



Digital and hybrid teaching in medical education using the example of the Medical Interprofessional Training Center (MITZ)

Impulses and development potential

A. Röhle, E. Bibrack*

Medical Interprofessional Training Center, Carl Gustav Carus Faculty of Medicine, Technische Universität Dresden

Abstract

Mit Beginn der COVID-19-Pandemie wurde die Durchführung der praktischen Lehre vor große Herausforderungen gestellt. Das Medizinische Interprofessionelle Trainingszentrum (MITZ) ist diesen mit der Implementierung neuer Lehr-/Lernformate erfolgreich begegnet und hat die Chance genutzt, weitere Projekte zu initiieren. Vor dem Hintergrund sich verändernder beruflicher An- und Herausforderungen wird damit zugleich der zunehmenden Kompetenzorientierung in der Hochschullehre Rechnung getragen, indem Lehr-/Lernprozesse die Lernenden als aktiv Handelnde in den Fokus stellen. Neue digitale Formate und Technologien haben das Potential, den Wandel hin zu einem eigenverantwortlichen und personalisierten Lernen zu vollziehen. Im Folgenden wird unter methodischen und bildungswissenschaftlichen Aspekten die Neuausrichtung der praktischen Lehre im MITZ vorgestellt.

With the onset of the COVID-19 pandemic, the implementation of practical teaching was faced with significant challenges. The Medical Interprofessional Training Center (MITZ) has successfully met these challenges by implementing new teaching/learning formats and has taken the opportunity to initiate further projects. Against the backdrop of changing professional requirements and challenges, this also takes into account the increasing competence orientation in higher education by focusing teaching/learning processes on the learners as active agents. New digital formats and technologies have the potential to bring about a change towards independent and personalized learning. In the following, the new orientation of practical teaching at MITZ is presented under methodological and educational aspects.

*Corresponding author: eva.bibrack@uniklinikum-dresden.de

1. Introduction

With the onset of the COVID-19 pandemic, the implementation of practical teaching was faced with significant challenges. The Medical Interprofessional Training Center MITZ has successfully met these with the implementation of new teaching/learning formats and has taken the opportunity to initiate further projects. In the following, the reorientation of practical teaching at MITZ is presented under methodological and educational aspects.

2. Introduction of the Flipped Classroom Model during the COVID-19 pandemic.

The MITZ, the skills lab of the Faculty of Medicine Carl Gustav Carus Dresden, prepares students of human medicine and dentistry for their future professional life: The compulsory curriculum of the human medicine study program provides for 35 and that of the dental medicine study program for 14 trainings of basic practical and communicative skills. Teaching takes place in small groups in a peer-teaching format [1].

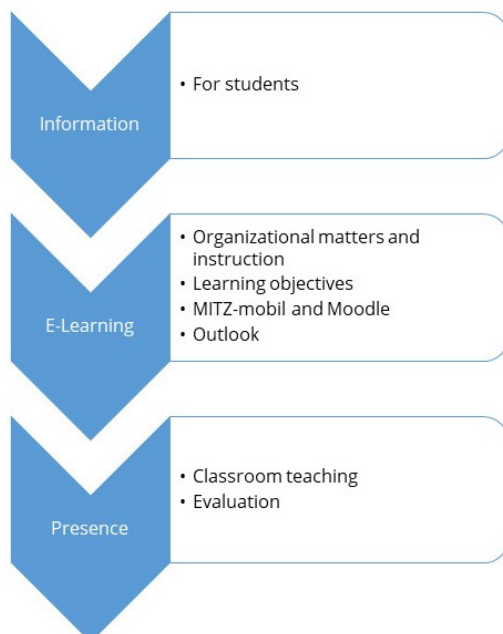


Fig. 1: Overview of the implementation of the ICM at MITZ.

In order to maintain teaching during the COVID-19 pandemic in the summer semester

2020, the teaching/learning format Inverted Classroom (also Flipped Classroom - ICM) was implemented [2]. In this didactic concept, learning content is developed by the students in self-study and taken up during the face-to-face course (Fig. 1). As a variant of blended learning, this concept combines the advantages of digital learning with those of classroom teaching. The self-study phase focuses on learning at a lower level of cognitive processes, which are nevertheless essential in necessary preparation for the classroom phase. This paves the way for activating learning to enable the acquisition of more cognitively demanding skills.

The self-learning phase was structured using the learning management system Moodle in combination with the website www.MITZ-Mobil.de [3] (Fig. 2). After piloting the ICM, the teaching/learning format was also implemented for the winter semester 2020/2021 [4] and firmly established and further developed from the summer semester 2021 [5].

