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

Results from the MEDMBK evaluation, fall 2015

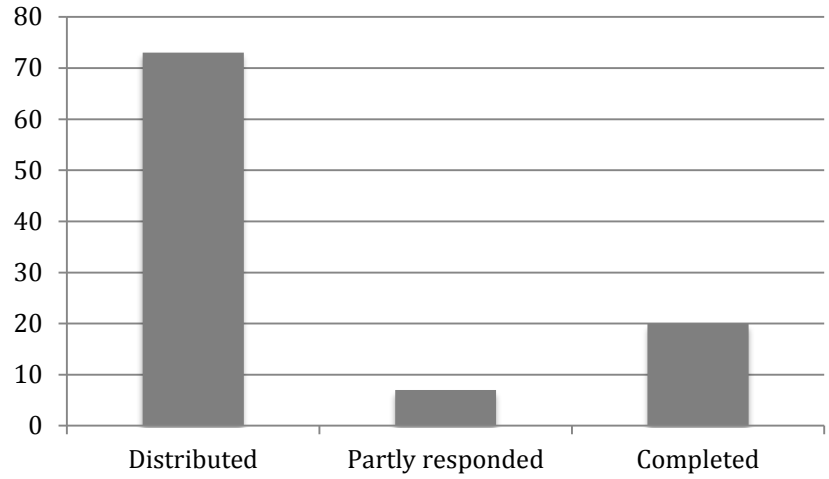


Figure 1. Overview of the level of students having participated in the fall 2015 evaluation (in percent %).

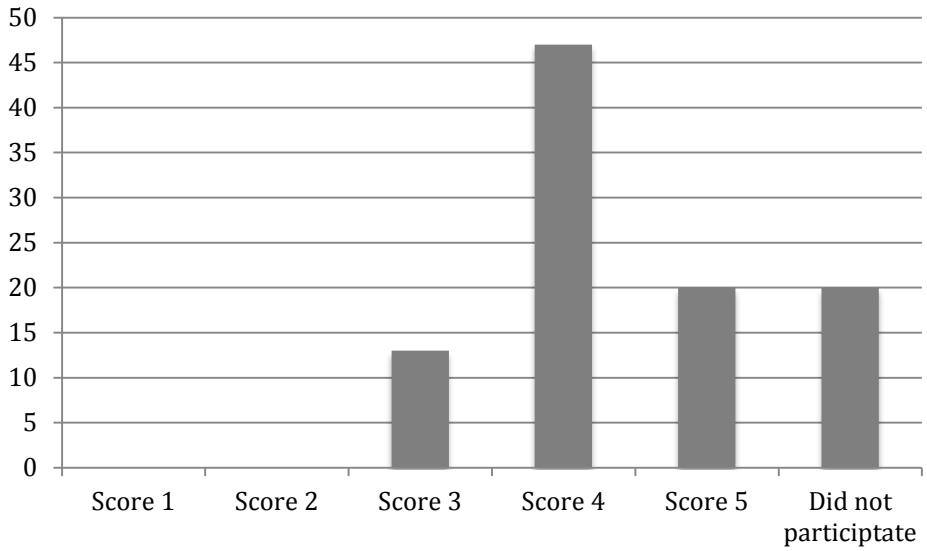


Figure 2. Evaluation of the content of the diabetes mellitus lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

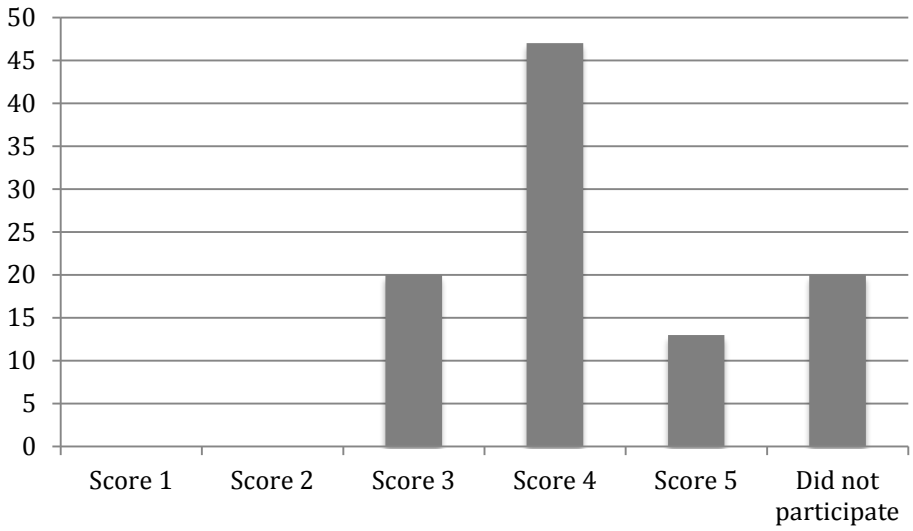


Figure 3. Evaluation of the presentation of the diabetes mellitus lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

