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Student experiences of two small group teaching formats: seminar and fishbowl.

Running Head: Seminar and fishbowl teaching formats

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Keywords: Active learning, small group teaching, fishbowl format, seminars.

Abstract

Introduction: As teaching strategies, the seminar and fishbowl approaches promote active learning and shift the focus from the teacher to the learner. The aim of this study was to compare the self-reported perceptions of each student-centred teaching technique among a group of dental students as well as resultant quiz scores after each teaching technique.

Material and Methods: During the first semester of 2017, all year-3 (N=88) Semiology and year-5 (N=71) Oral Surgery students participated in weekly seminars in which teams of students from both cohorts were given an actual clinical case to

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study; a diagnosis and treatment plan would be rendered, and an oral case presentation would be presented to the rest of the class. In the second semester, the same students tried to solve similar clinical cases using the fishbowl training format. A course coordinator provided final feedback, and the session culminated with a quiz. Students were invited to provide quantitative and qualitative perceptions while quiz scores obtained during seminar and fishbowl teaching formats were compared.

Results and Discussion: A total of 97 (61%) seminar and 92 (58%) fishbowl students provided insights regarding these teaching techniques. Both cohorts believed the fishbowl format allowed them to be actively involved. However, only year-3 students gave the fishbowl format a significantly higher score than the seminar format, considering it an attractive format that allowed them to learn. In contrast, year-5 students believed the seminars met their expectations better than the fishbowl format. Interesting clinical cases as well as the final round of feedback were qualitative themes reported by both cohorts. The mean seminar and fishbowl quiz scores were statistically significant different for year-3 students ($p < 0.0001$), but not for year-5 students ($p = 0.09$).

Conclusions: These findings suggest that a more structured small-group learning-teaching format can be implemented for younger students while at the same time allowing more flexible organisation for senior students.

Introduction

The aim of teaching is to enable students to learn, that is, to foster and stimulate a change in the way they understand, experience, or conceptualise the world around them, not to merely have students repeat information on demand.¹

Traditional large classroom lectures during which information is transmitted to students have been the mainstay of on-campus education for centuries.² Although this method is arguable the most efficient method to deliver large amounts of complex content to a large group, introduce new and difficult topics, and provide broad overviews and summaries,³ the classic lecture format does not necessarily induce students to actively engage with the content such that that come to understand it.¹

One alternative to classic lecturing is active teaching in which students participate in the learning activity, thereby shifting the focus from the teacher to the learner (the student-centred approach) and allowing students to actively acquire knowledge by performing meaningful activities and thinking about what they are doing. This approach facilitates achieving higher-order cognitive tasks such as problem solving, critical thinking, and reflecting rather than memorising.⁴⁻⁷

An array of active teaching formats have been proposed for healthcare education.^{3, 8-12} Edmunds and Brown conveniently categorise these formats as: *facilitating* methods that encourage students to talk (buzz groups, thinking time, snow-ball

groups, crossover groups, alternative seating arrangements, etc.); *generic* methods used for small group teaching sessions (seminars, tutorials, workshops, syndicates, electronic tutorials, etc.); and *specific* methods used within generic ones (fishbowl, lecturing, brain-storming, role play, step by step discussion, tutorless groups, free discussion, etc.).¹¹

As described below, one generic (seminar) and one specific (fishbowl) active teaching method were tested in the present study. Seminars, derived from the Latin term for seedbed (*seminarium solotenus diruere*), are opportunities for student ideas to germinate and intellectual abilities to develop and grow by way of discussion and reflection. Currently, seminars are often based on a presentation delivered by a student (or group of students) who is expected to have prepared himself or herself to teach a topic. Presentations are then followed by a group discussion moderated by a faculty member.¹³ Group discussion addresses the primary objective of seminars and other small group teaching formats – teaching students to think for themselves and actively engage in their own learning experience, as well as that of their peers through thoughtful articulation of their personal views and understanding of the material.¹⁴ The generic format can also include specific tasks assigned to other students in the class to improve interaction and group discussion, such as requiring students to ask questions, summarise key points, offer alternative views, and/or comment on the content and quality of the presentation.¹¹

The fishbowl format, also known as clusters or the group-on-group technique, is another tool for dynamic group involvement that can assume several configurations.

