Journal Club Challenge: team-based learning and gamification enhance students adherence to critical article reading

Thiago Santos*, School of Medical Sciences of Unicamp, Emergency Medicine, Campinas, Brazil
Daniel Franci, School of Medical Sciences of Unicamp, Emergency Medicine, Campinas, Brazil
Carolina Gontijo-Coutinho, School of Medical Sciences of Unicamp, Emergency Medicine, Campinas, Brazil
Tatiana Ozañata, School of Medical Sciences of Unicamp, Emergency Medicine, Campinas, Brazil
Marcelo Schweller, School of Medical Sciences of Unicamp, Emergency Medicine, Campinas, Brazil
Marco Carvalho-Filho, School of Medical Sciences of Unicamp, Emergency Medicine, Campinas, Brazil

Background: Medical Students must develop the ability to critically evaluate recent articles in the academic medical literature. Therefore, the journal club (JC) is an essential, well-recognized, traditional teaching method. However, our experience has shown JC to be counterproductive, because students often fail to read the papers, leaving this task only for the one who prepares the presentation.  

Summary of Work: We created a new kind of JC, based on the concepts of gamification and team-based learning. The activity consists of a competition between two undergraduate and internal medicine resident teams. Two medical articles are given each week, and each participant must prepare one question from each paper. Teams are assembled just before the competition begins. Senior doctors are the “referees”.  

Summary of Results: We observed greater students’ interest on reading the papers and very good compliance with our JC. Most students considered our activity to be more effective and amusing than conventional JC.  

Discussion and Conclusions: By means of TBL and gamification, undergraduates and residents practiced their memories, enhanced their communication skills and team work. We believe this kind of activity to be the future of JC in our department.  

Take-home messages: Team-based learning and gamification may be good teaching tools enhance medical students’ adherence to journal club activities.

Improving Knowledge of Pediatric Nephrology in the 6th year medical students by using Team-Based Learning

Noosara Klumsombut*, Ratchaburi Hospital Medical Education Center, Pediatric, Ratchaburi, Thailand

Background: TBL has been used in a variety of medical education setting. We used TBL in pediatric nephrology clinic for the 6th year medical students in Ratchaburi Hospital Thailand for improving their knowledge and enthusiasm.  

Summary of Work: Individual students studied the objective of common pediatric nephrology diseases 2 weeks before class. In class, they completed an individual test to assure their knowledge. Groups of 3-students then re-take this exam and they got immediate feedback on their performance by the teacher. They got an assignment to review the history of the pediatric nephrology patient who had an appointment to pediatric nephrology clinic. When the students attended the clinic, they had to apply their knowledge to manage their patients under supervision of the teacher.

This method was first used in 2014. The difference between the score of individual and groups and post class questionnaires were analyzed.

Summary of Results: Average score of the individual was 53%(44%-91%) and average score of the groups was 68%(44%-91%). In all groups, the score of group was more than the score of individual. Post class questionnaire showed that all students appreciated the participation in group discussion and the application of their knowledge in pediatric nephrology clinic.

Discussion and Conclusions: Students benefit from TBL through problem-solving discussions in group and applications competent knowledge to manage the patients.

Take-home messages: TBL improve knowledge and enthusiasm of the students by their active participation.
Does the students’ assessment of TBL reflects active learning and final examination results?

Jaroslav Mareš*, 2nd Faculty of Medicine, Institute of Biology and Medical Genetics, Prague, Czech Republic
Vera Tumova, 2nd Faculty of Medicine, Institute of Biology and Medical Genetics, Prague, Czech Republic
Marcela Klabanova, Diana Lucina, Institute of Biology and Medical Genetics, Prague, Czech Republic

Background: We introduced TBL in 2010 and this approach became one of the most popular teaching method among students in Medical Biology and Embryology and Developmental Biology subjects, respectively. For assessment of TBL we use a feedback model based on written survey after subject examination. In this study, the goal was to identify changes in awareness and value of TBL, to motivate students to self-learn and to correlate the TBL assessment with the final examination scores. (Supported by IP 1110005 and Diana Lucina).