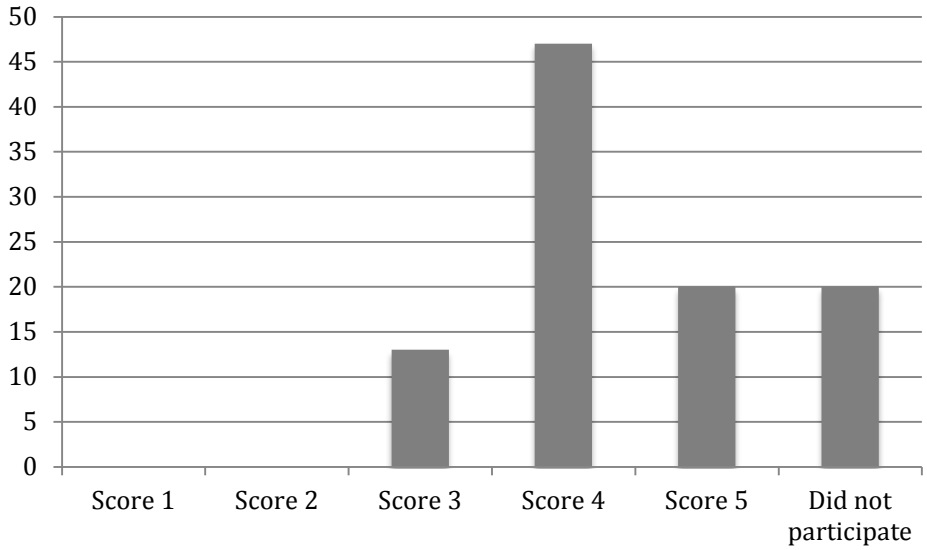


Figure 4. Evaluation of the content of the obesity lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

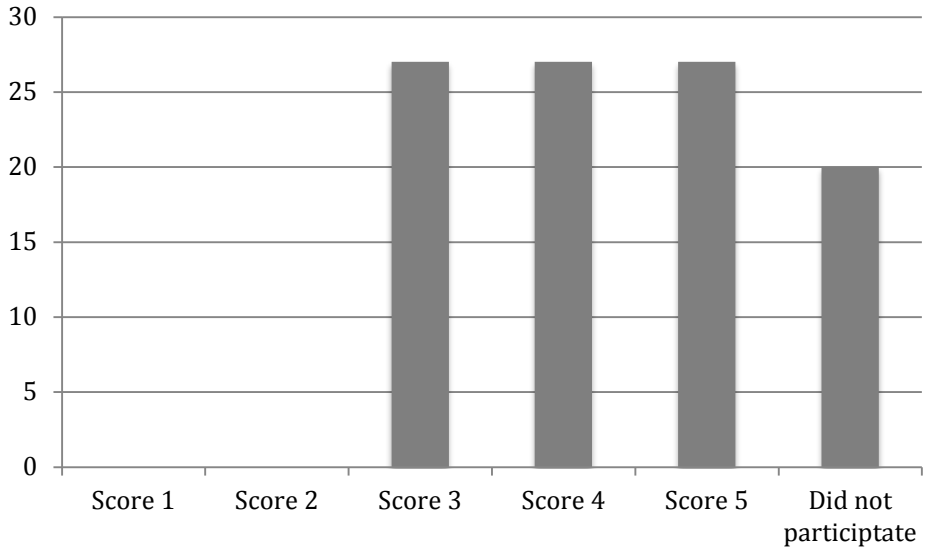


Figure 5. Evaluation of the presentation of the obesity lectures fall 2015. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

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 lecures as much of what was said was known before. Otherwise, in general very good and inspireing!”.

