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Finding valuable direction for teaching and learning in campus-integrated Medical Massive Open Online Courses

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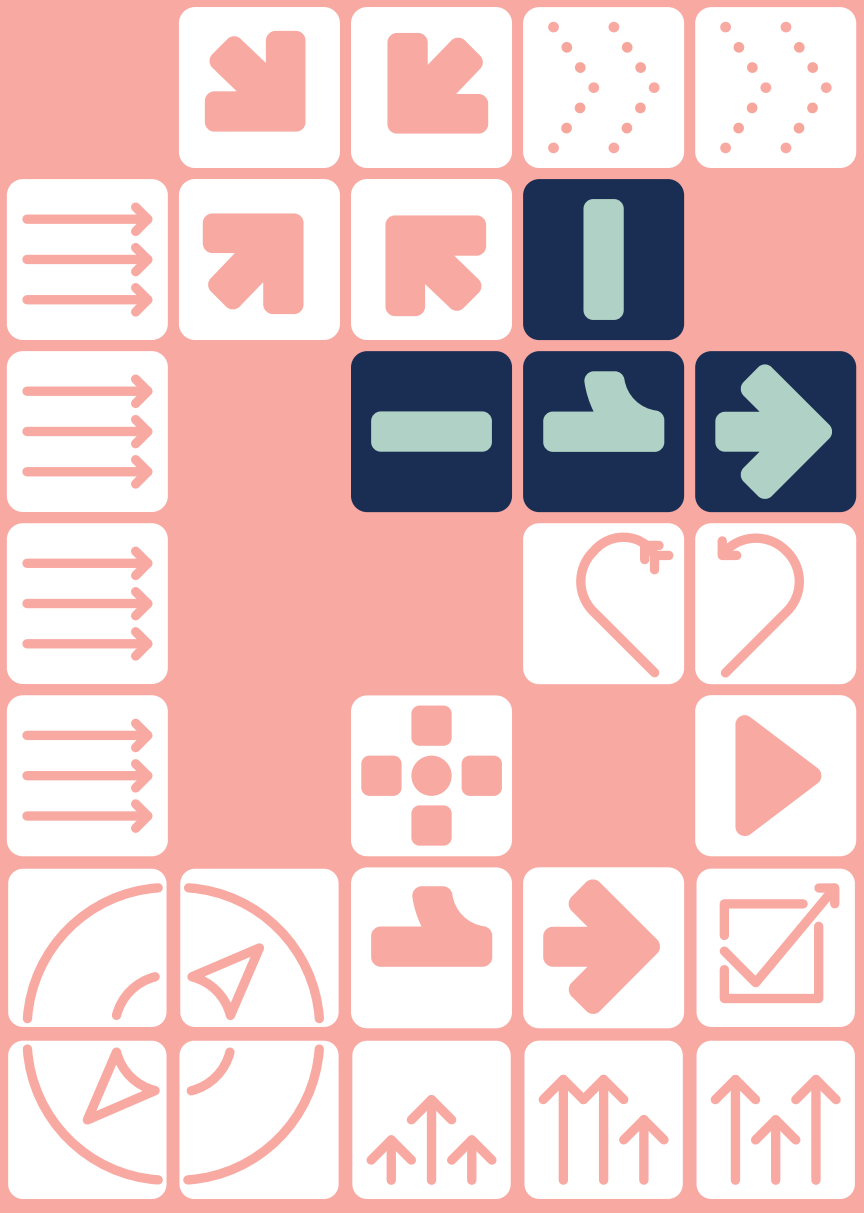
APPENDIX



SUMMARY

In **Chapter 1** medical Massive Open Online Courses (MOOCs) and the desire to integrate these courses into formal campus education are introduced. Then the problem focused on in this thesis is identified: the added value of medical MOOC integration lies in high quality teaching and learning, however how to design optimal teaching and learning is unclear. We operationalize high quality learning and teaching: high quality teaching is approached through the concepts of teaching modes, social-epistemological dimensions of teaching modes, instructional design principles and practical organization of MOOC integration. For high quality learning in integrated medical MOOCs we concentrate on students' motivation to learn, self-regulated learning skills and the act in which these concepts overlap: goal-setting. The aim of this thesis is to provide answers to the following questions: 'What do medical MOOCs have to offer for integration?' in Chapters 2 and 3; 'What does creating and integrating a medical MOOC entail?' in Chapters 4 and 5; and 'How can learning in integrated MOOCs be supported?' in Chapters 6, 7 and 8. Finally, an overview of research questions and aims, methods and analyses for each chapter is provided and the research paradigm is shortly discussed.