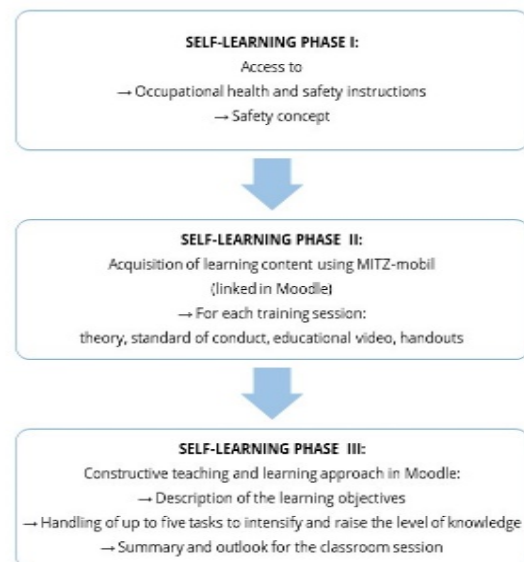


Fig. 2: Structure of the preparatory e-learning in the Moodle learning management system

Accompanying the implementation and stabilization of the ICM, the evaluation on the part of the students was carried out with an online questionnaire based on EvaSys [https://www.electricpaper.de/] survey and examination software.

3. Further development of the ICM

The separate assessment of e-learning and face-to-face training within the evaluation provided further clues for potential improvements [5], which primarily concern the provision and adaptation of interactive teaching materials to the learners' technical requirements (Tab. 1).

In addition, there was an overarching need for adaptation based on constructive alignment [6] and the requirements of the National Competence-Based Learning Objectives Catalogue for Medicine (NKLM) 2.0 [7], which relates to

the learning needs-based adaptation of learning objectives and teaching methods.

With an extended evaluation for e-learning starting in the summer semester 2022 as well as the revision of learning objectives and teaching methods, the demand-oriented compulsory teaching in MITZ is to be further consolidated and expanded.

The success of the realignment of practical teaching in MITZ, as well as the piloting of new innovative hybrid concepts in the context of practical teaching, is justified below from an educational science perspective.

Tab. 1: Adaptations at different levels of the teaching/learning format

Subarea of the ICM	Adjustments made
MITZ-mobil	Additional instructional videos and visuals Clarification and adaptation of individual contents
Moodle	Layout more user-friendly Individual issues sharpened and solutions deposited
Learning objectives	Differentiation of learning objectives into e-learning objectives and classroom objectives
Tutor guides (training of peer tutors)	Basic didactic revision Linking the learning locations MITZ-mobil, Moodle, classroom teaching (New) familiarization of all tutors
Classroom teaching	Structural sequence of the practical teaching unit: teaching outline adapted in favor of practical training time

4. Digitization as an opportunity for competence-oriented university teaching

"In the lecture halls [...] of today, there is a generation of [...] students with new technological needs, the 'millennial generation'. This results not only in new content and new lecture hall environments, but also in a new pedagogy." [8]

A look at the campus of a university confirms it: the "digital natives", students who have grown up with smartphones, tablets and the like, have long since arrived in everyday university life. They interact digitally in almost all areas of life and presumably expect their digital lifestyle to be taken into account in the academic teaching/learning environment as well [8]. Contradictory to this statement, however, it can be stated that this young generation nev-

ertheless does not act as a driver of digitization. In terms of learning and successful completion of their studies, their focus is much more on obtaining credit points. They seem to be less interested in how teaching is actually structured [8]. Most university lecturers also stick to existing teaching formats - lecturers who are very open to digitization tend to be considered "exotic" [8].

As a major digitization driver, the COVID-19 pandemic has increasingly forced teachers to relocate their teaching to new digital learning venues since the beginning of 2020 and thus to redesign the learning environment. Even if this transformation has been forced and many teachers would like to switch back to previous teaching formats after the pandemic, this time of crisis should be understood as a great op-

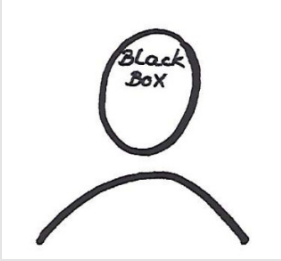
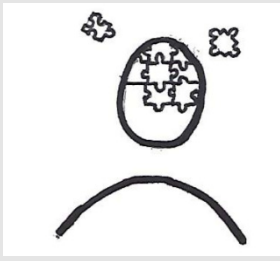
¹ This reference has been translated for the English version of the paper.