Results from the MEDMBK evaluation, spring 2016

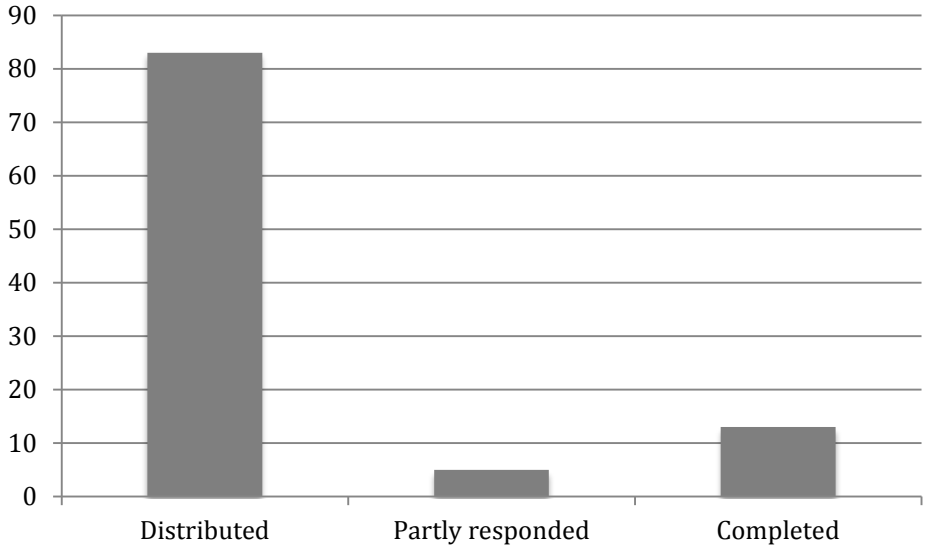


Figure 6. Overview of the level of students having participated in the spring 2016 evaluation (in percent %).

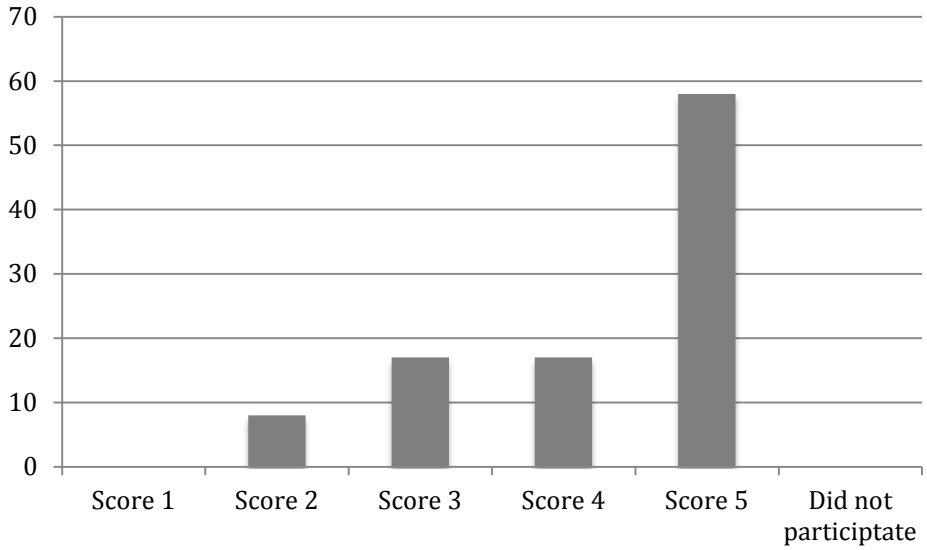


Figure 7. Evaluation of the content of the diabetes mellitus lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

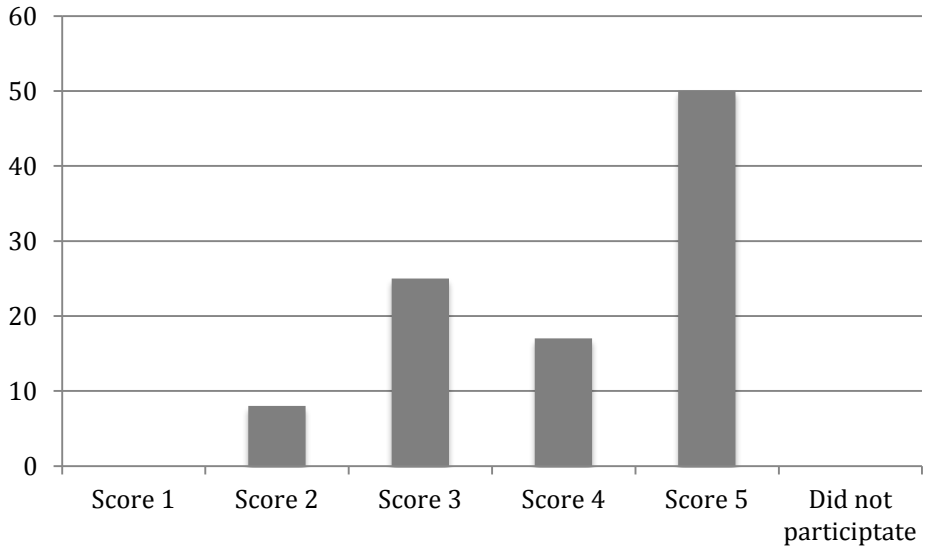


Figure 8. Evaluation of the presentation of the diabetes mellitus lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