The basic structure consists of not one, but two concentric circles (groups) that alternate roles between working (discussion) and observing groups.^{15, 16} Students in the inner circle (the fishbowl) discuss a given assignment (a relevant issue, topic, or case) while surrounded by an outer circle (the observation group). Students in the outer circle silently observe the discussion, identifying themes and patterns and assessing the validity and merits of arguments proposed by the inner group.⁸ Once the inner group's allotted time is finished, the outer circle asks questions, provides commentary, and/or offers feedback to the inner group discussion.¹⁷ The two groups may then be asked to discuss the same or another related assignment with the roles reversed so that each group engages in both discussion and observation groups. A faculty member monitors and evaluates all components of the fishbowl to be able to provide feedback in a summary session.⁸

The fishbowl training format has several dynamic uses, but its primary goal is to familiarise students with the structure and characteristics of an in-depth interactive discussion as a means of learning (generating, communicating, distributing, and sharing knowledge).¹⁸ Accordingly, this format has been suggested as a problem-solving or decision-making tool to generate divergent views, encourage team building, and improve intergroup communication and relations, etc.^{14, 17, 19}

The aim of the present study was to compare student perceptions of the effectiveness of two student-centred teaching techniques, the seminar and fishbowl formats, in two groups of dental students (Semiology and Oral Surgery).

Methods

Ethical Approval

The study protocol was reviewed and approved by the University of the Andes, Faculty of Medicine Scientific Ethical Committee (reference number CECFM 201508).

Context

The University of the Andes Dental School curriculum comprises a six-year outcome-based programme organised in 12 semesters. In 2015, the institution endorsed a comprehensive plan to foster student-centred and small group teaching (including the seminar and fishbowl formats) across the whole programme.

The Semiology I and II courses for year-3 students represent their first exposure to direct clinical work. Hence, the learning objectives for the seminar as well as for fishbowl formats were to identify pathological characteristics and oral manifestations of systemic diseases using a series of clinical cases. In contrast, the Oral Surgery III and IV courses are the last supervised oral surgery training courses for year-5 students before they enter internship in year-6. The learning objective for both student-centred approaches in this course was to formulate a differential diagnosis for each clinical case presented. For both Semiology and Oral Surgery courses, the

seminar format was used during the first semester and the fishbowl format was used the following semester.

Seminars Implementation

Following the traditional approach of the last six years, all year-3 (N=88) students in the 2017 Semiology I course and all year-5 students (N=71) in the 2017 Oral Surgery course participated in mandatory weekly seminars (attendance was controlled) in which eight teams of nine to ten students from both cohorts were given a real clinical case, including medical history, clinical photographs, and results of laboratory tests to study one week in advance of orally presenting the case (including the diagnosis) as a group to the rest of the class via a 15 minute PowerPoint® presentation. This was followed by a 20-minute discussion; clinical staff supervised each session. Tutors promoted discussion between presenters and their peers, both during and after the presentations, with occasional intrusions and challenging questions. Each team presented twice during the semester and thus received two distinct clinical cases based on different pathologies.

Anecdotal evidence from previous years suggested that not all students in the class were actively engaged during peer presentations; some students were quite passive and ignoring the oral presentations. Consequently, seminars conducted in 2017 incorporated some facilitating methods suggested in the literature to improve interactions between the presenting team of students and their classmates and thus increase overall engagement in the learning process.¹¹ These methods comprised brain-storming, think-pair-share, and buzz group sessions before, during, and after the presentations.

At the end of each seminar session, the course coordinator discussed the teaching experience and provided feedback on the clinical cases presented, followed by a summative multiple-choice knowledge application quiz (15 total sessions) given to all students. The presenting students received extra marks for their two presentations during the course using a known rubric; each student added 17 seminar marks.

Fishbowl Implementation

Despite implementation of facilitating methods aimed at improving student engagement, the issue of non-participation was not adequately resolved. Therefore, we decided to try something new. We applied the fishbowl training format in place of seminars during the second semester (August to December) of 2017. Learning objectives for both the Semiology and Oral Surgery courses remained the same, as in the previous academic year.

After initial planning and training of staff during the midterm holidays, one member (JT) of the Dental School Faculty Development Office (AFODO) led a workshop for all registered students regarding how the fishbowl training format works including a demonstration using a mock case (amalgam versus resin composite fillings). The purpose of this training exercise was to ensure that the students understood the new format and to practise its dynamic, following a sequence of discussions to facilitate thinking, explaining issues, and resolving problems. All workshop materials were uploaded to the course e-learning platform so that students could review it at their own pace.

Subsequently, all 159 students registered for the Semiology II (year-3, N=88) and Oral Surgery IV (year-5, N=71) courses were randomly organised into eight teams of 19-20 peers (Figure 1-A arrangement); ten students formed year-3 subgroups, and the other ten formed the year-5 subgroups of students (Figure 1-B arrangement), except for one group that had ten year-3 and nine year-5 students.

