Implementing Kolb´s Experiential Learning Cycle by Linking Real Experience, Case-Based Discussion and Simulation

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M. Wijnen-Meijer[1], T. Brandhuber[2], A. Schneider[2] and P.O. Berberat[1]

[1]Technical University of Munich, School of Medicine, TUM Medical Education Center, Munich, Germany.
[2]Technical University of Munich, School of Medicine, Institute of General Practice and Health Services Research, Munich, Germany.

ABSTRACT

BACKGROUND: Background: To prepare medical students for their future, they must become acquainted with clinical practice, for example by means of simulations, clerkships and discussing patient cases. By connecting these different approaches, according to Kolb´s experiential learning cycle, the learning effect can be strengthened.

METHODOLOGY: In the development of a didactical program for students who are being prepared for their role as general practitioners, we have adopted a new didactic approach, in which educational formats are interlinked, according to Kolb´s experiential learning cycle. The content of these courses is determined by the Entrustable Professional Activities (EPAs) for the clerkship in family medicine, combined with the most common chief complaints of patients in the GP's practice. In 2019, the first course was implemented at the Technical University of Munich, Germany, with 6 medical students. A first seminar discusses patients who the students have seen for themselves during their clerkship in family medicine. In addition, matching theory is discussed and skills are practiced. In the next seminar, students apply the acquired knowledge and skills in scenarios with standardized patients. Students evaluated the courses as positive. The evaluations show they find discussing personally experienced patient cases and the opportunity to practice very valuable.

CONCLUSIONS: A course design according to Kolb's Experiential learning cycle, which integrates experience, theory and simulation, is a valuable addition to existing forms of teaching in medical education. Students appreciated both discussing personally experienced patient cases and the opportunity to re-practice similar cases in a simulated environment. To gain more insight into the learning effects, it is recommended to further explore this approach in a different context.

KEYWORDS: kolb, simulation, clinical practice, curriculum development

TYPE: Methodology

CORRESPONDING AUTHOR: Marjo Wijnen-Meijer, Technical University of Munich, School of Medicine, TUM Medical Education Center, Ismaninger Straße 22, 81675 München, Raum 03/3.14 (3. OG).
Email: marjo.wijnen-meijer@tum.de

1. Background

In order to prepare medical students for their future work, several didactic settings are used to integrate clinical practice into medical school. Besides direct clinical exposure discussing patient cases in seminars, which enable students to learn clinical reasoning and simulation-based training, where students can practice skills such as communication and physical examination are frequently used methods.[1–3] Courses encouraging clinical reasoning, decision-making and problem-solving are of great importance for medical students to apply their knowledge expanding beyond the medical facts.[4] For example, the clinical reasoning mapping exercise (CResME) discussed by Torre et al in 2019 uses clinical information for multiple disease entities as nodes in different domains (history, physical exam, imaging, laboratory results, etc) and allows students to connect these nodes of information developing accurate differential diagnoses and/or management plans.[5] Simulation tools in medical education such as simulated patients or task trainers, provide the students with experiences of patients in controlled setting and allow students to experiment, make mistakes, get feedback and acquire clinical skills without putting patients at risk.[6] Moreover, a simulation-based training in handling critically ill patients was shown to improve not only diagnostic and medical expertise skills but also non-technical skills, such as situation awareness, decision-making, communication, teamwork and leadership.[7] Finally, there are various forms of education in clinical practice, ranging from one-day observations to carrying out medical tasks under supervision during longer clerkships.[8,9]

Furthermore, in order to strengthen the link with and preparation for clinical practice, the concept of Entrustable Professional Activities (EPAs) is increasingly used in the clinical phase of medical school and residency.[10–13] EPAs are defined as essential elements of a physician's daily work that can be assigned to a trainee once sufficient competences have been acquired. As the amount of supervision is gradually reduced, students are given increasing responsibility for performing medical tasks.[10,11] As a result, students and residents grow incrementally in their (future) roles, facilitating the transition to the next phase. Although the EPA concept was

originally developed for residency, it has been implemented in medical schools as well.[10–12] An important prerequisite for the successful implementation of this method is that trainees are regularly observed performing the tasks, so that the amount of required supervision can be estimated. In addition, it is necessary for the development of the trainee that he/she receives targeted feedback on a regular basis.[11,13]

Although all three, the discussion of patient cases, simulation and learning in clinical practice are part of most medical curricula, they are usually not directly didactically linked in one single course. There are various chief complaints in family medicine, which differ greatly. It is different whether one treats abdominal pain or a common cold. The students cannot simply extrapolate from cause A to cause B. Moreover, there is no standardised training for these clearly defined chief complaints.