Summary of Work: One hundred and seventy two 2nd year medical students participated in TBL class of practical works (molecular genetics and human developmental biology) in 2014. After subject examination students completed a survey that can analyze group member’s opinion. We analyzed relationships between the students’ TBL assessment and individual exam results in final examination (score, number of attempts, mark in test of practical knowledge).

Summary of Results: The general TBL assessment, team work awareness and students’ motivation are closely related to individual exam scores ($p<0.01$) in the final examination and in the test of practical knowledge. The TBL evaluation is less related to number of examination attempts ($p<0.05$).

Discussion and Conclusions: Students’ exam success was closely related to positive assessment and awareness of TBL.

Take-home messages: Our feedback model allows us to verify usefulness of TBL, to identify its advantages and drawbacks and to improve our pedagogical attitude.

Changing behavior of antibiotic prescribing for URTIs: Effectiveness of team-based learning approach in Internship

Kanokrot Kovjiriyapan*, Medical Education Center Phayao Hospital, Phayao, Thailand

Background: Clinical teaching should ideally improve a medical students’ knowledge and change their behavior in daily practice toward a best clinical practice. Interactive methods such as team-based learning and case-based learning can impart sustainable knowledge and lead to high satisfaction among participants, but there are fewer reports of its use with postgraduate doctors. We designed an interactive case-based seminar using team-based learning approach to evaluate whether it leads to a changing behavior of antibiotic prescribing for Upper respiratory tract infections (URTIs) of interns.

Summary of Work: 12 interns rotated in 2013 learning “Antibiotic used in URTIs” in Team based learning (TBL) module. Antibiotic prescribing for URTIs of interns were collected from medical record before and after learning.

Summary of Results: Mean scores of antibiotic prescribing in pre-learning and post-learning were 10.15, 7.95% respectively ($p<0.05$).

Discussion and Conclusions: Team-based learning can change medical practice toward appropriate antibiotic prescribing for URTIs.

Take-home messages: Team-based learning can be successfully introduced into a postgraduate training program.
A comparison of satisfaction towards team-based learning and problem-based learning approaches among third-year medical students at Suranaree University of Technology

Dalad Phromphan*, Medicine, Surgery, Nakhon Ratchasima, Thailand
Taweesak Tongtaweew, Medicine, Family and Community, Nakhon Ratchasima, Thailand
Soraya Kaewpiitoom, Medicine, Pathology and Laboratory Medicine, Nakhon Ratchasima, Thailand
Sanong Sukaweang, Medicine, Pediatrics, Nakhon Ratchasima, Thailand
Naporn Uengarporn, Medicine, Surgery, Nakhon Ratchasima, Thailand
Likit Matrakool, Medicine, Nakhon Ratchasima, Thailand

Background: Team-based learning (TBL) and problem-based learning (PBL) have been widely exercised as effective methods to promote active learning in medical education. However, a small body of research has been regarding the application of both methods among Thai medical students. The aim of the study was to compare satisfaction towards these methods among third-year medical students at Suranaree University of Technology, Nakhon Ratchasima, Thailand.

Summary of Work: The study incorporated 60 third-year medical students who enrolled in a two-week course in Gastrointestinal System, which employed an integrated TBL and PBL approach. Student satisfaction towards these two learning methods was evaluated by questionnaires upon completion of the course. Data were analyzed using the two-sample t-test.

Summary of Results: Significant difference was found between student satisfaction towards TBL and PBL in the following categories: knowledge (understanding of learning content, application of pre-clinical knowledge, a variety of knowledge from instructors), self-development (confidence to search for medical information, confidence to solve unexpected problems, eagerness to learn), presentation skills (oral presentation, confidence to work as a team), as well as overall satisfaction (p < 0.05). However, the study revealed no significant difference of satisfaction scores in terms of the holistic view of patients (p = 0.053).

Discussion and Conclusions: Our study revealed that the majority of the students were more satisfied with TBL than PBL.

Take-home messages: The study showed that TBL was more efficient than PBL in the students’ opinion.

