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Design thinking in medical education to tackle real world healthcare problems: The MasterMinds Challenge

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ABSTRACT

Educational challenge: Medical education must equip future professionals with the necessary skills to navigate the complex healthcare landscape. Clinical knowledge is essential, and critical and creative thinking skills are vital to meet the challenges of the system. Design thinking offers a structured approach that integrates creativity and innovation, yet its application in medical education is absent.

Solution and implementation: The compulsory MasterMinds Challenge course at Leiden University Medical Center utilizes design thinking principles to address real world healthcare challenges. Final-year medical students participated in a two-day program. The course encompassed empathizing with stakeholders, problem definition, ideation, prototyping, and refining solutions. Presentation skills were emphasized, culminating in a symposium where teams showcase their outcomes. Implementation of the MasterMinds Challenge course was successful with 33 sessions delivered to 1217 medical students. Challenges covered various healthcare topics, yielding creative yet practical outcomes. Students appreciate the real world healthcare challenge, team-based approach, and the applicability of design thinking principles. Challenge owners expressed satisfaction with students' commitment, creativity, and empathizing abilities.

Lessons learned and next steps: To further enhance the MasterMinds Challenge course, a more longitudinal format is being designed, enabling greater autonomy and emphasizing the refining and implementation phases. The course can be extended to medical postgraduate professionals and interdisciplinary collaborations, fostering innovative ideas beyond current practices. By developing problem-solving skills, the MasterMinds Challenge course contributes to a future-proof medical education program and prepares students to meet the evolving needs of healthcare.

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Design thinking; healthcare challenges; collaboration; medical education

Educational challenge



Healthcare is a highly intricate network involving numerous stakeholders. It is pivotal to teach future medical professionals skills to effectively navigate this complexity and address its inherent challenges. While clinical knowledge is essential, medical professionals should also possess critical and creative thinking skills to meet the evolving demands of the system (Frenk et al. 2010; Sandars and Goh 2020).

Medical schools play a key role in training students in problem-solving skills. It is important to adapt current educational models to foster critical and creative thinking skills that consider the diverse needs of patients, healthcare providers, and other stakeholders. Design thinking offers a framework combining creativity and innovation in a structured approach. The design thinking methodology originates from engineering, and is applied in the medical field as well, but scarcely in medical education. An important element of the approach concerns empathizing with the end-user allowing the process of problem-solving

and solution-design to be relevant to (clinical) practice (Badwan et al. 2018; Sandars and Goh 2020; Madson 2021).

Solution and implementation

The MasterMinds Challenge course was developed and introduced at our institute in 2017. This compulsory course targets our final-year medical school students and uses the design thinking principle to tackle real world healthcare challenges. The course runs six times per year, with a maximum of 50 students per course. Prior to the challenge days, each student completes a Belbin team roles test. Based on the diversity of Belbin team roles, we form student teams to ensure a well-rounded mix of skills and behavior within each team. This approach facilitates collaboration and enables teams to approach the challenges using multiple perspectives and behaviors. The first team task is to develop a team name and logo. This assignment

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serves as a team-building exercise establishing a positive and collaborative atmosphere, setting the stage for subsequent stages of the course.

The challenge days consist of two full-time days where student teams learn and apply the design thinking principles. On day 1, students engage in three parts: learning the fundamentals of design thinking, the presentation of the challenge, and a 'learning-by-doing' session (Sandars and Goh 2020). The challenge owner presents an authentic, relevant healthcare-related challenge. Subsequently, teams embark on the initial step of design thinking: empathize. Teams devote at least one hour to gain a deep understanding of the stakeholders. To enhance their comprehension of the user experience, student groups utilize tools such as empathy maps and personas. Subsequently, teams define the problem in more detail. Next, teams scrutinize and redefine the problem, empowering them to effectively navigate potential solutions. During the ideation phase, students leverage their creative abilities and employ brainstorming techniques to generate a plethora of innovative solutions. Throughout this process, students are encouraged to embrace a non-judgmental mindset and explore unconventional and imaginative ideas. Following the divergent ideation phase, convergence unfolds. Teams deliberate and select promising ideas for further exploration and development. Students finalize their selection two hours prior to the conclusion of day 1: the remaining time is for the practical development of a prototype and conducting more detailed stakeholder interviews.