This lack of integration makes it more difficult for the students to connect the knowledge and skills they have learned in a coherent way. [14] This program aims to create a standardisation of training in relation to the chief complaints.

Combining and integrating explicitly all these three didactic settings can be seen as an implementation of Kolb's learning cycle which postulates that effective learning is ideally achieved by progressing through a cycle of four stages (see Figure 1): *having an experience ("concrete experience"), reflecting on the experience ("reflective observation"), learning from the experience ("abstract conceptualization" and trying out what you have learned ("active experimentation").*[16] Additionally the EPA concept may build a coherent guiding base through the cycle and emphasizes the targeted final competence.

In Kolb's learning theory, which fits the constructivist approach, the learned knowledge is mentally anchored by a concrete experience, corresponding to this knowledge. This means that the different didactic methods must be logically linked to each other on the same subject. [15]

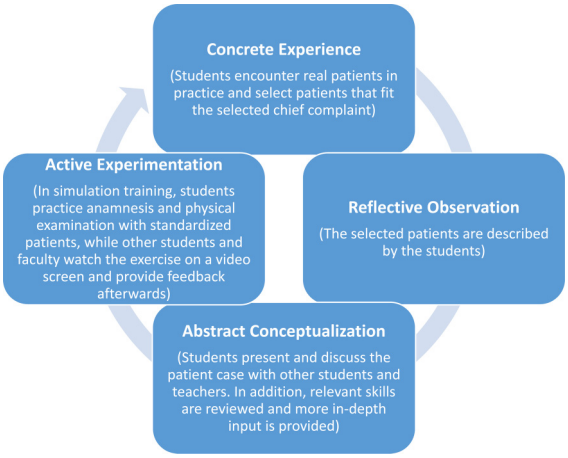

Figure 1. Adapted kolb´s experiential learning cycle.

We made the connection between these didactic approaches in a program for students who are preparing for their future role as general practitioners. In addition to the regular medical school program, these students receive additional courses on topics that are especially relevant to general practice.[16] The content of these courses is determined on the basis of EPAs for the final yeaŕs clerkship in family medicine, combined with the most common chief complaints of patients in the GP's practice. After the cognitive case-based confrontation with personally experienced cases, they faced matching simulated cases and finally focused und reflected on follow-up experiences of the same cases in general practice reality.

This article discusses the methodology and the first experiences with this didactic approach.

2. Course Design

2.1. Context

From 2019 a special track has been developed at the medical school of the Technical University of Munich, in addition to the regular curriculum, to prepare students to work as general practitioners in rural areas of Bavaria. All students of the clinical phase of medical school can apply. The participating students receive a stipend and mentoring by experienced GPs. Participation in the additional educational program is compulsory. In this context, this course, based on Kolb´s experiential learning cycle was introduced.

2.2. Course

Selected chief complaints (based on a high frequency and relevance in general practice) were linked to specific EPAs (for example the chief complaint "acute abdominal pain" for the EPA "Consultation with a patient with acute symptoms") and consists of the following components:

1. During a clerkship in family medicine, two students are given the assignment to select a patient that fits the selected chief complaint. They describe the symptoms of this patient, anamnesis, physical examination, additional examinations, differential diagnosis, treatment and further course (*Kolb's "concrete experience" & "reflective observation").*[15]
2. During a following seminar (3 hours) with a focus on clinical reasoning, these students present these patient cases and discuss them with other students and teachers (who are experienced GPs). Furthermore, a short knowledge test on the subject, an in-depth input by the teachers and repetition of relevant skills, for example, the anamnesis and physical examination in case of acute abdominal pain, is included in this seminar. Therefore the students elaborate the experienced cases and gain further specific and structured knowledge and skills *(Kolb's "abstract conceptualization").* [15]

