Use of alternative tools in the teaching of diabetes mellitus and obesity for improved learning outcome

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1. Introduction

The medical biochemistry course MEDMBK is a five credit point course, which medical students undertake in their 3rd year under the old study program (students commenced prior to 2015). The course is taught twice a year (two semesters). Learning objectives for this course includes knowing the connection between regular medical biochemical analyses and normal pathological processes within the body, knowledge of common medical biochemical analyses used in diagnostics and follow-up in different medical areas, as well as the most important strengths and limitations of common biochemical analyses. Furthermore, it is expected that the students should know the basis for analytical reference values and how biology and analytical variation can affect analytical data. Learning objectives also include knowing the meaning of pre- and post-analytical factors for analytical data and understand specific analytical terms used (sensitivity, specificity, predictive value). During the MEDMBK program, the students go through various different diseases and their associated biochemical analyses/dysregulations; their sensitivity, specificity, predictive value and how these diseases are treated. The MEDMBK course is taught by several (total of 11) doctors/researchers from the department of clinical science (Supplementary Figure 1). Many of these lecturers have have taught the MEDMBK course for years, while some are fairly new/substitute teachers. It is suspected that teaching, in general, is based on blackboard or powerpoint
teaching, and that there is limited use of student activities like group work, quizzing, etc in this course.

The aim of this study was to implement kahoot quizzing (https://getkahoot.com/) as a novel teaching tool in the diabetes and obesity/carbohydrate lectures, as a means to improve the learning outcome from these specific lectures within the MEDMBK course.

2. Methodology: Implementation of kahoot quizzing as teaching tool

Of a total of 51 lecture hours in the MEDMBK curriculum, three hours encompass the subject diabetes mellitus disease and obesity (Supplementary Figure 1). In the fall 2015 semesters, the diabetes mellitus and obesity subject was taught solely by powerpoint. In the spring 2016 semester the students (different class) were quizzed (two kahoot tests) in biochemical signatures of diabetes disease (Supplementary Figure 2) as well as in case studies (Supplementary Figure 3).

3. Results and discussion on the course/lecture evaluation

At the end of the semester, the medical students are normally asked to perform an evaluation of the MEDMBK course and on the separate lectures/subjects. As a means of assessing the value of kahoot quizzing as novel teaching tool to improve the learning outcome of the students, the evaluation of the diabetes mellitus and obesity/carbohydrate metabolism sessions was compared; the evaluation before (fall 2015 evaluation) and after implementing kahoot testing as teaching method (spring 2016 evaluation).

Sadly, only a small fraction of the students performed the two evaluations that was the basis for the comparison (15-20% of students with feedback). Based on specific
comments given by students in the evaluations, a reason for the low response rate may have been that the students did not have time to perform these due to hectic semesters. Moreover, the spring 2016 evaluation was sent, from the institute to the students, at a later stage than the fall 2015 evaluation, and after the students had had the MEDMBK exams. Of other specific comments the students were generally content with how the different subjects had been presented by the lecturers. However, several students wished for more ”organized powerpoint presentations”. Moreover, the suggestion for introducing alternative teaching methods like ”quizzing” of students at the end of the session, was made by one student.

Only the evaluation for the diabetes mellitus and obesity/carbohydrate metabolism lectures are presented in this article.

Results from the MEDMBK evaluation, fall 2015

![Figure 1. Overview of the level of students having participated in the fall 2015 evaluation (in percent %).](image)
Figure 2. Evaluation of the content of the diabetes mellitus lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

Figure 3. Evaluation of the presentation of the diabetes mellitus lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.
**Figure 4.** Evaluation of the content of the obesity lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

**Figure 5.** Evaluation of the presentation of the obesity lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.
Specific comments made by students relevant for the diabetes mellitus/obesity lectures in the fall 2015 evaluation:

“The lectures on diabetes mellitus by she who said she was a researcher and not a doctor could have been more expanded. In the other lectures by other teachers, the pathophysiology have been firstly explained prior to focusing on the molecular level of the disease. I missed this in the lectures as much of what was said was known before. Otherwise, in general very good and inspiring!”.