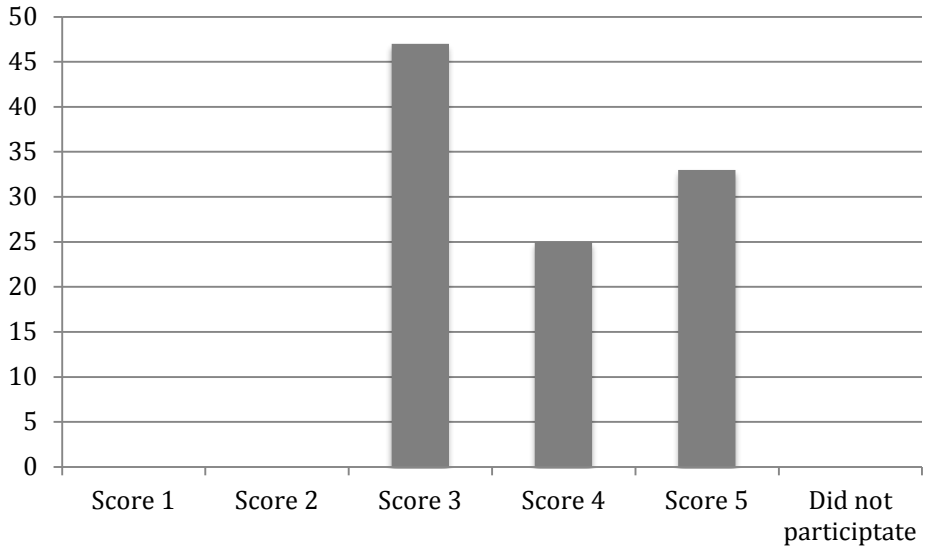


Figure 9. Evaluation of the content of the obesity lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

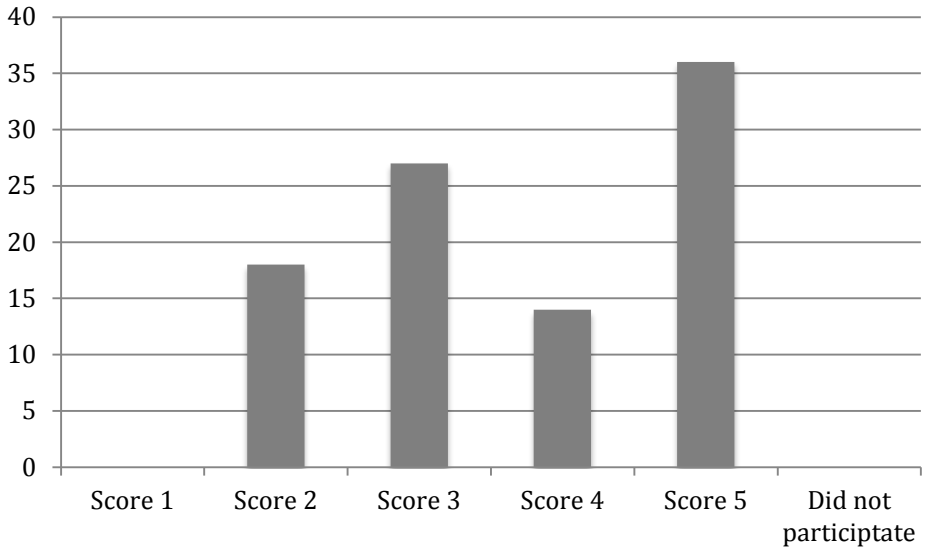


Figure 10. Evaluation of the presentation of the obesity lectures spring 2016. Overview of the level of students and the scores given (in percent %). Score 1 = poorly, score 5 = very good.