Similar to the seminars, one real clinical case was uploaded weekly to the course e-platform (14 cases in total). In contrast to the seminar arrangement, a more structured case format was provided. Each clinical case included 20 open-ended semiology, diagnosis, and treatment planning questions with emphasis on depth of understanding to be prepared by all year-3 and year-5 students. Following Bloom's taxonomy,²⁰ the rationale for this format was that all students come to the fishbowl session with a general understanding of the case to be presented. Later, all students had to engage with the clinical scenario by applying and analysing what they had learned as well as generate a diagnosis and treatment plan given the case evidence provided.

At mandatory weekly fishbowl sessions (attendance was controlled), each group of year-3 students started sitting in the inner circle (the discussion group), while year-5 students sat in the outer circle (the observation group; Figure 1-C arrangement). Subsequently, the inner groups (the fishbowl) discussed and collaboratively tried to solve the semiology questions of the assigned case for 30 minutes, while year-5 student groups, sitting in the external circle, observed and listened to the discussion while taking notes. During the following 10 minutes, the year-5 subgroups added to

the discussion, made corrections, and asked questions of the students in the fishbowl, complementing the semiology of the case discussed by the year-3 subgroups (Figure 1-D arrangement).

Next, the groups reversed roles and followed the same protocol. That is, year-5 students, now in the inner circle, discussed and collaboratively tried to solve the diagnosis and treatment planning questions of the same case for 30 minutes, while year-3 students, sitting in the external circle, silently observed the discussion (Figure 1-E arrangement). Similar to the previous setting, this format was followed by 10 minutes of questioning from the year-3 groups to their senior peers (Figure 1-F arrangement).

One faculty member per group monitored and facilitated discussions, guided enquiries, and promoted overall understanding of the case. Notes were made in a known rubric to formatively assess the depth of each student's intervention and understanding. Finally, after every session all the small groups were brought back into one classroom, where, as in the seminars, the course coordinator discussed the teaching experience and provided clinical case feedback. Finally, a summative multiple-choice knowledge application quiz was delivered to all students (different quizzes were administered to year-3 and year-5 students according to level of training). Each student got 14 fishbowl marks.

Perceptions' questionnaire

Before the end of the first and second semesters, and hence prior to completing the Semiology and Oral Surgery courses, all students were asked to complete an anonymous perception e-questionnaire to assess how well they engaged in and felt about the course formats. The questionnaire contained seven items with response options on a five-point Likert scale and a final open-ended question with a free text response asking to “provide comments to improve”.

Data Analysis

During the 2017 academic year (first semester, March to July; second semester, August to December), responses for the seminar and fishbowl perception e-questionnaire from students who completed the Semiology I and Oral Surgery III courses (seminar format) and the Semiology II and Oral Surgery IV courses (fishbowl format) were descriptively analysed. Subsequently, several Student *t*-tests were used to compare seminar questionnaire results with those of fishbowl.

Free text “comments to improve” provided by students for both seminar and fishbowl sessions were studied following the principles of content thematic analysis. All written comments were grouped into themes (by one researcher) using an “open coding” interpretative process to breakdown the data analytically,²¹ ensuring that all manifestations from each theme were accounted for.²² The comments were then compared and those that were conceptually similar were labelled and grouped together to form themes.

Mean quiz scores from students who completed seminar and fishbowl sessions of the Semiology and Oral Surgery courses during the same academic year were calculated. Reliability of weekly quizzes was determined using Cronbach's alpha.²³ Student t-tests were used to compare scores from seminars and fishbowl sessions. All statistical analyses were performed using IBM Statistical Package for Social Sciences Windows® version 24 (SPSS Inc. IBM, Chicago, IL, USA).

Results

Of the 159 students who successfully finished the Semiology I and Oral Surgery III courses and participated in the seminar format, 97 (61%) completed the perception questionnaire and 59 (37%) provided qualitative comments regarding potential improvements. Of those who completed the fishbowl format as part of their Semiology II and Oral Surgery IV courses, 92 (58%) completed the perception questionnaire and 48 (30%) provided qualitative comments. First and foremost, it is important to highlight that the study framework did not generate any reported problems or concerns from students or faculty.

Quantitative Analysis of Students' Perceptions

Table 1 shows the average responses to the perception questionnaire for each teaching format. Seminar students assigned the highest score to the question "How true is it that the course met the set learning outcomes" (Question 3), with a mean of 3.8, while students in the fishbowl session assigned the highest mean score (3.8) to the question "How true is it that the course allowed me to be actively involved" (Question 6).

Furthermore, two questions were scored significantly higher by students from the fishbowl session compared to the seminar session (year-3 and year-5 together).