In **Chapter 2** we performed a document analysis of webpages to identify and characterize teaching modes in medical MOOCs that are available for integration purposes. First, an overview of 410 medical MOOCs was composed and inclusion criteria were determined: 1) a medical condition in the title, 2) availability in English during time of investigation, 3) no charges for course content, and 4) the stated target audience does not exclude students. Based on these criteria 33 MOOCs on a medical topic were included for analyses. A data collection tool was created and calibrated to analyse teaching modes and their social-epistemological dimensions. For this purpose, researchers enrolled in the MOOCs and examined all course pages. Teaching modes were categorized into existing or new modes and social-epistemological dimensions were identified for each teaching mode through coding according to the Teaching Approach Framework. We found 29 teaching modes, including three that were not described previously as available in MOOCs. The distribution of teaching modes varied considerably among MOOCs. Video lectures, discussion forums and multiple choice quizzes were included regularly, however medical MOOCs were diverse in additional teaching modes and they did not have a universal teaching mode profile. Regarding social-epistemological dimensions, teaching modes in medical MOOCs were mostly focused on constructivist and individual teaching instead of objectivist and group teaching. This means that medical MOOCs have much to offer for integration into campus education and may even support innovative teaching. In addition, provision of a specific teaching mode profile for each MOOC by its creators would ease integration as analyses for this study revealed that identification of a teaching mode profile is quite time-consuming.

In **Chapter 3** we performed a document analysis of all webpages of the same 33 MOOCs as described in chapter 2 to investigate their instructional design quality. An eleven-principle

framework for instructional design quality of MOOCs was compiled, including five principles for learning activities: *problem-centeredness, activation, demonstration, application and integration*; five principles for learning resources and support: *collective knowledge, collaboration, differentiation, authentic resources and feedback;* and one principle for support of self-regulated learning: *goal-setting*. A data collection tool to code the presence of these principles was compiled and calibrated. Subsequently and all course pages were reviewed. We found medical MOOCs to meet the principles in varying degree: *Application, authentic resources, problem-centeredness and goal-setting* were present in many courses. *Activation, collective knowledge, differentiation, and demonstration* were present in less than 50% of the courses. Last, *integration*, *collaboration*, and *expert feedback* were present in less than 15% of the courses. This study showed that the instructional design quality of medical MOOCs varies considerably and should be assessed prior to integration into campus education in order to ensure the instructional quality of the integrated design. In addition this study described *collaboration* and *expert-feedback* to fit poorly to the MOOC concept, and *differentiation* and *goal-setting* as currently under investigation to progressively include in online settings. Finally, more efficient MOOC assessment methods for large scale MOOC integration were described.

In **Chapter 4** we described our experiences with creating the medical MOOC 'Clinical Kidney, Pancreas and Islet Transplantation', and integrating it into campus education. We also discussed experiences of learners who participated in the MOOC between 2016 and 2020. Development of the MOOC took almost a year and was conducted by a multidisciplinary team. The targeted audience was (bio)medical students and healthcare professionals. The product was a course of four weeks, addressing a stage in the transplantation process each week, including activating and innovative activities. The outline and teaching mode profile were provided. In January 2016 the course went live on Coursera, free of charge for everyone interested. Additionally, the MOOC was used in two formal courses of the second year of the medical curriculum at the Leiden University Medical Center, the Leiden Oxford Transplantation Summer School (LOTS), and the Leiden University Honours program. The way the MOOC was used differed in each curriculum. Data of the informal learners were gathered through the Coursera analytics dashboard (n=14996), learner stories (n=112) and a survey regarding learning intentions (n=29). Dashboard data showed that 66% of the enrolled learners started the course, 7.9% earned a certificate, and learners originated from over 90 countries. Learners expressed personal learning goals (30%), achievement of learning goals (22%), liking the design of the course (14%) and gratitude for availability of the course (75%) in learner stories, and mostly joined because of personal growth, interest, the prestigious university or relevance to their job/education. Formal student data were gathered using an evaluative questionnaire with 15-60% response in each course. Additionally the survey regarding learning intentions was used to which 52 students responded. Most students found the MOOC inspired them for knowledge yield and enhanced their learning quite a lot. Over 40% of the respondents in each integration participated in more than the obligated content. Regarding learning intentions, second year