Results from the MEDMBK evaluation, spring 2016

Figure 6. Overview of the level of students having participated in the spring 2016 evaluation (in percent %).
Figure 7. Evaluation of the content of the diabetes mellitus lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.
**Figure 8.** Evaluation of the presentation of the diabetes mellitus lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

**Figure 9.** Evaluation of the content of the obesity lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.
**Figure 10.** Evaluation of the presentation of the obesity lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

**Specific comments relevant for the diabetes mellitus/obesity lectures in the spring 2016 evaluation:** None made.

**Summary of the evaluations**

In the evaluation from fall 2015, a total of 20 out of 54 students had performed parts or all of the evaluation. In the evaluation from spring 2016 a total of 15 out of 74 students had performed parts or all of the evaluation (evaluation sent out after the exams and possibly the reason for the lower response rate). Comparing the two evaluations from 2015 (no kahoot implemented) and 2016 (kahoot implemented) and the scoring of the diabetes lectures by “content”, a larger fraction of the students were more content (gave top score (5)) in 2016 (58% compared to 20%). Regarding the “presentation” of the diabetes sessions, more students were content (gave top score (5)) in 2016 (50% compared to 13%). For the obesity and carbohydrate metabolism session, a larger fraction of the students in 2016 gave top score (5) regarding the “content” compared to 2015 (33% versus 20%). Moreover, for the “presentation” of this session, more students in 2016 gave top score (5) than in 2015 (36% versus 27%). Worth noting, however, is that there was a larger range in the scores given in 2016 (from 2-5) than in the 2015 evaluation (from 3-5). Moreover, as many as 20% of the students in the 2015 evaluation did not perform the evaluation, while all the students receiving the form in 2016 performed the evaluation. However, it seems that, overall, the students were more content with the content and presentation of the diabetes and obesity sessions in 2016.
than in 2015, indicating that implementation of kahoot quizzing as additional teaching tool was well received and enjoyed by the students.

4. Conclusion

The main impression from the two evaluations is that kahoot quizzing has been a valuable addition to the powerpoint presentation. Whether this addition has truly improved the understanding of the biochemical signatures and symptoms/treatment of various forms of diabetes disease and obesity, is uncertain since a comparison of how the two student classes performed in their exam, was not possible in this study. Moreover, a more extensive teaching tool-specific survey for these sessions should be performed in order to exactly monitor how valuable the students find kahoot as part of their teaching of this subject, and as addition to the general powerpoint presentation.
### Supplementary Figure 1. Schedule of lectures in MEDMBK (highlighted in orange).

<table>
<thead>
<tr>
<th>Week</th>
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<th>Wednesday</th>
<th>Thursday</th>
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</tbody>
</table>

**Week 1**
- **F1** Mødekrav (B-302, Akklen)

**Week 2**
- **F2** Mødekrav (B-302, Akklen)
- **F3** Lørdag (B-302, Akklen)

**Week 3**
- **F4** Mødekrav (B-302, Akklen)
- **F5** Lørdag (B-302, Akklen)

**Week 4**
- **F6** Mødekrav (B-302, Akklen)
- **F7** Lørdag (B-302, Akklen)

**Week 5**
- **F8** Mødekrav (B-302, Akklen)
- **F9** Mødekrav (B-302, Akklen)

**Week 6**
- **F10** Mødekrav (B-302, Akklen)
- **F11** Mødekrav (B-302, Akklen)

**Week 7**
- **F12** Mødekrav (B-302, Akklen)
- **F13** Mødekrav (B-302, Akklen)

**Week 8**
- **F14** Mødekrav (B-302, Akklen)
- **F15** Mødekrav (B-302, Akklen)

**Week 9**
- **F16** Mødekrav (B-302, Akklen)
- **F17** Mødekrav (B-302, Akklen)

**Week 10**
- **F18** Mødekrav (B-302, Akklen)
- **F19** Mødekrav (B-302, Akklen)

**Week 11**
- **F20** Mødekrav (B-302, Akklen)
- **F21** Mødekrav (B-302, Akklen)
Supplementary Figure 2. Kahoot quiz on biochemical signatures of different subtypes of diabetes.
Supplementary Figure 3. Kahoot quiz on case studies and patients with suspected diabetes and obesity.