish was obtained from all the participants included in the study. Approval from research Ethics Committee, Faculty of medicine Suez Canal University was taken before starting data collection. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Availability of data and materials

The datasets generated during and/or analysed during the current study are available in abouzeid, enjy, 2021, "Team Based Script Concordance Test", <https://doi.org/10.7910/DVN/8PGSK8>, Harvard Dataverse. <https://dataverse.harvard.edu/dataverse/SCT>

Code availability

Not applicable

Conflict of interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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References

1. Loughlin M, Bluhm R, Buetow S, Borgerson K, Fuller J. Reasoning, evidence, and clinical decision-making: The great debate moves forward. *J. Eval. Clin. Pract.* England; 2017. p. 905–14.
2. Bagg W, Clark K. Professionalism: medical students, future practice and all of us. *Intern. Med. J.* Australia; 2017. p. 133–4.
3. Charlin B, Brailovsky C, Leduc C, Blouin D. The Diagnosis Script Questionnaire: A New Tool to Assess a Specific Dimension of Clinical Competence. *Adv Health Sci Educ Theory Pract.* Netherlands; 1998;3:51–8.
4. Lee A, Joynt GM, Lee AKT, Ho AMH, Groves M, Vlantis AC, et al. Using illness scripts to teach clinical reasoning skills to medical students. *Fam Med.* United States; 2010;42:255–61.
5. Karila L, François H, Monnet X, Noel N, Roupret M, Gajdos V, et al. [The Script Concordance Test: A multimodal teaching tool]. *La Rev Med interne.* France; 2018;39:566–73.
6. Fournier JP, Demeester A, Charlin B. Script concordance tests: guidelines for construction. *BMC Med Inform Decis Mak.* 2008;8:18.
7. Charlin B, Tardif J, Boshuizen HP. Scripts and medical diagnostic knowledge: theory and applications for clinical reasoning instruction and research. *Acad Med.* United States; 2000;75:182–90.
8. Schank RC, Abelson R. *Scripts, Plans, Goals, and Understanding: an inquiry into human knowledge structure.* Hillsdale , NJ Earlbaum Assoc. 1977;248.
9. Tedesco-Schneck M. Script Concordance Model and Think Aloud Approach to Facilitate Clinical Reasoning in Baccalaureate Nursing Students. *Nurs Educ Res Conf* Washington DC. 2018;
10. Faucher C, Dufour-Guindon M-P, Lapointe G, Gagnon R, Charlin B. Assessing clinical reasoning in optometry using the script concordance test. *Clin Exp Optom.* Australia; 2016;99:280–6.
11. Atayee RS, Lockman K, Brock C, Abazia DT, Brooks TL, Pawasauskas J, et al. Multicentered Study Evaluating Pharmacy Students' Perception of Palliative Care and Clinical Reasoning Using Script Concordance Testing. *Am J Hosp Palliat Care.* United States; 2018;35:1394–401.
12. Haque M, Majumder MA. Team Based Learning in Medical Education – A Review. *Int J Pharm Sci Rev Res.* 2017;43:59–63.