On day 2, students shift focus toward refining their solutions and enhancing their presentation content, structure, and delivery. In a concluding plenary session, teams present their solutions to the challenge owner and other stakeholders. Additionally, each team prepares a comprehensive report describing the stages and tools used throughout their process, potential solutions, and an implementation plan. While the main process stages remain consistent, the choices of tools are unique to each student team. This enables a diverse range of problem definitions and solution outcomes, contributing to a more comprehensive and varied learning experience. Course evaluation is part of the educational routine.

Since its introduction, we organized 33 MasterMinds Challenge courses for 1217 medical students. Table 1 shows examples of addressed topics. All challenge outcomes were creative yet practical, related to the empathizing and ideation phases of the design thinking process. Some students participated in solution implementation teams. For 24 courses, 56% of students completed the survey. For six courses, evaluative survey was unavailable due to adjustments to online methods during COVID-19. For three courses, surveys were missing for technical reasons.

Students rated the course with 7.3 points on average (scale of 1–10, standard deviation 0.97). Positive aspects mentioned were the teaching environment, the real-world healthcare challenge, the team-based approach and the need to use a large set of skills in a limited time period. Most importantly, students positively awarded the design thinking principles and felt engaged to use these tools in the future.

Students indicated as improvement points: limited interdisciplinary character and course duration, particularly for the prototyping and refinement phase. All challenge owners were positive on the course set-up and outcomes: very satisfied (95%) with the students' commitment and positively surprised by the empathizing part (91%) of the solutions. In terms of merits, challenge owners highly appreciated creativity (86%) and applicability (95%) of the presented solutions.

Lessons learned and next steps

To our knowledge, this course is the only compulsory course using design thinking methodology to tackle real-world healthcare challenges in medical education. The course enables medical students to learn to use creative methodology to approach complex problems. The program is a success given the students' and challenge owners' positive feedback. Moreover, input from student-defined solutions directly led to resolution of some challenges. This unique asset substantiates the potential to actually make an impact on the healthcare domain.

Design thinking has been used previously to understand complex medical challenges and design innovations, e.g. in interprofessional healthcare hackathons (McLaughlin et al. 2019). Our focus is to develop our course by enabling involvement of master students from different programs as well. Interprofessional education empowers students with skills crucial for effective teamwork, necessitating reasoning and integrating perspectives of different disciplines. Course refinement will cover organizational issues as time constraints and allocation of credit points (EC) for other curricula.

Students evaluated the two-day course setup divergently. Despite the fact that this pressure-cooker-like format allows a rapid encounter with the different phases of design thinking, it inherently brings some bluntness to the process that could negatively influence creativity. We are exploring options for a longitudinal approach including shared kick-off and close-out sessions, alternated with self-regulated group activities. This format will enhance autonomy, room for creativity, and emphasis on the refining and implementation phases of the process, thereby strengthening the overall learning experience.

Table 1. Topics covered in MasterMinds challenge courses.

Theme	Number of challenges	Example challenge topics
Medical/healthcare	22	'How to effectively plan patients for small sterile procedures' 'How to prevent delays in patient hospital discharge'
Strategic/business management	6	'How to organize medical device maintenance and repair in a hospital'
Education	4	'How to teach palliative care to medical students'
Research	1	'How to involve clinical personnel in scientific research'

Developing problem-solving skills is essential in modern society, and our compulsory course fosters these skills in future medical professionals (Frenk et al. 2010; Badwan et al. 2018). This step-wise approach can be extended to postgraduate medical professionals and areas adjacent to the medical field, enabling interdisciplinary collaboration and exploration of concepts beyond current standards of practice. The relative inexperience of medical students in the specific content of the challenges serves as a catalyst for creative innovation.

By demonstrating the potential of medical students to inspire healthcare professionals in resolving complex challenges, we advocate for a future-proof medical education program stimulating the development of critical and problem-solving skills. The MasterMinds Challenge course is a practical and effective means of empowering future medical professionals with problem-solving skills, ensuring they are well-equipped to meet the evolving needs of healthcare.

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