These were Question 1 “How true is it that the course was delivered using an attractive format” ($p=0.005$) and Question 6 “How true is it that the course allowed me to be actively involved” ($p<0.0001$).

When responses were considered by academic year (year-3 vs. year-5), mean responses for Question 4, “How true is it that the course allowed me to learn” (for which overall results between seminar and fishbowl were not significantly different [$p=0.29$]) was significantly higher for fishbowl compared to seminar (3.7 vs. 3.3) among year-3 students ($p=0.009$). Similarly, mean responses to Question 1 “How true is it that the course was delivered using an attractive format” were only significantly different among year-3 students (fishbowl, 3.8; seminar, 3.4; $p=0.009$). However, mean responses for Question 7, “How true is it that the course met my expectations”, showed a significant difference only among year-5 students (fishbowl, 3.3; seminar, 3.8; $p=0.005$).

Qualitative Analysis of Students’ Perceptions

The seminar students provided 59 comments for improvements once the course was completed. These comments were grouped into 11 themes. Similarly, 48 fishbowl students provided comments also grouped into 11 themes (Table 2).

Seminar and Fishbowl Scores

The means of the seminar quizzes and presentation (N=17) scores were 64% (range 48%-70%) for year-3 and 71% (range 65%-78%) for year-5 students (Figure 2), and Cronbach's alpha coefficient was 0.626 and 0.709 for year-3 and year-5 students, respectively. Similarly, the means fishbowl quiz scores (N=14) were 78% (range 64%--86%) for year-3 and 74% (range 64%-83%) for year-5 students. Cronbach's alpha coefficients were 0.733 and 0.672 for year-3 and year-5 scores, respectively.

Differences between mean seminar and fishbowl quiz scores were statistically significant among year-3 students ($p<0.0001$), but not for year-5 students ($p=0.09$).

Discussion

The present study investigates student perceptions of the effectiveness of the seminar and fishbowl teaching formats for the Semiology and Oral Surgery courses within a dental school curriculum.

As suggested in the dental literature,^{24, 25} our dental school has utilised case-based seminars to stimulate discussion between groups of students who had prepared and presented a clinical case to the rest of the class. In this training format, the learning was expected to evolve via exchanging of views from more knowledgeable students who had prepared the clinical case beforehand and subsequently presented their work to the other class participants.¹⁷ Regrettably, most other participants were just passive listeners, despite efforts of moderators to encourage active engagement from the entire class. As highlighted in the literature, the single most important single problem with small group work is students non-participation.¹⁹ It is possible that large

group sizes may have also inhibited active student participation. Furthermore, it was noted that only some students attained a real understanding of the clinical cases that they had not personally prepared for presentation.

Based on these experiences, the Dental School Curriculum Committee agreed to pilot the fishbowl format to provide all students the opportunity to learn the same material and to monitor their own learning.⁸ We wanted to try something new while maintaining the option to cover considerable amounts of content in large groups, as we had in prior seminars.

Although the present study showed mixed results, the primary idea for testing the fishbowl format was to introduce a different participatory small group training technique that would stimulate and ensure involvement of the entire class in a relatively easy manner. This particular teaching approach was adopted because it permits and encourages meaningful participation via give-and-take experiences and threat-free discussion while providing the opportunity to learn from one's peers and to solve problems together.¹⁷ The theoretical basis of our study was Kolb's experiential learning theory, where learning is not based so much on transmission and acquisition of content, but on interaction between content and experience, whereby each transforms the other.²⁶

When the quantitative perceptions of teaching formats from the year-3 and year-5 student cohorts were analysed together, mean scores for only two questions (Q1 and Q6) were significantly higher for the fishbowl format (Table 1). Specifically,

students believed that the fishbowl format was more attractive (Q1) and that it allowed them to be more actively involved in the learning process (Q6). Perceptions from questions 2-5 and 7 showed no differences between year-3 and year-5 students.

Interestingly, when year-3 and year-5 student perceptions were analysed separately, mean scores for question 1 (whether the method was an attractive format) were significantly higher for the fishbowl format only among year-3 students. Similarly, only year-3 students scored the fishbowl format significantly higher than the seminar format in allowing them to learn (Q4). In contrast, question 7 (whether the format met their expectations) was higher for the seminar format only among year-5 students.

These complex results may be partially explained by differences in the learning approaches of our third and fifth year students, as measured quantitatively.^{27, 28}

Year-3 students showed very similar deep and surface approaches to learning (ratio of deep:surface=1.0), while year-5 students showed a higher deep:surface ratio (1.2) in their approach to learning. This finding might explain why more senior fifth-year students preferred the more flexible seminar approach, since they appear to have a higher intrinsic motivation to study. Thus, more senior students may not need highly structured student-centred teaching techniques such as the fishbowl format. Conversely, more junior third-year students may need to be told what to do and how to do it, as they appear to have lower intrinsic motivation to learn.