A cell biology Team-Based Learning day achieves high acceptability in a large class of first year medical students

Fernanda Marques*, Life and Health Sciences Research Institute (ICVS), School of Health Sciences, University of Minho, Braga, Portugal
Alexandra Miranda, Life and Health Sciences Research Institute (ICVS), School of Health Sciences, University of Minho, Braga, Portugal
Helder Novais, Life and Health Sciences Research Institute (ICVS), School of Health Sciences, University of Minho, Braga, Portugal
Isaac Braga, Life and Health Sciences Research Institute (ICVS), School of Health Sciences, University of Minho, Braga, Portugal
Manuel Costa, Life and Health Sciences Research Institute (ICVS), School of Health Sciences, University of Minho, Braga, Portugal
Nuno Sousa, Life and Health Sciences Research Institute (ICVS), School of Health Sciences, University of Minho, Braga, Portugal

Background: Team Based Learning (TBL) is not commonly used in cell biology courses. We developed a TBL day for a large class of first year medical on molecular and cellular processes of mitosis and meiosis associated with human pathologies. We describe the acceptability of the activity by students.

Summary of Work: 130 students participated in this TBL activity. The learning objectives were related to cell cycle, mitosis and meiosis mechanisms, and their implications on chromosomopathies and cancer. The Individual Readiness Assignment (IRA) was developed by clinical and basic sciences faculty, (27 Items), all with clinical vignettes. The IRA was administered in an auditorium (60 min). Then students worked around the IRA in their teams (120 min). Finally, the class returned to the auditorium to discuss the learning issues (180 min) 24 hours later, students answered a custom-made survey to evaluate the impact of the TBL day.

Summary of Results: There were 89 responses (68% response rate). Students considered that the TBL day largely increased their knowledge on mitosis (83%), meiosis (86.5%), cell cycle (84.2%), relationships between chromosomopathies and meiosis (78.6%), cancer and cell signaling (74%) and characteristics of cancer cells (72%). A free text answer revealed that students appreciated the opportunity to contextualize problems within clinical relevant situations and the mediation by peer discussions, which are part of the Team processes, and the opportunity to search information autonomously.

Discussion and Conclusions: A large class of first year medical students developed positive perceptions of a TBL day on cell division and proliferation.

Take-home messages: A TBL day seems to achieve positive motivation outcomes in first year medical students.
The association between Team-based Learning (TBL) and Learning Management Systems (LMS) by Moodle®

Miriam Monteiro de Castro Graciano*, Unifenas, Alfenas, Brazil
Patrícia Carolina de Souza Pereira, Unifenas, Alfenas, Brazil
Marly Moreira Dias, Unifenas, Alfenas, Brazil
Maurício Moreira Júnior, Unifenas, Alfenas, Brazil

Background: TBL is an important active learning methodology that consolidates concepts, provides teamwork and requires decision making.

Summary of Work: We used the Moodle® to conduct the first three steps of TBL. The following steps were conducted in a traditional way. Finally, the student’s perception of the method was evaluated using the Liker scale.

Summary of Results: In the first step the matters were made available in different media via Moodle®. In the second step (iRAT), randomized questions and answers, with time restriction and without feedback was fulfilled by the students in the computer lab. Also in the computer lab during the third step (tRAT), the same questionnaire was made available in adaptive mode, with immediate feedback, penalty setting and time limit. Assessment of the activity by the students got satisfaction rates between 94.37% and 96.25%.

Discussion and Conclusions: The randomization of the questions and answers during iRAT avoided cheat and the achievement of immediate report enabled the establishment of performance-based groups. Immediate feedback during the tRAT consolidated the main aspect of the methodology that is the interest in performing teamwork to take shared decision. Graphics generated in the Moodle® evidenced issues of greatest difficulty, helping to drive the fourth step in a more objective way.

The combination of active learning methodologies and information and communication technology seems to constitute a need and an advance in the medical field.

Take-home messages: In cyberculture times the use of information technology enriches the teaching and learning process.

Problem-based Learning or Team-based Learning, What should the students choose?