portunity to carry out necessary restructuring. Against the background of a changing educational ideal in recent decades, the paradigm of learning theory has shifted from objective-behaviorist to subjective-constructivist approaches (Tab. 2). The assumption is no longer that knowledge is objectively available, but that individuals need skills to access, prioritize, and structure knowledge in order to represent it individually. The focus is less on the creation and availability of knowledge and more on knowledge management, i.e., dealing with an ever-increasing amount of knowledge [9]. The significance of such interdisciplinary, methodical skills is becoming increasingly important in order to adequately prepare students for professional, but also for societal demands and challenges. The shift from content orientation to competence orientation in studies is expressed by the term *shift from teaching to learning* [9]. This paradigm shift requires restructur-

ing measures - teaching/learning processes must be modified, learning environments must be increasingly learner-centered to meet the needs of learners. Learning must encourage independent thinking and practice and self-directed complex problem solving. Accordingly, teaching must be designed in such a way that students act as active agents in their learning process, while teachers take on more of an accompanying, supporting, moderating role. As a consequence, the learning environment must be adapted and enriched with new media (e.g., through blended learning formats) [9].

The period of crisis could accelerate the progress of digitization at German universities. In necessary adaptation to future challenges facing society as a whole and the profession, this further development should be accelerated instead of falling back into old teaching patterns.

Tab. 2 Comparison of learning theories

Behaviorism	Constructivism
Learning as a "black box"	Learning as a construction process
	
Focus is on generation and availability of knowledge: "Deposit of knowledge".	Focus is on tapping, prioritizing and structuring knowledge: "Knowledge management".
Goal: Acquisition of (factual) knowledge → Giving correct answers	Goal: Acquisition of competence → Coping with complex situations
Learners act in an externally/externally controlled manner	Learners act self-directed
Teacher as authority figure	Teacher as coach, companion:in

5. Learning in a personalized learning environment

With the pandemic introduction of the Flipped Classroom model, MITZ has taken a significant step toward realigning future-oriented teaching. Hybrid learning at ICM complements digital and analog teaching in a coordinated concept that integrates the digital content instead of letting it exist merely as a supplement or in

isolation alongside the classroom components. e-learning and classroom teaching form a precisely coordinated unit and, as such, lead to the achievement of the defined learning objectives.

MITZ's hybrid teaching model offers good conditions for increasingly integrating students as active designers of their learning process in a new learning environment. Learning is to be

designed in a more personalized way and oriented towards the respective individual. In a personalized learning environment, prior knowledge, experiences and interests of the learners are the focus. At the same time, students are responsible for independently identifying strengths and deficits with regard to their own acquisition of competencies. This self-assessment leads to measures being taken to achieve the desired and required learning goals. The learning process is thus characterized by the students becoming active. The teachers are by no means passive or do not bear any responsibility on their part, but have to create a stimulating environment for this kind of learning. Central demands on this learning environment are:

- Enabling students to independently explore and tackle complex problems.
- Enabling exchange with other learners.
- Ensuring feedback on learning success.

In order to meet these requirements and to complement the existing hybrid compulsory courses in MITZ, the individual needs of students are to be increasingly addressed in the form of optional learning opportunities. With the help of digital assessments, for example, feedback procedures are to be developed that provide students with feedback on their learning success. The establishment of a personalized learning environment has numerous advantages, both for the structural conditions in MITZ and with regard to the comprehensive acquisition of competencies:

- Existing teaching/learning scenarios of hybrid compulsory teaching serve as a basis for the conception of optional offerings; already existing (digital) media can be taken up and expanded.
- The offers can be used flexibly, i.e. independent of personnel and time resources.
- Digital competencies of the students are promoted.
- Digital learning opportunities as a chance to include students who are not able to participate in face-to-face courses.
- Self-assessment skills are encouraged.
- The acquisition of professional competence is promoted on an overarching level.

The Flipped Classroom model as a pandemic teaching concept has not only ensured the continuation of compulsory teaching, but has also created numerous points of contact for the expansion of digital learning opportunities at MITZ, thus paving the way for a new personalized teaching/learning culture at MITZ.

6. Perspectives in the virTUos project

It can currently be stated that digital teaching/learning formats are not yet used comprehensively and integratively in medical training, but their added value has become increasingly relevant in the course of the necessary adjustments due to the COVID 19 pandemic, among other things. In addition, the need for augmented integration of digital teaching is justified against the background of participation in education and by the changed learning behavior of students. The merely selective enrichment of teaching with digital media does not correspond to the present and the still expected need for a fundamentally changing learning culture. The increasing change towards teaching that accompanies the self-directed learning process [10] and a more intensive interaction with learners offers the opportunity to permanently create a teaching offer that enables demand-oriented and user-oriented learning free of structural and temporal conditions.

With this goal in mind, various sub-projects are to be realized within the framework of the virTUos project in the field of medicine - on the one hand, the establishment of telepresence robots in teaching and, on the other hand, the development and introduction of a digital assessment for the evaluation of skills and abilities in the self-directed learning process.