Some extracted themes from the student comments on both the seminar and fishbowl formats (Table 2) correspond to what the literature suggests an active learning experience should entail: peer collaboration (fishbowl), enjoyable time (fishbowl), teacher as facilitator (seminars & fishbowl), and increasing communication skills (seminars).¹² However, only two themes were common to both formats: “interesting clinical cases” and “helpful coordinator final feedback”. Both these comments could be interpreted as “motivational, relevant, and getting useful feedback from the facilitator” and are considered essential for successful small group teaching.^{19 pp. 173-174} Similar to these results, a 14-week study of 38 students aimed at promoting peer collaboration reported that the fishbowl technique addressed “solving particular research problems and receiving advice”.²⁹

Conversely, some themes extracted from student comments on the seminar and fishbowl sessions showed remarkable contrast. Seminars were reportedly dull for some students: “hard to keep awake and concentrated”, “boring, dark room, after lunch”, “passive for most of the class”, “no motivation to take part, better reading”. Comparatively, a common fishbowl theme was “a good and very active format”. Another set of conflicting themes were “seminar classmates not good enough” and “good collaboration between 3rd and 5th year [students]” and “enjoyable group study” reported for the fishbowl format.

The above comments can be interpreted as in agreement with the higher scores obtained for the fishbowl format in the quantitative perception questionnaire (Table 1). Specifically, in the framework of “How true is it that the course...” Question 1

(...was delivered using an attractive format) and Question 6 (...allowed me to be actively involved).

Our students' comments from the fishbowl session can be compared to those from German students enrolled in a course on Civic Education, in which the fishbowl format was more often perceived as 'fun/interesting' compared to the plenum method of student-centred teaching.³⁰ In another study, 128 students majoring in psychology were taught to use the insight skill of interpretation using the fishbowl format and three other methods.³¹ Self-efficacy improved after use of all formats, but the students considered the fishbowl format the least helpful. However, the authors explain that most students only "observed" the fishbowl discussion due to time constraints. This suggests that the fishbowl exercise should only be used in cases where everyone has the opportunity to participate.

The mean quiz scores (N=14) using the fishbowl format (77%) were higher than those achieved using the seminar format (67%) format (N=15). However, these scores were only significantly different for year-3 students ($p < 0.0001$) (Figure 2).

This finding may also be interpreted as consistent with the results from question 4 of the perception questionnaire (...allowed me to learn), where only year-3 students scored the fishbowl format higher than seminar ($p=0.009$). Then again, since students were aware of their weekly quiz results, they may have been biased in their perception that they were indeed learning.

The case for year-5 students is somehow different than that of year-3 students. When analysing the perceptions of this more senior cohort, one observes that they found both the seminar and fishbowl formats similarly attractive (Q1). Despite their perceptions that the fishbowl format allowed them to be more actively involved (Q6), year-5 students scored seminars significantly higher than the fishbowl format in meeting their expectations (Q7). Thus, although senior students seem to have liked the new fishbowl format (Q1), they preferred the seminar format. The reason for these results cannot be clearly understood from the present study, but it may be hypothesised that senior students consider the less structured, more flexible seminar format more germane to actual clinical problem solving for which more knowledgeable year-5 students are better prepared to engage. Alternatively, as suggested in the education literature, the wide range of mixed-abilities and different educational backgrounds among students currently entering universities may also explain why our year-3 students preferred the higher degree of organisation and structure of the fishbowl format.¹⁴

One limitation of this study is that it is not readily generalisable. Although the sample size was sufficient for a reliable analysis, we report results from a single cohort of mixed year-3 and year-5 dental students using only two student-centred training formats. Multiple other techniques for facilitating structured discussions were not assessed. According to the ADEE profile of undergraduate dental education in Europe, possible other useful formats for clinical training include role-playing, situated learning, and storytelling, among others.³² In addition, potential bias may have been introduced in the study design. The two teaching methods being compared were applied to all students in subsequent semesters, with the seminar method first and fishbowl second. A crossover study would have averted this issue.

Another factors to consider in comparing the seminar and fishbowl teaching formats is the cost. In our institution, implementation of the fishbowl format required several more staff members than seminars, adding to the cost of each course. Seminars were delivered exclusively by the course coordinator, whereas the fishbowl format necessitated an additional seven monitors who needed intense training in preparation of introducing the new format.²⁷

Conclusions

Most participating dental students believed the new fishbowl training format allowed them to be actively involved. However, only junior students thought this was a more attractive format that allowed them to learn better than in seminars. In contrast, senior students thought the seminars met their expectations better than the fishbowl format.