medical school students focused on educational intentions whereas LOTS students focused on personal intentions. Although student data most likely suffered selection bias, integration of this MOOC had added value to many instructors and learners. In addition, we decided that motivation differences between informal and formal learning, and between integration designs needed further investigation.

In **Chapter 5** we constructed a step-by-step approach for integrating medical MOOCs into campus teaching which included 12 steps: 1) Clearly define what content you want to include in your course; 2) Determine the way you like to use the online materials; 3) Search for MOOCs on the selected topic; 4) Determine the availability of the specific MOOC and its contents; 5) Gauge the credibility of the MOOC before deciding to integrate; 6) Ensure the MOOC content is freely available to your students; 7) Determine if the MOOC contains the desired teaching modes; 8) Determine the social-epistemological dimensions of the course; 9) Make sure you align the goals, the teaching activities, and the assessments; 10) Provide clear instructions to students on how to enrol onto the MOOC; 11) Provide clear instructions to students on how to utilize the MOOC and its resources; and 12) Determine the success of MOOC integration. For each step, considerations, tips and literature were provided. We concluded that MOOC integration is not an easy process. It can be made more efficient and effective however, by following the provided steps.

In **Chapter 6** we outlined a mixed methods research protocol in which five research questions regarding motivation to learn, self-regulated learning, and goal-setting in integrated medical MOOC learning are addressed. Research aims were to: 1) describe motivation profiles of medical students learning in integrated MOOCs, and discern if motivation profiles are associated with specific MOOC integration designs; 2) investigate how psychological needs of medical students are satisfied or frustrated in different MOOC integration designs; 3) investigate the relationship between autonomous motivation to learn in an integrated MOOC and use of self-regulated learning skills in that MOOC; 4) uncover processes that are involved in goal acceptance or rejection of medical students in integrated medical MOOC designs with assigned learning goals; and 5) identify obstacles medical students encounter when learning with assigned learning goals in integrated medical MOOCs. Undergraduate students enrolled in three different formal MOOC integration designs using the same medical MOOC, were asked to participate. Integration designs differed on 4 levels: degree of obligation, ratio of online versus face-to-face teaching, replacement or addition of MOOC content to formal courses, and level of contact with other online learners in the MOOC. Data collection consisted of 3 parts: a pre-test survey before the start of the courses, a post-test survey after completion of the MOOC part of the course, and interviews after initial analyses of the surveys, as to inform purposive sampling. Self-reported *motivation to learn* (Aim 1 and 3) and *self-regulated learning* (Aim 3) were measured by the pre- and post-test, and the post-test also included the measures of *psychological need satisfaction and frustration* (Aim

2). Primary qualitative measures to extract from the interviews were *processes that are involved in goal acceptance or rejection* (Aim 4) and *obstacles and promoting factors that medical students encounter* (Aim 5) when learning with assigned learning goals in integrated medical MOOCs. Described analyses included a two-step cluster analysis followed by a chi-square test (Aim 1), a one-way ANOVA followed by post-hoc tests (Aim 2), a cross-lagged panel analysis using Pearson's r (Aim 3), a constructivist grounded theory analysis (Aim 4) and a Cultural Historical Activity Theory template analysis (Aim 5). Results of these studies will help to characterize the motivation to learn in different MOOC integration designs and the underlying reasons, identify the relation between motivation to learn and self-regulated learning, and offer insight into acceptance processes, obstacles and promoting factors surrounding assigned learning goals. Findings will lay a foundation for further MOOC integration practices and research.