7. Telepresence Robot

In the future, telepresence robots will make MITZ teaching/learning offerings accessible at a low threshold. Students who are unable to participate in classroom teaching will not be impaired in their studies. The use of telepresence robots is therefore seen as an opportunity to make teaching at MITZ more inclusive, to enable digital distance learning and

thus to allow all students to participate in the teaching/learning opportunities and to have a positive influence on a successful course of study.

8. HybParc

In addition, a particular challenge of practical teaching at MITZ is coping with the individual learning needs of a large number of students. Developmental learning support for each individual student is not feasible due to limited human resources. Against this background, it is necessary to develop assessments that nevertheless address individual learning needs by setting up a self-learning environment. Students should increasingly recognize their own potential and deficits in the learning process and take advantage of appropriate training and self-learning opportunities. For feedback and assessment, an automated feedback system will be used, which will be developed, piloted and implemented in the subproject HybParc in an interprofessional innovation team. The focus is on the use of video recordings and sensor data for the (partially) automated analysis of action sequences within training/examination courses. In addition to increasing efficiency in the teaching of practical skills, the HybParc subproject also promotes the development of digital skills among students.

In addition to sensor-based feedback, teaching/learning scenarios for virtual realities will be designed in the HybParc subproject. Virtual realities are able to simulate real situations and dynamic facts and make it possible to experience them. In the future, learning in VR learning environments will be another way to provide additional learning opportunities for students.

9. Conclusion

The experience gained from the Covid-19 pandemic has generated important insights in the field of digital teaching. The progress should be used as an opportunity to further advance digital teaching and learning and not to fall back into old teaching patterns. However, the opportunities and limitations of digitization

should also be weighed up critically as a meaningful supplement to established classroom teaching. In this context, digital teaching/learning formats must be embedded in a coherent didactic concept and always used in a justified manner to complement other teaching formats.

The current development of practical teaching at MITZ points the way to trends that will significantly influence the learning environment and teaching/learning formats and make teaching more personalized, interactive and mobile - MITZ plays an exemplary role in the field of medical education.

Literature

- [1] Alvarez S, Dethleffsen K, Esper T, Horneffer A, Reschke K, Schultz JH. An overview of peer tutor training strategies at German medical schools. *Z Evid Fortbild Quali Gesundheitswes.* 2017;126:77-83. doi: 10.1016/j.zefq.2017.09.009.
- [2] Röhle et al. Practical teaching in undergraduate human and dental medical training during the COVID-19 crisis. Report on the COVID-19-related transformation of peer-based teaching in the Skills Lab using an Inverted Classroom Model. *GMS J Med Educ* 2021;38(1):Doc2. DOI: 10.3205/zma001398.
- [3] Weber T. MITZ-mobil - Contemporary learning at the Carl Gustav Carus Medical Faculty in Dresden. In: Annual Meeting of the Society for Medical Education (GMA). Bern, Sept. 14-17, 2016. Düsseldorf: German Medical Science GMS Publishing House; 2016. docDE25-616 . DOI: 10.3205/16gma265.
- [4] Röhle A, Hübsch G. Necessary steps of further development of practical teaching after implementation of COVID-19 conditional blended learning concepts. In: 15th International SkillsLab Symposium 2021. sine loco [digital], 18-20 Mar 2021. Düsseldorf: German Medical Science GMS Publishing House; 2021. DocV3.3. DOI: 10.3205/21isls32, URN: urn:nbn:de:0183-21isls329.
- [5] Poweleit G, Krumm K, Willemer M-C. In press. The further development of the 4th learning site at the Medical Interprofessional Training Center (MITZ) Dresden. Demand-oriented adaptation of e-learning offerings to promote learning motivation and learning effect of students of human medicine: iSL 2022 - online event of Karl Landsteiner Private University for Health Sciences, Krems, Austria, University of Bern, Switzerland and University of Cologne, Germany. 2022.
- [6] <https://www.e-teaching.org/didaktik/konzeption/constructive-alignment> (last accessed 4/12/2022)
- [7] <https://www.medizinische-fakultaeten.de/themen/studium/nklm-nklz/> (last accessed 4/12/2022)
- [8] Handke J. Handbuch Hochschullehre Digital. Guide to modern and media-appropriate teaching. Badeb-

- Baden: Tectum; 2020: 19-44. DOI: 10.5771/9783828875302.
- [9] Bachmann H. Competence-oriented university teaching. The need between coherence of learning objectives, forms of assessment and teaching-learning methods. Bern: h.e.p; 2011: 14-31.
- [10] Pädagogisches Landesinstitut Rheinland-Pfalz Speyer. Changing perspectives in the education system: from input- to outcome-oriented thinking. Available at www.kmk-format.de/material/Fremdsprachen/1-2-7_Outcome-Orientierung.pdf (last accessed 12.4.2022).