We believed we could improve our student's seminar experience and sought to do so using a new and somewhat different student-centred approach. The fishbowl format was somewhat better, particularly for junior students. These results and our experience may assist other faculty members who want to try something different to optimize the educational value of their small group learning sessions, like the fishbowl training format.

References

1. Ramsden P. Learning to Teach in Higher Education. Oxon, UK: RoutledgeFalmer; 2003.
2. Long A, Lock B. Lectures and Large groups. In: Swanwick T, editor. Understanding medical education: evidence, theory and practice. 1st ed. West Sussex, UK: Wiley-Blackwell; 2014. p. 137-48.
3. McCrorie P. Teaching and leading small groups. In: Swanwick T, editor. Understanding medical education: evidence, theory and practice. 2nd ed. West Sussex, UK: Wiley-Blackwell; 2014. p. 123-36.
4. Prince M. Does Active Learning Work? A Review of the Research. Journal of Engineering Education. 2004;93(3):223-31.
5. Michael J. Where's the evidence that active learning works? Advances in Physiology Education. 2006;30(4):159-67.
6. Friedlander MJ, Andrews L, Armstrong EG, Aschenbrenner C, Kass JS, Ogden P, et al. What Can Medical Education Learn From the Neurobiology of Learning? Acad Med. 2011;86(4):415-20.
7. Harden R, Laidlaw J. Essential Skills for a Medical Teacher: An Introduction to Teaching and Learning in Medicine: Elsevier Health Sciences UK; 2012.
8. Jaques D. Teaching small groups. BMJ : British Medical Journal. 2003;326(7387):492-4.
9. McLaughlin JE, Roth MT, Glatt DM, Gharkholonarehe N, Davidson CA, Griffin LM, et al. The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions School. Acad Med. 2014;89(2):236-43.
10. Parmelee D, Michaelsen LK, Cook S, Hudes PD. Team-based learning: a practical guide: AMEE guide no. 65. Med Teach. 2012;34(5):e275-87.

11. Edmunds S, Brown G. Effective small group learning: AMEE Guide No. 48. *Med Teach*. 2010;32(9):715-26.
12. Fornari A, Poznanski A. How-To Guide for Active Learning A Publication of the International Association of Medical Science Educators. In: IAMSE, editor. 2015.
13. Hinchliff S, Dolan B. *The Practitioner As Teacher - Updated Edition*: Elsevier - Health Sciences Division; 2017.
14. Fry H, Ketteridge S, Marshall S. *A Handbook for Teaching and Learning in Higher Education: Enhancing Academic Practice*. 3rd ed. Oxon, UK: Taylor & Francis; 2009.
15. Kane CM. Fishbowl training in group process. *Journal for Specialists in Group Work*. 1995;20(3):183-8.
16. Grabosky F. The Dynamic Commitment Design. *Small Group Behavior*. 1985;16(1):111-9.
17. Eittington JE. *The Winning Trainer*. 4th ed. New York USA: Taylor & Francis; 2015.
18. Andreas K, Tsiatsos T, Terzidou T, Pomportsis A. Fostering collaborative learning in Second Life: Metaphors and affordances. *Comput Educ*. 2010;55(2):603-15.
19. Race P. *The Lecturer's Toolkit: A practical guide to assessment, learning and teaching*. 4th ed. Oxon, UK: Routledge; 2015.
20. Bloom BS. *Taxonomy of educational objectives: the classification of educational goals : Handbook I, Cognitive domain*: McKay; 1969.
21. Corbin J, Strauss A. *Grounded theory research: Procedures, canons, and evaluative criteria*. *Qual Sociol*. 1990;13(1):3-21.
22. Pope C, Mays N. *Qualitative Research in Health Care*. Chichester, UK: Wiley; 2013.
23. Cronbach L. Coefficient alpha and the internal structure of tests.

Psychometrika. 1951;16(3):297-334.

24. Samuelson DB, Divaris K, De Kok IJ. Benefits of Case-Based versus Traditional Lecture-Based Instruction in a Preclinical Removable Prosthodontics Course. *J Dent Educ.* 2017;81(4):387-94.

25. Brunton PA, Morrow LA, Hoad-Reddick G, McCord JF, Wilson NHF. Students' perceptions of seminar and lecture-based teaching in restorative dentistry. *Eur J Dent Educ.* 2000;4(3):108-11.

26. Kolb D. *Experiential Learning: Experience as the source of learning and development.* Ney Jersey, USA: Prentice-Hall; 1984.