Wichan Kittiprapan*, Buddhachinaraj Medical Education Center, Department of Pediatrics, Phitsanulok, Thailand
Kosa Sudhorm, Buddhachinaraj Medical Education Center, Department of Pediatrics, Phitsanulok, Thailand
Sireeluck Klanarong, Buddhachinaraj Medical Education Center, Phitsanulok, Thailand

Background: Problem-Based Learning(PBL) and Team-Based Learning(TBL) are active learning methods. This report is aimed to compare the medical students’ opinions towards the two methods.

Summary of Work: In 2014, the fourth year medical students studying in pediatrics at the Buddhachinnaraj Hospital have learned with the PBL and TBL. In the last week, they answered the closed-end questionnaire comparing their preference of the two methods. The data has been compared by the independent t-test.

Summary of Results: 48 (100%) medical students answered the questionnaire. The opinions towards TBL are very good include: the method is suitable for fourth year students; the method encourages them to analyze issues and find solutions; the content is arranged systematically with clear procedures; there is an emphasis and conclusion on the subject; knowledge from instructors; knowledge from friends in the team; satisfaction and the application/adaptation of the knowledge after classes. The opinions towards PBL is good and significantly statistical different. Moreover, there is less stress in TBL classes. Finally, 100% of the students prefer TBL.

Discussion and Conclusions: The medical students prefer TBL probably because of different procedures of the two. TBL is more systematic with clear process. There is a test for the readiness and accountability of the students as well as a good exchange of knowledge in the team. Importantly, there are immediate and regular feedbacks from the instructors. These factors help the students to have more knowledge in class and can apply it better after class.

The active learning methods are important and necessary even though the students prefer TBL over PBL.

Take-home messages: There should be more use of TBL methods widely.
Medical Students’ Attitudes toward Team-Based Learning in Radiology

Chalakot Dejarkom*, Buddhachinaraj Medical Education Center, Radiology, Phitsanulok, Thailand
Kosa Sudhorm, Buddhachinaraj Medical Education Center, Pediatrics, Phitsanulok, Thailand

Background: Team-based learning (TBL) has been applied to various courses in medical schools, and a void in the literature exists regarding the attitude of TBL in radiology. The objective of this study was to evaluate medical students’ attitudes toward TBL in radiology.

Summary of Work: One hundred seventy nine 5th year medical students in Buddhachinaraj Medical Education Center in elective course of radiology in academic year 2010-2013 were studied topic gastrointestinal radiology by TBL method. At the end of the course, they were surveyed for their attitudes toward team based learning in radiology by using 10 (five rating scale) questionnaire items. Data were analyzed for frequency, percentage, mean and standard deviation.

Summary of Results: The level of attitudes was very good (mean 4.21) for knowledge after study, teamwork, community skill, coordination, responsibility, instructor feedback and harmony. The level of attitudes was good (mean 3.41 - 4.20) for preparation and duration. The level of attitudes was acceptable (mean 3.15) for knowledge before study. Mean G-RAT scores was significantly higher than mean I-RAT scores (70.39 ± 9.84, 33.41 ± 15.57, p < 0.001).

Discussion and Conclusions: The level of attitudes was very good for knowledge after study, teamwork, community skill, coordination, responsibility, instructor feedback and harmony, because of the student have to had high responsibility, good coordination and discussion under supervise in TBL. The results reveal that medical students’ attitudes toward TBL in radiology are good to very good.

Take-home messages: TBL is one of the good choice study method in radiology.

Anatomy and additive manufacturing: Imaging methods and 3D printing for anatomy education

John F Bertram*, Monash University, Anatomy and Developmental Biology, Clayton, Australia
Justin W Adams, Monash University, Anatomy and Developmental Biology, Clayton, Australia
Paul G McMenamin, Monash University, Anatomy and Developmental Biology, Clayton, Australia

Background: The combined challenges of the cost of maintaining bequest programs, storing human cadavers, and minimizing exposure to formalin has led to major changes in the use of dissection-based teaching. Alternatives such as plastinated specimens have raised a plethora of ethical concerns about the acquisition and trading of human cadavers.