13. Chung E-K, Rhee J-A, Baik Y-H, A O-S. The effect of team-based learning in medical ethics education. *Med Teach*. England; 2009;31:1013–7.
14. Koles P, Nelson S, Stolfi A, Parmelee D, Destephen D. Active learning in a Year 2 pathology curriculum. *Med Educ*. England; 2005;39:1045–55.
15. Hrynchak P, Batty H. The educational theory basis of team-based learning. *Med Teach*. England; 2012;34:796–801.
16. Charlin B, van der Vleuten C. Standardized assessment of reasoning in contexts of uncertainty: the script concordance approach. *Eval Health Prof*. United States; 2004;27:304–19.
17. Michaelsen L, Knight A, Fink L. Team-based learning: a transformative use of small groups. 2002.
18. Parmelee D, Michaelsen LK, Cook S, Hudes PD. Team-based learning: a practical guide: AMEE guide no. 65. *Med Teach*. England; 2012;34:e275-87.
19. Schuwirth LWT, Durning SJ, King SM. Assessment of clinical reasoning: three evolutions of thought. *Diagnosis* (Berlin, Ger. Germany; 2020;
20. Torre D, Durning SJ, Rencic J, Lang V, Holmboe E, Daniel M. Widening the lens on teaching and assessing clinical reasoning: from “in the head” to “out in the world”. *Diagnosis* (Berlin, Ger. Germany; 2020;
21. Humbert AJ, Besinger B, Miech EJ. Assessing clinical reasoning skills in scenarios of uncertainty: convergent validity for a Script Concordance Test in an emergency medicine clerkship and residency. *Acad Emerg Med Off J Soc Acad Emerg Med*. United States; 2011;18:627–34.
22. Cooke S, Lemay J-F. Transforming Medical Assessment: Integrating Uncertainty Into the Evaluation of Clinical Reasoning in Medical Education. *Acad Med*. United States; 2017;92:746–51.
23. Faezi ST, Moradi K, Ghafar Rahimi Amin A, Akhlaghi M, Keshmiri F. The effects of team-based learning on learning outcomes in a course of rheumatology. *J Adv Med Educ Prof*. 2018;6:22–30.
24. Farland MZ, Sicat BL, Franks AS, Pater KS, Medina MS, Persky AM. Best practices for implementing team-based learning in pharmacy education. *Am J Pharm Educ*. 2013;77:177.
25. Roberti A, Roberti M do RF, Pereira ERS, Costa NM da SC. Script concordance test in medical schools in Brazil: possibilities and limitations. *Sao Paulo Med J*. Brazil; 2016;134:116–20.
26. Nseir S, Elkalioubie A, Deruelle P, Lacroix D, Gosset D, Lineberry M, et al. Experts’ responses in script concordance tests: a response process validity investigation. *Med Teach*. England; 2017;34:796–801.

Tables

Table 1: The aggregate method was used to develop the key score.					
Answer	-2	-1	0	+1	+2
Score	0	0	0.2	0.2	0.6
Number of experts who have chosen each answer	0	0	2/10	2/10	6/10

Table 2: Comparison of the mean score of script concordance test vignettes between the students and the experts.

Test vignette	Mean (SD)			P value		
	Students	Teams	Examiners	Students vs Teams	Students vs Examiners	Teams vs Examiners
1	0.40 (0.19)	0.42 (0.18)	0.62 (0.07)	0.646**	0.000*	0.002*
2	0.27 (0.15)	0.26 (0.13)	0.42 (0.10)	0.774**	0.004*	0.008*
3	0.37 (0.10)	0.41 (0.07)	0.39 (0.10)	0.417**	0.205**	0.557**
4	0.45 (0.23)	0.53 (0.25)	0.75 (0.11)	0.267**	0.000*	0.023*
5	0.36 (0.12)	0.33 (0.10)	0.42 (0.13)	0.313**	0.228**	0.100**
6	0.30 (0.16)	0.32 (0.13)	0.49 (0.15)	0.516**	0.002*	0.022*
7	0.45 (0.28)	0.56 (0.18)	0.71 (0.17)	0.279**	0.006*	0.056**
8	0.55 (0.28)	0.78 (0.28)	0.86 (0.08)	0.007*	0.000*	0.829**
9	0.50 (0.26)	0.57 (0.25)	0.79 (0.02)	0.495**	0.000*	0.005*
10	0.37 (0.22)	0.34 (0.20)	0.71 (0.08)	0.698**	0.000*	0.001*
11	0.29 (0.15)	0.31 (0.16)	0.67 (0.13)	0.667**	0.000*	0.000*
12	0.36 (0.18)	0.40 (0.20)	0.65 (0.17)	0.485**	0.000*	0.005*
13	0.32 (0.16)	0.40 (0.18)	0.44 (0.13)	0.251**	0.039*	0.470**
14	0.34 (0.37)	0.41 (0.17)	0.55 (0.11)	0.176**	0.000*	0.063**
15	0.46 (0.16)	0.52 (0.40)	0.79 (0.14)	0.597**	0.016*	0.186**
16	0.32 (0.19)	0.38 (0.16)	0.50 (0.03)	0.198**	0.010*	0.204**
17	0.43 (0.23)	0.56 (0.20)	0.62 (0.17)	0.054**	0.010*	0.678**