27. Tricio JA, Montt JE, Ormeño AP, Del Real AJ, Naranjo CA. Impact of Faculty Development Workshops in Student-Centered Teaching Methodologies on Faculty Members' Teaching and Their Students' Perceptions. *J Dent Educ.* 2017;81(6):675-84.

28. Biggs J, Kember D, Leung D. The revised two-factor Study Process Questionnaire: R-SPQ-2F. *Br J Educ Psychol.* 2001;71(1):133-49.

29. Miller RL, Benz JJ. Techniques for encouraging peer collaboration: Online threaded discussion or fishbowl interaction. *Journal of Instructional Psychology.* 2008;35(1):87-94.

30. Manzel S. Competence for democracy: Participation and decision-making in classroom interaction. *Citizenship, Social and Economics Education.* 2016;15(1):15-27.

31. Jackson JL, Hill CE, Spangler PT, Ericson SK, Merson ES, Liu J, et al. Training Undergraduate Students to Use Interpretation. *The Counseling Psychologist.* 2014;42(6):778-99.

32. Field JC, Walmsley AD, Paganelli C, McLoughlin J, Szep S, Kavadella A, et al. The Graduating European Dentist: Contemporaneous Methods of Teaching, Learning and Assessment in Dental Undergraduate Education. *Eur J Dent Educ.* 2017;21(S1):28-35.

Table 1. Average 2017 perception questionnaire answers per teaching format (sd) (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree). T-test results compared the seminars questionnaire results with those from the fishbowl.

Q	How true is it that the course...	Seminar year-3 & year-5 (N=97-61%)	Fishbowl year-3 & year-5 (N=92-58%)	Seminar year-3 (N=54)	Fishbowl year-3 (N=51)	Seminar year-5 (N=43)	Fishbowl year-5 (N=41)
1	...was delivered using an attractive format.	3.4 (0.9)	3.7 (0.8)	3.4 (0.7)	3.8 (0.8)	3.3 (1.1)	3.5 (0.8)
		<i>p</i> 0.005		<i>p</i> 0.009		<i>p</i> 0.133	
2	...included important subjects for my training as a dentist.	3.7 (0.9)	3.7 (0.8)	3.6 (1.0)	3.7 (0.8)	3.8 (0.9)	3.7 (0.8)
		<i>p</i> 0.836		<i>p</i> 0.547		<i>p</i> 0.607	
3	...met the set learning outcomes.	3.8 (0.8)	3.7 (0.8)	3.8 (0.8)	3.7 (0.8)	3.8 (0.7)	3.7 (0.7)
		<i>p</i> 0.062		<i>p</i> 0.237		<i>p</i> 0.161	
4	...allowed me to learn.	3.6 (0.8)	3.7 (0.8)	3.3 (0.8)	3.7 (0.8)	3.8 (0.7)	3.7 (0.8)
		<i>p</i> 0.217		<i>p</i> 0.009		<i>p</i> 0.296	
5	...assessment was fair and acceptable.	3.6 (0.9)	3.6 (0.9)	3.7 (1.0)	3.5 (0.9)	3.5 (0.9)	3.7 (0.9)
		<i>p</i> 0.994		<i>p</i> 0.280		<i>p</i> 0.308	
6	...allowed me to be actively involved.	3.1 (1,1)	3.8 (0.8)	3.1 (0.9)	3.7 (0.7)	3.1 (1.0)	3.8 (0.8)
		<i>p</i> <0.0001		<i>p</i> 0.001		<i>p</i> <0.0001	
7	...met my expectations.	3.3 (0.9)	3.5 (0.8)	3.3 (0.9)	3.5 (0.8)	3.8 (0.9)	3.3 (0.9)
		<i>p</i> 0.191		<i>p</i> 0.154		<i>p</i> 0.005	

Table 2. Seminar (N=59) and Fishbowl (N=48) student themes extracted from their comments regarding improvements after their courses were completed.

Seminar	Fishbowl
Long afternoons	Need more time for such wide cases
Hard to keep awake and concentrated	Monitors should help more
Interesting clinical cases	Interesting clinical cases
Too many medical cases	Year-5 always better prepared
Passive for most of the class	Good and very active format
Written summary would help	Fair to have differentiated tasks
Good for communication skills	Good collaboration between 3rd and 5th year
Boring, dark room, after lunch	Too much content and work overload
Helpful coordinator final feedback	Helpful coordinator final feedback
No motivation to take part, better reading	Better than seminars
Classmates not good enough	Enjoyable, like group study