Summary of Work: We have developed methods for applying imaging and additive manufacturing to reproduce prosected human cadaver and other specimens that obviates many of the above issues. We have developed techniques to produce high resolution, full colour reproductions of prosections from medical imaging (CT/MRI) and surface scanning datasets.

Summary of Results: This approach of creating multiple reproducible anatomical replicas or 3D prints offers several advantages over other techniques including: (1) the ability to capture anatomy too complex for traditional physical molding and casting methods; (2) the rapid production of multiple identical copies; (3) ability to manipulate size and scale; and (4) false colouring to enhance structure visibility. 3D prints from surface scanned specimens have high concordance to the original, and accurately resolve the morphology of extremely small structures.

Discussion and Conclusions: Our ongoing development of 3D printing for anatomy education represents a significant advance impacting the range of resources available to universities, hospitals and other educational institutions. 3D printing avoids some of the financial, cultural and ethical issues associated with cadaver specimens either in an embalmed or plastinated form. 3D-printed anatomical specimens represent a significant educational advance.

Take-home messages: 3D printing can be used to manufacture accurate full colour reproductions of prosections and represent a major advance in anatomical education.
#5BB1 (24674)
Importance of dissections in our anatomy curriculum – Is it about details or concepts?

Suvi Viranta-Kovanen*, University of Helsinki, Anatomy, Helsinki, Finland
Heikki Hervonen, University of Helsinki, Anatomy, Helsinki, Finland

Background: Dissections are a part of the anatomy curriculum in the University of Helsinki. Because of the small number of cadavers and limited hours spent in the gross lab, we have made the dissection sessions highly structured. Students follow a detailed dissector-handout to proceed the dissection. Moreover, students alternate in different well defined roles during the session.

Summary of Work: 126 students replied to our questionnaire considering the dissection session they had just had. We asked which roles they played, which ones they found most important for their learning, and how they view learning in the lab.

Summary of Results: In average students felt that reflecting and discussing anatomical knowledge is as important as learning by doing in the dissection sessions. In general, students thought that active roles helped to learn and only 10% thought that just observing dissections helped to learn anatomy. Only 43% thought anatomy lab was helpful for memorizing details, whereas 94% thought it helped them to understand the bigger picture.

Discussion and Conclusions: Dissections are integral part of medical students anatomy learning. Our study shows that students feel that even brief dissection sessions enhance their learning. They feel that the dissection process helps them build a comprehensive view of human body.

Take-home messages: Students may learn anatomy during the dissection by doing, observing and discussing. Especially dissections help students to understand anatomical concepts.

#5BB1 (27096)
Understanding 2D anatomy learning- a reinforcement task based approach

Sarah Anderson*, University of Calgary, Community Health Sciences, Calgary, Canada
Heather Jamniczky, University of Calgary, Anatomy and Cell Biology, Calgary, Canada
Olave Krigolson, University of Victoria, Neuroscience Program; Neuroeducation Network, Victoria, Canada
Kent Hecker, University of Calgary, Veterinary Clinical and Diagnostic Sciences; Community Health Sciences, Calgary, Canada

Background: Given reduced formal instruction time for many of the basic sciences within medical curricula, educators are searching for efficient instructional methods that ensure students have the necessary foundational knowledge.

Summary of Work: The objective of this study was to design a reinforcement learning task in which novice participants successfully learn to identify neuroanatomical structures in a time efficient manner. We predicted that provision of immediate feedback would activate reinforcement learning mechanisms within the brain thus enhancing knowledge acquisition such that performance accuracy (correct identification of neuroanatomical structures) improves from approximately 50% (guessing) to 90% by task completion.

Summary of Results: Behavioural learning curves show learning occurs over the course of a task (320 trials) including 16 trial blocks (20 trials/block). Participants (n = 10) consistently exceed 90% accuracy in block 13 (260 trials). The total task duration was approximately 30-35 minutes with all participants reaching proficiency by 25-30 minutes. Importantly, there was a significant increase in performance on a post knowledge test compared to a pre-test, $M = 90.00\%CI [81.57, 98.43]$, $t(9) = 24.15$, $p < .001$.