3. Consequently in a simulation training session (3 hours) the students practice anamnesis and physical examination with standardized patients. The cases fit the same chief complaint, but the students do not know the details beforehand. The other students and the teachers watch the consultation on a video screen in a different room and give feedback afterwards. During the feedback session, certain parts of the video recordings can be viewed and, if desired, the respective students can view the entire video recording later themselves. By means of this simulation session, the students can immediately transfer the newly gained insights to a practice situation and this in a highly structured and protected learning environment *(Kolb's "active experimentation")*.[15]
4. Finally, the students reflect in the upcoming clerkships on the renewed experience with similar cases in a portfolio-based matter. Thus, the cycle closes on a higher level as it started in the clinical reality *(Kolb's "concrete experience" & "reflective observation")*. [15]

During the whole course (consisting of 6 hours of seminars, combined with at least four weeks of education in clinical practice) the specific EPA is the guiding concept that helps teachers and students align during all the different didactic settings to the aimed at final competency.

A total of 10 such courses have been developed, based on the 10 chief complaints. In each course, 2–3 students prepared the cases for the first seminar and did the simulations in the second seminar. The other students actively participated in the discussion, observed the simulations and provided feedback. Consequently, all students have learned about all 10 chief complaints.

Table 1. Evaluation results in % of the seminar (discussion of patient cases, content presentation and training skills) -average evaluation scores of two sessions (N = 6 for both sessions).

N = 6	++	+	+/-	-	--	N.A.
The information on the seminar was clear and concise.	58	42				
I found the seminar instructive.	58	42				
I found the self-study assignments instructive.	50					50
I feel that I have achieved the learning goals.	92	8				
I found the coherence between the parts of this seminar good.	75	17				8
The contents of the seminar corresponded to my previous knowledge.	83		17			
I found the guidance from the teachers stimulating.	100					

2.3. Evaluation

The students were asked to rate the seminars as a whole with a score

In order to evaluate the usefulness of this didactic method, the students who took part in the first two series of the course completed an evaluation form consisting of quantitative questions, supplemented with the questions for qualitative explanations. The six students (4 female) were asked to rate the seminars as a whole using a score from 1 (= very good) to 6 (= very bad). The average grade for the first seminar (discussion of patient cases, content presentation and training skills) was 1.4 and for the simulation training (anamnesis and physical examination with standardized patients, followed by feedback) 1.6. This shows that the students appreciated the overall design of the course. This is also shown by the scores on the different items, which the students have rated with "++", "+", "+/-", "-" or "- -" (see Tables 1 and 2 and Supplemental material). Most students found the seminars to be instructive, appropriate to their prior knowledge and coherent. All students also indicate that the learning goals are (very) well achieved with this course.

All students substantiated their scores with short explanations. The comments on the first seminars show that the students found the level appropriate, also because of the combination of "basics" and more profound knowledge.

Table 2. Evaluation results in % of the simulation training (anamnesis and physical examination with standardized patients) - average evaluation scores of two sessions (N = 6 for both sessions).

N = 6	++	+	+/-	-	--	N.A.
The information on the seminar was clear and concise.	50	25	17			8
I found the seminar instructive.	50	25	17	8		
I found the self-study assignments instructive.	50	8				42
I feel that I have achieved the learning goals.	42	50		8		
I found the coherence between the parts of this seminar good.	50	25				25
The contents of the seminar corresponded to my previous knowledge.	75			8		17
I found the guidance from the teachers stimulating.	75	25				

Note: ++ = very good; + = good; +/- = satisfactory; - = sufficient; -- = insufficient; N.A. = not applicable.

Discussing real-life patient cases was seen as a good way to introduce the frequent chief complaints and made the clinical relevance clear. Finally, repeating the skills was considered very valuable.

For the simulation training session, the opportunity to practice with standardized patients, the extensive debriefing and the honest feedback from other students and teachers were especially appreciated. The combination with the first seminar, where the required knowledge and skills were addressed, was also well appreciated. The students who were more advanced in their studies found the simulated cases a little too easy. Opinions were divided about the video recordings: some found it unpleasant, others liked the fact that they could re-watch the consultation with the patient.