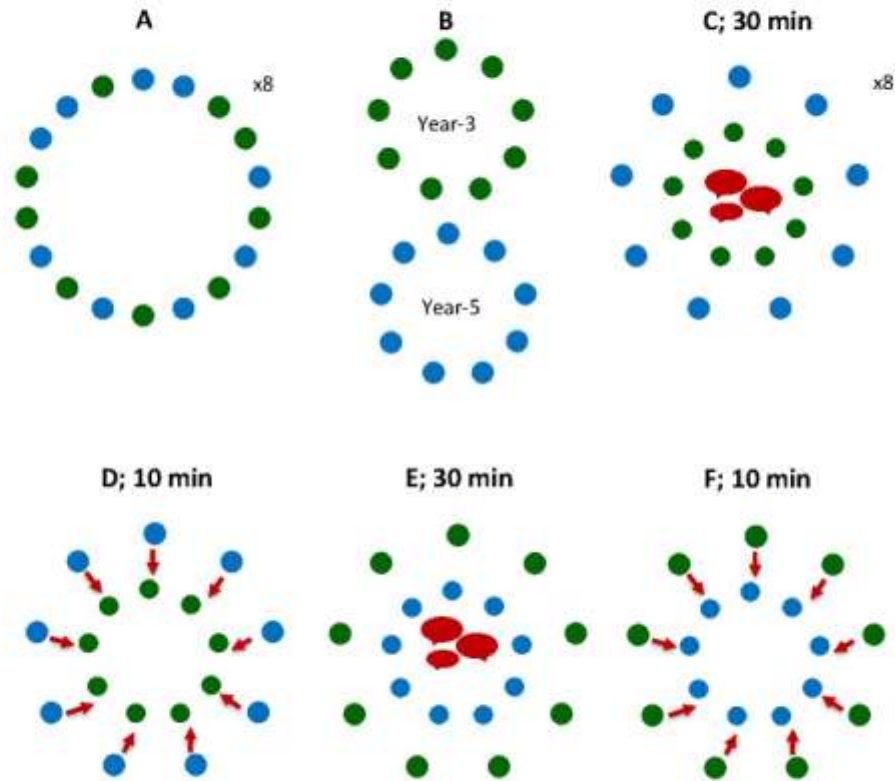


Figure 1. Fishbowl format sequence. All 159 students who were registered for the courses of Semiology I & II and Oral Surgery III & IV were randomly organised in eight teams of 19-20 peers (A); ten formed year-3 subgroups and the other ten formed the year-5 subgroups (B), except for one group that had ten year-3 and nine year-5 students. Each group of year-3 students started by sitting in the inner circle (the fishbowl), where they discussed and tried to solve the semiology questions of the assigned case for 30 minutes, while year-5 groups sat in the outer circle to silently observe the fishbowl group (C). In the following 10 minutes, year-5 subgroups added to the discussion, made corrections and directed questions to students in the fishbowl, complementing the semiology of the case discussed by year-3 subgroups (D). In the next step, the groups reversed roles, and the year-5 students, now in the inner circle, discussed and tried to solve the diagnosis and treatment planning questions of the same case for 30 minutes, while year-3 students sat in the external circle (E). As before, this portion was followed by 10 minutes of questioning from the year-3 groups to their senior peers (F).

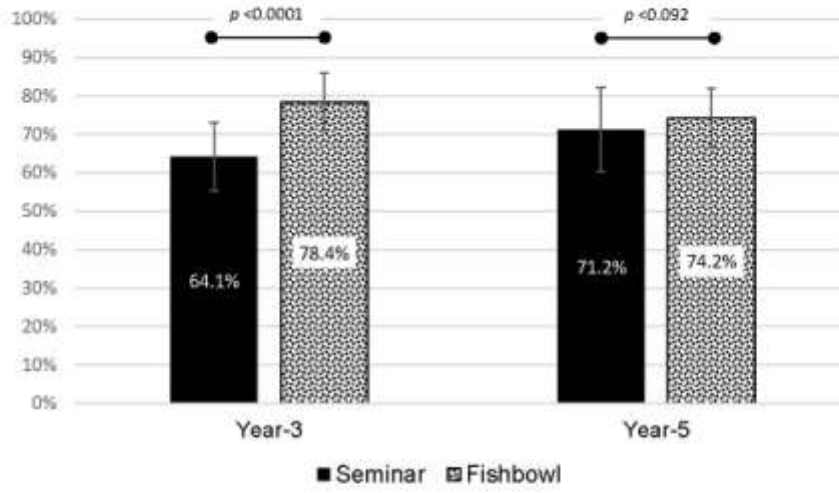


Figure 2. Average seminar and fishbowl quiz scores of year-3 and year-5 students.