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

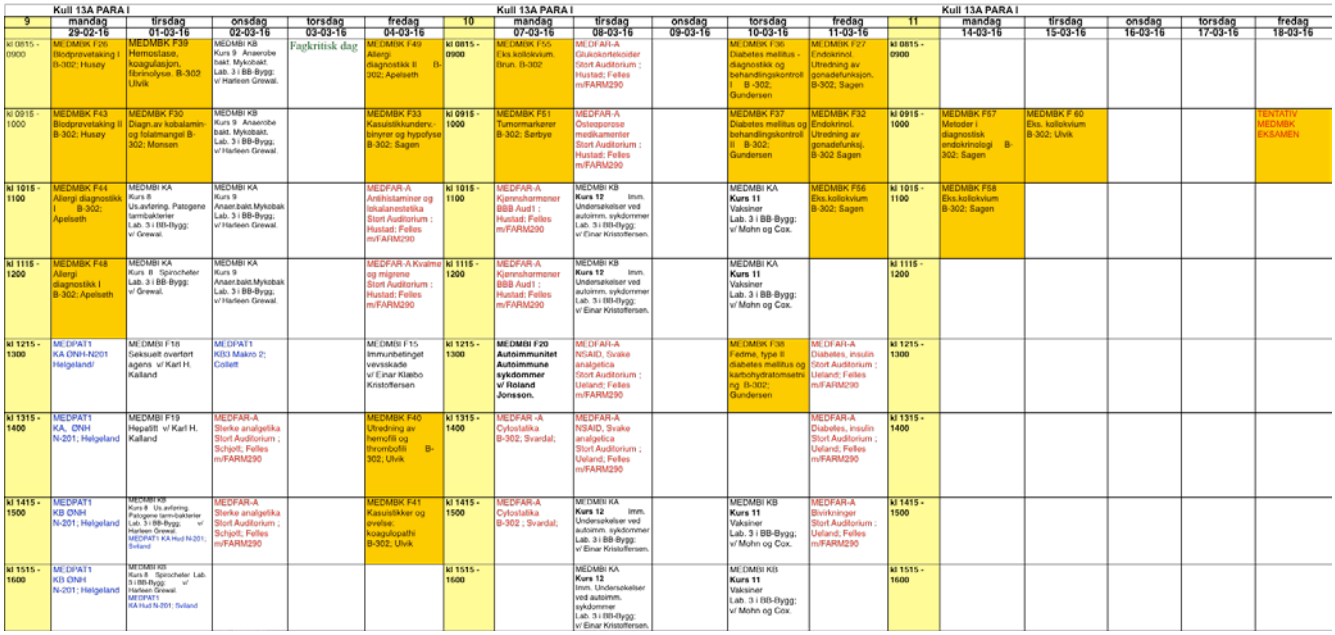
than in 2015, indicating that implementation of kahoot quizzing as additional teaching tool was well received and enjoyed by the students.

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 eextensive 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.

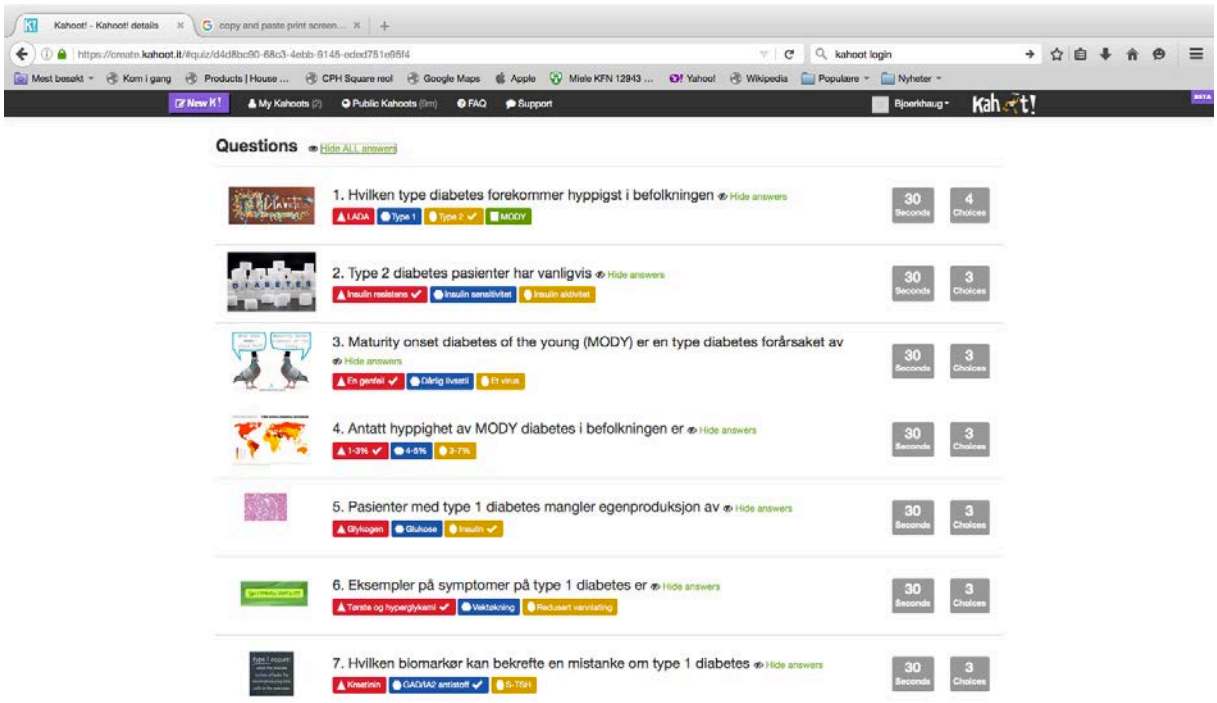
Supplementary Figure 1. Schedule of lectures in MEDMBK (highlighted in orange).