Discussion and Conclusions: Our results highlight the key role of reinforcement learning approaches to establishing foundational knowledge in the pre-clinical sciences, specifically anatomy. Progression of learning can be assessed through examination of learning curves. Future work will assess neurophysiological responses through measurement of event-related brain potentials using electroencephalography.

Take-home messages: Designing effective pre-class exercises that make use of reinforcement learning theory as a means to promote learning may be an effective method to build base knowledge prior to classroom interactions in anatomy education.
#5BB13 (26752)
Removing Cadaveric Dissection from a Medical Curriculum

Abhishek Chitnis*, Keele University, Stoke-on-Trent, UK
Philip Bradley, Newcastle University, Newcastle upon Tyne, UK

Background: For over half a millennia, cadaveric dissection has been instrumental in the teaching and learning of anatomy. However, a recent emerging trend demonstrates that many medical schools have abandoned this practical hands-on approach. A literature-based enquiry was therefore conducted to look at the possible impact of removing cadaveric dissection from a medical curriculum.

Summary of Work: By capturing the existing literature describing medical students’ and anatomists’ perceived benefits and drawbacks of cadaveric dissection, insights could be made into the possible impact of teaching and learning without dissection. Relevant papers were identified using a defined search strategy that encompassed six databases. Strict inclusion and exclusion criteria were implemented and papers were critically appraised. The thematic Analysis was used to synthesise and present the data.

Summary of Results: Twenty-three papers met the full inclusion criteria. Findings indicated the perceived benefits of dissection to be within the broad themes of Knowledge, Skills and Attitudes. Similarly the drawbacks of dissection fell within the themes of Emotional Reactions and Practical Reactions.

Discussion and Conclusions: Findings discuss the perceived merits and shortcomings of cadaveric dissection, and thus make inferences into what might be ‘lost’ if dissection were to be withdrawn. If this were to happen, steps must be taken to fill in the potential gaps in students’ anatomical knowledge and learnt skills in addition to the possible loss in their personal and professional development.

Take-home messages: With the reform in anatomy pedagogy, there is a possibility of cadaveric dissection being completely cut out of the undergraduate medical curriculum, and therefore, similarly suitable and sustainable alternatives must be sought.

#5BB14 (27415)
3D Head and Neck project: Development of a novel visualisation tool for education, training and research in human anatomy

Yeshwanth Pulijala*, Glasgow School of Art, Digital Design Studio, Medical Visualisation, Glasgow, UK
Paul Anderson, Glasgow School of Art, Digital Design Studio, Medical Visualisation, Glasgow, UK
Mathieu Poyade, Glasgow School of Art, Digital Design Studio, Medical Visualisation, Glasgow, UK

Background: The human head and neck anatomy includes core elements of respiratory, nervous and digestive systems making it the most vital zone of our body. However none of the existing visualisations realistically represent medically validated anatomy. This inspired the inception of 3D head and neck project. This presentation demonstrates the development and potential of the project in education, training and research.

Summary of Work: The 3D digital head and neck model is constructed using anatomical data acquired from 3D laser scans and radiography of human cadavers. It is then integrated within a bespoke visualization platform to create a real-time interactive 3D digital model. Furthermore, haptic force feedback interaction is added for dental training purposes.

Summary of Results: Learners and teachers can interact with the fully annotated model in a real-time 3D environment allowing virtual dissections to be carried out layer by layer. Moreover, integration with haptic force feedback allows dental students to virtually administer local anaesthesia in a safe and repeatable environment.

Discussion and Conclusions: High resolution data capture and accurate modelling supported by specialist clinical inputs makes the 3D head and neck a highly reliable resource of anatomical knowledge, allowing intuitive and self-paced exploration with a level of details never met before. Real-time interactivity and haptic force feedback provides scope for training and research.

Take-home messages: This high-resolution (10µm) 3D head and neck model allows medical and dental professionals to intuitively explore the anatomy of the head and neck at their own pace and use it for education, training and research purposes.