The whole test mean score	0.37 (0.08)	0.43 (0.09)	0.61 (0.07)	0.063**	0.000*	0.001*
SD: standard deviation						
*Mann-Whitney U test, P value statistically significant (< 0.05)						
**Mann-Whitney U test, P value statistically non-significant (> 0.05)						

Table 3: Comparison of the mean score of script concordance test vignettes between the lower achiever students and the students' teams.

Test vignette	Mean (SD)		P value
	Lower achievers	Teams	
1	0.37 (0.20)	0.42 (0.18)	0.450**
2	0.16 (0.13)	0.26 (0.13)	0.056**
3	0.32 (0.12)	0.41 (0.07)	0.053**
4	0.29 (0.18)	0.53 (0.25)	0.015*
5	0.31 (0.15)	0.33 (0.10)	0.754**
6	0.19 (0.12)	0.32 (0.13)	0.018*
7	0.29 (0.22)	0.56 (0.18)	0.004*
8	0.29 (0.30)	0.78 (0.28)	0.001*
9	0.31 (0.27)	0.57 (0.25)	0.021*
10	0.34 (0.22)	0.34 (0.20)	0.981**
11	0.23 (0.13)	0.31 (0.16)	0.372**
12	0.27 (0.17)	0.40 (0.20)	0.095**
13	0.26 (0.14)	0.40 (0.18)	0.054**
14	0.20 (0.13)	0.41 (0.17)	0.004*
15	0.26 (0.34)	0.52 (0.40)	0.064*
16	0.23 (0.17)	0.38 (0.16)	0.009*
17	0.32 (0.26)	0.56 (0.20)	0.015*
The whole test mean score	0.37 (0.08)	0.43 (0.09)	0.063**
SD: standard deviation			
*Mann-Whitney U test, P value statistically significant (< 0.05)			
**Mann-Whitney U test, P value statistically non-significant (> 0.05)			

Table (4): Students' perception of STC structure, STC/TBL approach and benefits of teamwork.			
	Agreement (%)	Neutrality (%)	Disagreement (%)
STC Test structure and format:			
Clear test instruction	75	13	11.1
Appropriate test duration	87	7.4	9.3
The real-life situations reflection	75.9	20.4	3.7
Learning enhancement	73.2	13	13.8
Challenging test format	68.6	18.4	13
Instructional method	68.9	7.4	24.2
Assessment tool	33.3	16.7	50
The test through STC/TBL helped the students in:			
Critical thinking	75.9	18.5	5.6
Problem solving	75.9	14.8	9.3
Clinical judgement	64.8	29.6	5.6
Understanding course material	57.4	29.6	13
Focusing on core information	50	38.9	11.1
Independent thinking	79.6	11.1	9.3
Correction of the mistakes of iSCT through discussions of tSCT	77.7	11.1	11.2
STC/TBL students' judgement:			
Differences in answers between iSCT and tSCT	46.3	37	16.7
Preference of SCT/TBL over the traditional lecture format	73.8	11.4	14.8
Useful learning activity	68.4	27.8	3.8
Benefits of teamwork:			
STC/TBL is a perfect way to practice what was learned	79.5	16.70	3.80

The teams worked well together	83.3	14.8	1.9
Attention during TBL sessions	83.3	14.8	1.9
Developing information synthesizing skills	75.9	18.5	5.60
Respecting other teammates points of view	83.3	11.10	5.60

Figures

Figure 1

Shows the distribution of the test core among the three groups