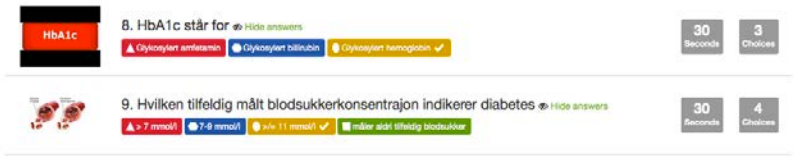
Kull 13A PARA I						Kull 13A PARA I					
5	mandag	tirsdag	onsdag	torsdag	fredag	6	mandag	tirsdag	onsdag	torsdag	fredag
	01-02-16	02-02-16	03-02-16	04-02-16	05-02-16		08-02-16	09-02-16	10-02-16	11-02-16	12-02-16
kl 0815 - 0900	MEDPAT1 F1 Innføring B-302; Molven	MEDPAT1 F9 Tumor 1 B-302 Akslen		MEDMBI KB Kurs 1 Prøvetak. Forsend. Lab. 3 i BB-Bygg; v/ Lindemann /	MEDMBK F19 Bruk av lab.prøver og tolkning av analysesvar III B-302;Ulvik	kl 0815 - 0900		MEDPAT1 KA Tumor N-201; Akslen		MEDMBI F5 Innate immunsystem v/ Kristoffersen	MEDPAT1 F10 Tumor2 B302 Akslen
kl 0915 - 1000	MEDPAT1 Omvisning B-302. Sviland, Halvorsen, Collett, Helgeland			MEDMBI KB Kurs 1 Dyrkning. Lab. 3 i BB-Bygg; v/ Lindeman	MEDFAR-A Innføring for medisinstudenter B-302; Hustad	kl 0915 - 1000	MEDMBK F54 Kollokvium Eksamens-orientering B-302.; Brun	MEDPAT1 KA Tumor N-201; Akslen		MEDMBI F6 HLA v/ Silke Appel.	
kl 1015 - 1100	MEDPAT1 F2 Vevskade B-302;. Molven	MEDMBI F1 B Introd. MEDMBI v/ Wiker. Lab. 3 i BB-bygget. MEDPAT1 KA Basis N-201; Molven		MEDM BI KA Kurs 1 Prøvetak. Forsend. Lab. 3 i BB-Bygg; v/ Lindemann./ MEDPAT1 KB Basis N-201; Molven		kl 1015 - 1100	MEDMBI F16 Infeksjonsimmunologi og vaksiner. v/ Ulvestad	MEDMBI KA Kurs 2 Streptokokker Lab. 3 i BB-Bygg; v/ Harald Wiker. MEDPAT1 KB Tumor N-201; Akslen		MEDMBI KA Kurs 3 Stafylokokker Lab. 3 i BB-Bygg, v/ Harleen Grewal.	MEDMBI F7 Antistoff og TCR; v /Torbj. Hansen
kl 1115 - 1200	MEDPAT1 F3 Regenerasjon B-302; Molven	MEDMBI F2 B Bakterier. Klassifikasjon. Forekomst.Egenskaper v/ Wiker. Lab. 3 i BB-bygget/ MEDPAT1 KA Basis N-201; Molven		MEDMBI KA Kurs 1 Dyrkning. Lab. 3 i BB-Bygg; v/ Lindemann. / MEDPAT1 KB Basis N-201; Molven	MEDMBK F42 Vurdering av nyrefunksjon I. Brun B-302	kl 1115 - 1200	MEDMBI F17 Infeksjonsimmunologi og vaksiner. v/ Ulvestad	MEDMBI KA Kurs 2 Streptokokker Lab. 3 i BB-Bygg; v/ Harald Wiker. MEDPAT1 KB Tumor N-201; Akslen		MEDMBI KA Kurs 3 Stafylokokker Lab. 3 i BB-Bygg; v/ Harleen Grewal.	MEDMBI F8 Cytokiner; v/ Roland Jonsson
kl 1215 - 1300	MEDPAT1 KB2, Makro1 Morild	MEDMBK F46 Utredning av anemi B-302. Brun		MEDPAT1 KB4, Makro 2 Sviland	MEDMBK F29 Vurdering av nyrefunksjon II. B-302; Brun	kl 1215 - 1300	MEDPAT1 KB2, Makro 2; Collett	MEDMBK F23 Lever- og gallesykdom I B-302; Brun		MEDFAR-A Farmakokinetikk 1 Stort auditorium; Hustad Felles m/FARM290	MEDMBK F12 Kasuistikker og øvelser, tolkning B-302; Ulvik
kl 1315 - 1400	MEDMBK F24 Lab. prøver ved revmatisk sykdom B-302.Haldorsen	MEDMBK F17 Bruk av lab. prøver og tolkning av anallysesvar I B-302; Ulvik		MEDMBK F18 Bruk av lab.prøver og tolkning av analysesvar II B-302; Ulvik	MEDMBK F25 Utredning av proteinuri. B-302;Brun	kl 1315 - 1400	MEDPAT1 KA4, Makro 1; Gjelberg	MEDMBK F11 Lever- og gallesykdom II B-302; Brun		MEDFAR-A Farmakokinetikk 2,Stort auditorium ; Hustad Felles m/FARM290	MEDPAT1 F11 Tumor3 B301. Akslen
kl 1415 - 1500	MEDPAT1 KA1, Makro 2 Børretzen	MEDMBI F1 A Introd. MEDMBI v/ Wiker. Lab. 3 i BB-bygget.		MEDPAT1 KA2, Makro 2; Nginamau	MEDMBI F3 Virus som årsak til sykdom 1 v/ Karl H. Kalland.	kl 1415 - 1500	MEDPAT1 F13 Obduksjon B-302. Lilleng	MEDMBI KB Kurs 2 Streptokokker. Lab. 3 i BB-Bygg; v/ Harald Wiker		MEDMBI KB Kurs 3 Stafylokokker Lab. 3 i BB-Bygg; v/ Harleen Grewal. MEDPAT1 KA3, Makro 2 Andersland	
kl 1515 - 1600	MEDPAT1 KA3, Makro 1 Grønseth	MEDMBI F2 A Bakterier. Klassifikasjon. Forekomst.Egenskaper v/ Wiker.Lab. 3 i BB-bygget.		MEDPAT1 KB1, Makro 1 Tærud	MEDMBI F4 Virus som årsak til sykdom 2 v/ Karl H Kalland.	kl 1515 - 1600	MEDPAT1 F7 Trombose B-302; Collett	MEDMBI KB Kurs 2 Streptokokker. Lab. 3 i BB-Bygg; v/ Harald Wiker		MEDMBI KB Kurs 3 Stafylokokker Lab. 3 i BB-Bygg; v/ Harleen Grewal. MEDPAT1 KA4, Makro 2 Sviland	