In **Chapter 7** we executed a cross-sectional study to explore and describe motivation to learn in formally integrated medical MOOCs for undergraduate students. This study encompasses research aims 1 and 2 as described in chapter 6. Students in three MOOC integration designs (A-C) were asked to participate in a survey after completing the MOOC part of their course, measuring motivation to learn and psychological need satisfaction and frustration. Integration design A added the full MOOC as prerequisite for a face-to-face summer school of 3,5 days. Design B replaced one week of lectures in an eight-week face-to-face module with a set of MOOC activities in a separate iteration of the MOOC, blocking contact with worldwide learners. Finally, Design C added the full MOOC combined with a written assignment as an optional individual course for credit in an extracurricular Honours program. Respectively, 19 (95%), 240 (67%) and 13 (49%) students completed the survey. Exploratory factor analyses showed different factors for motivation than previously described in formal education. However, they resembled motivation factors previously described for learning in informal MOOCs: autonomous motivation, instructor trusting motivation and positive image motivation. These factors were combined to identify motivation profiles, using a two-step cluster analysis, a double split cross validation, and a MANOVA to discern if constituting motivation factors could explain variance. Six motivation profiles were found, with a Cohen's Kappa of .547 for stability of the clusters: self-determined learners and highly self-determined learners, grade hunters, and teacher trusters who are moderately, highly or extremely trusting. Motivation factors in integrated MOOC learning resembled factors in informal MOOC learning, but motivation profiles did not. Further, a chi-square test revealed that a weak to medium association existed between MOOC integration design and motivation profile. This idea was supported by the fact that overall, students in Design B scored lower on psychological need satisfaction and higher on psychological need frustration than students in Design A and C. This study is the first to characterize motivation to learn in formally integrated MOOCs, and the first to compare integration designs based on motivation. Findings imply that motivation factors should be measured as in informal MOOC learning, motivation should be monitored in MOOC integration

contexts, and for obligatory designs specifically, effort should be made to support autonomous motivation to learn.

In **Chapter 8** we performed a constructivist grounded theory interview study to understand acceptance and rejection processes that occur when students learn with assigned learning goals in formally integrated MOOC contexts, since goal setting is an essential self-regulated learning skill for MOOC learning. In this iterative study we found however, that the processes were not limited to integrated MOOC learning, but extended to all assessed undergraduate courses and thus we broadened our scope. Participants were purposively sampled based on motivation and self-regulated learning scores previously gathered, and integration designs. Full saturation of the data was reached after 13 interviews. Through open, axial and selective coding of all interviews by two researchers, Assigned Learning Goal Acceptance Theory (ALGAT) formed. ALGAT describes the processes involved in acceptance of assigned learning goals in a Prescribed Study System. Four essential elements were found: 1) the perceived fit of learning goals as a tool with students' study strategies; 2) the level of explicit or implicit acceptance of content of learning goals depending on the students' strategies; 3) the level of acceptance that is based on considerations of usefulness, comprehensibility, and perceived constructive alignment of learning goals within a course; and 4) students' acquiescence to whatever is expected to pass the examination. Assigned Learning Goal Acceptance Theory contributes to understanding and improving learning goal acceptance and offers directions for future research.

In **Chapter 9** main findings are summarised for each study, and overarching conclusions are drawn. Regarding the added value of medical MOOC integration for high quality teaching we conclude: (1) Medical MOOCs provide a wealth of opportunities for integration into campus, including options to offer high quality, innovative teaching; (2) Medical MOOCs do not all share one teaching mode profile or the same design quality principles, and so each course needs to be investigated separately before integration; and (3) MOOC integration practice is not an easy process and it demands time, several steps and specific knowledge. For high quality learning in integrated medical MOOCs we conclude: (1) Monitoring of autonomous motivation and use of self-regulation skills is essential for personalized support of effective learning in MOOC integration, and personalized motivation support may be targeted through specific integration designs; (2) Instructor trusting motivation is highly important for students in formal medical MOOC learning, and it may be the key to foster high quality motivation; and (3) Goal acceptance may bridge theoretical desires to set goals personally and practical preferences to assign goals, not only in MOOC integration designs. These conclusions are discussed in light of recent literature. Additionally, strengths and limitations are discussed. We conclude with practical implications of this thesis and future research avenues.