3. Discussion

By combining and coherently integrating different learning methods, such as clinical experience, case-based discussions and simulation, continually based on the EPA framework, the learning effect can be enhanced. The design of the course program described in this article fits well with Kolb´s Experiential Learning Cycle (see Figure 1) that is widely accepted as an effective model for learning.[15] This model is based on the assumption that there are four phases in a learning process, which students ideally all go through. The first phase is the phase of *concrete experience*. In our course, these are the real patients, who the students encounter in practice. The second phase concerns the phase of *reflective observation*, which happens when the students describe the patient cases in preparation for the seminar. In the third phase, *abstract conceptualization* takes place. This is done in the first seminar where the patient cases are discussed and theory is presented by the teachers, matching the chief complaint and a specific EPA. The fourth phase is the phase of *active experimentation*, in which students apply what they have learned in an exercise situation. This takes place during the simulation session, in which students practice the anamnesis and physical examination with standardized patients, which represent similar cases, as experienced before in reality, and get feedback on it from teachers, other students and standardized patients. Finally, the students take these experiences with them when they meet similar patients in the next clinical situation (concrete experience) and the Kolb´s Experiential Learning Cycle restarts on a higher level.[15]

The method described also aligns with the ALACT model, developed by Korthagen et al in 2001,[17] for cyclic professional development, focused on stimulating reflection. The acronym refers to the five phases in this model, which are: Action, Looking back on action, Awareness of essential aspects, Creating alternative methods of action and Trial. In particular, the phases "looking back on action" and "Awareness of essential aspects" (in our case, describing patient cases and discussing them in the seminar) would stimulate reflection.

In other fields, such as engineering and laboratory education, the didactic approach, according to Kolb, has been applied before. Studies in those areas show that the students are more positive and learn more when compared to a combination of teaching methods that are less interrelated. In addition, the students were able to recall the knowledge learned over a longer period of time.[18,19] Our experience shows that the method is also suitable for less technical studies, such as medicine.

Our evaluations show that students find discussing personally experienced patient cases and the opportunity to practice very valuable. The evaluations also make clear that the interaction with and feedback from the teachers is experienced as very useful. This is in line with the literature on simulations: both good guidance by teachers and getting feedback are important for the learning effect.[3] This is consistent with the results of a comprehensive meta-analysis by Hattie (2008) into what factors produce a learning effect. He found that both teachers and getting good feedback have a major impact on student learning.[20]

The special context in which these courses took place, with a small group of students and teachers, who know each other well, probably plays a positive role and may be the main limitation of this evaluation concerning intended transfer to other curricula. It is therefore recommended to implement and evaluate such a course in another context, with more students and teachers involved. An important next step would be a larger study with more participants, comparing the learning outcomes with the students who do not take part in this training. The participating students themselves indicate that they were able to achieve the learning goals with this training method, but it is recommended that this be investigated objectively in a follow-up study. Because the didactic formats and therefore the materials needed, such as rooms and equipment for simulations, this approach can be implemented well more broadly. In addition, the workload per student would be reduced with a rollout for more students.

There are a number of open questions that deserve attention in follow-up research. First, the direct link between theory, simulation and practice, probably stimulates the transfer of the learned knowledge and skills.[21] It would be very useful to examine what students do better next time they see similar patients, in practice or in a simulated environment.

The second question concerns the connection with the EPAs. These EPAs have been developed for the final year of medical school. Through these seminars, students already encounter these EPAs earlier and get feedback on them. It would be interesting to explore whether these students need less supervision to perform these activities during their final year, or whether the amount of supervision can be reduced more quickly.

Finally, it will be interesting to investigate whether students who complete such courses also reflect more actively on their actions afterwards, as the ALACT model suggests.[17]

4. Conclusion

The described course design, which is designed according to Kolb´s experiential learning cycle, is a valuable addition to existing learning formats in medical education. This method makes a strong link between theory, simulation training and clinical practice.

Competing Interests

The authors declare that they have no competing interests.

Ethical Approval

Not applicable, because this article does not contain any studies with human or animal subjects.

Informed Consent

Not applicable, because this article does not contain any studies with human or animal subjects.

Trial Registration

Not applicable, because this article does not contain any clinical trials.

Supplemental material

Supplemental material for this article is available online.

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