Kull 13A PARA I							Kull 13A PARA I						Kull 13A PARA I				
9	mandag 29-02-16	tirsdag 01-03-16	onsdag 02-03-16	torsdag 03-03-16	fredag 04-03-16	10	mandag 07-03-16	tirsdag 08-03-16	onsdag 09-03-16	torsdag 10-03-16	fredag 11-03-16	11	mandag 14-03-16	tirsdag 15-03-16	onsdag 16-03-16	torsdag 17-03-16	fredag 18-03-16
kl 0815 - 0900	MEDMBK F26 Blodprøvetaking I B-302; Husøy	MEDMBK F39 Hemostase, koagulasjon, fibrinolyse B-302 Ulvik	MEDMBK KB Kurs 9 Anaerobe bakt. Mykobakt. Lab. 3 i BB-Bygg: v/ Harleen Grewal.	Fagkritisk dag	MEDMBK F49 Allergi diagnostikk II B-302; Apelseth	kl 0815 - 0900	MEDMBK F55 Eks.kollokvium. Brun. B-302	MEDFAR-A Glukokortekoider Stort Auditorium ; Hustad; Felles m/FARM290		MEDMBK F36 Diabetes mellitus - diagnostikk og behandlingskontroll I B -302; Gundersen	MEDMBK F27 Endokrinol. Utredning av gonadefunksjon. B-302; Sagen	kl 0815 - 0900					
kl 0915 - 1000	MEDMBK F43 Blodprøvetaking II B-302; Husøy	MEDMBK F30 Diagn.av kobalamin- og folatmangel B-302; Monsen	MEDMBK KB Kurs 9 Anaerobe bakt. Mykobakt. Lab. 3 i BB-Bygg; v/ Harleen Grewal.		MEDMBK F33 Kasuistikkunderv.- binyrer og hypofyse B-302; Sagen	kl 0915 - 1000	MEDMBK F51 Tumormarkører B-302; Sørbye	MEDFAR-A Osteoporose medikamenter Stort Auditorium ; Hustad; Felles m/FARM290		MEDMBK F37 Diabetes mellitus og behandlingskontroll II B-302; Gundersen	MEDMBK F32 Endokrinol. Utredning av gonadefunksj. B-302 Sagen	kl 0915 - 1000	MEDMBK F57 Metoder i diagnostisk endokrinologi B-302; Sagen	MEDMBK F 60 Eks. kollokvium B-302; Ulvik			TENTATIV MEDMBK EKSAMEN
kl 1015 - 1100	MEDMBK F44 Allergi diagnostikk I B-302; Apelseth	MEDMBI KA Kurs 8 Us.avføring. Patogene tarmbakterier Lab. 3 i BB-Bygg; v/ Grewal.	MEDMBI KA Kurs 9 Anaer.bakt.Mykobak Lab. 3 i BB-Bygg; v/ Harleen Grewal.		MEDFAR-A Antihistaminer og lokalanestetika Stort Auditorium ; Hustad; Felles m/FARM290	kl 1015 - 1100	MEDFAR-A Kjønnshormoner BBB Aud1 ; Hustad; Felles m/FARM290	MEDMBI KB **Kurs 12** Imm. Undersøkelser ved autoimm. sykdommer Lab. 3 i BB-Bygg: v/ Einar Kristoffersen.		MEDMBI KA **Kurs 11** Vaksiner Lab. 3 i BB Bygg: v/ Mohn og Cox.	MEDMBK F56 Eks.kollokvium B-302; Sagen	kl 1015 - 1100	MEDMBK F58 Eks.kollokvium B-302; Sagen			
kl 1115 - 1200	MEDMBK F48 Allergi diagnostikk I B-302; Apelseth	MEDMBI KA Kurs 8 Spirocheter Lab. 3 i BB-Bygg: v/ Grewal.	MEDMBI KA Kurs 9 Anaer.bakt.Mykobak Lab. 3 i BB-Bygg; v/ Harleen Grewal.		MEDFAR-A Kvalme og migrene Stort Auditorium ; Hustad; Felles m/FARM290	kl 1115 - 1200	MEDFAR-A Kjønnshormoner BBB Aud1 ; Hustad; Felles m/FARM290	MEDMBI KB **Kurs 12** Imm. Undersøkelser ved autoimm. sykdommer Lab. 3 i BB-Bygg: v/ Einar Kristoffersen.		MEDMBI KA **Kurs 11** Vaksiner Lab. 3 i BB-Bygg: v/ Mohn og Cox.		kl 1115 - 1200					
kl 1215 - 1300	MEDPAT1 KA ØNH N-201 Helgeland/	MEDMBI F18 Seksuelt overført agens v/ Karl H. Kalland	MEDPAT1 KB3 Makro 2; Collett		MEDMBI F15 Immunbetinget vevsskade v/ Einar Klæbo Kristoffersen	kl 1215 - 1300	**MEDMBI F20 Autoimmunitet Autoimmune sykdommer v/ Roland Jonsson.**	MEDFAR-A NSAID, Svake analgetica Stort Auditorium ; Ueland; Felles m/FARM290		MEDMBK F35 Fedme, type II diabetes mellitus og karbohydratomsetn og B-302; Gundersen	MEDFAR-A Diabetes, insulin Stort Auditorium ; Ueland; Felles m/FARM290	kl 1215 - 1300					
kl 1315 - 1400	MEDPAT1 KA, ØNH N-201; Helgeland	MEDMBI F19 Hepatitt v/ Karl H. Kalland	MEDFAR-A Sterke analgetika Stort Auditorium ; Schjott; Felles m/FARM290		MEDMBK F40 Utredning av hemofili og trombofili B-302; Ulvik	kl 1315 - 1400	MEDFAR -A Cytostatika B-302 ; Svardal;	MEDFAR-A NSAID, Svake analgetica Stort Auditorium ; Ueland; Felles m/FARM290			MEDFAR-A Diabetes, insulin Stort Auditorium ; Ueland; Felles m/FARM290	kl 1315 - 1400					
kl 1415 - 1500	MEDPAT1 KB ØNH N-201; Helgeland	MEDMBI KB Kurs 8 Us.avføring. Patogene tarm-bakterier Lab. 3 i BB-Bygg: v/ Harleen Grewal. MEDPAT1 KA Hud N-201; Sviland	MEDFAR-A Sterke analgetika Stort Auditorium ; Schjott; Felles m/FARM290		MEDMBK F41 Kasuistikker og prelse: koagulopathi B-302, Ulvik	kl 1415 - 1500	MEDFAR-A Cytostatika B-302 ; Svardal;	MEDMBI KA **Kurs 12** Imm. Undersøkelser ved autoimm. sykdommer Lab. 3 i BB-Bygg: v/ Einar Kristoffersen.		MEDMBI KB **Kurs 11** Vaksiner Lab. 3 i BB-Bygg; v/ Mohn og Cox.	MEDFAR-A Bivirkninger Stort Auditorium ; Ueland; Felles m/FARM290	kl 1415 - 1500					
kl 1515 - 1600	MEDPAT1 KB ØNH N-201; Helgeland	MEDMBI KB Kurs 8 Spirocheter Lab. 3 i BB-Bygg: v/ Harleen Grewal. MEDPAT1 KA Hud N-201; Sviland				kl 1515 - 1600		MEDMBI KA **Kurs 12** Imm. Undersøkelser ved autoimm. sykdommer Lab. 3 i BB-Bygg: v/ Einar Kristoffersen.		MEDMBI KB **Kurs 11** Vaksiner Lab. 3 i BB-Bygg; v/ Mohn og Cox.		kl 1515 - 1600					

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.