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ORIGINAL ARTICLE

Effect of Numerical Requirement System on Dental Students' Learning Strategies

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ABSTRACT

Research on the impacts of the 'requirement system' on student learning is still rare, however the system is still widely applied by Dental Schools in many countries. The major consequent of this system is the unpreparedness of students' learning prior to presenting patients with particular complaints. **Objective:** This study aimed to explore the effect of the 'requirement system' on students' learning strategy in Dental Education University of Jenderal Soedirman, Purwokerto, Indonesia. **Methods:** This was a qualitative-phenomenography study. The collection of data was through observations and interviews. The number of subjects was 13 students of the same batch in a clinical education level, determined by purposive sampling. Observations by 2 clinical teachers were done in advance and lasted for six weeks, followed by in-depth interviews. The analysis followed the phenomenography method. **Results:** Interviews revealed that application of the 'requirement system' had prompted the students to get the patients and to learn or not learn correspondingly to the specified cases. Students will have adequate preparation to learn if they are motivated to discuss with the teachers, having previous experiences, and if the patient is perceived to be special. Inadequate preparation of learning occurred when students felt tired, insufficient time between patients' arrival and presentation in front of clinical teachers, and repetition of the case. Observations revealed that preparation for learning did not consequently lead to students' performance in doing clinical work. 'Well-done' up to 'less than expected' performances were found in both single-cases as well repetition-cases. **Conclusion:** 'Requirement system' driven students' preparation for learning. However, number of cases did not. Modifying the 'requirement system' and improving the quality of clinical supervision are two important things suggested by this study.

Key words: clinical cases, clinical learning, learning strategy, requirement system

INTRODUCTION

Clinical learning in dental education requires students to provide care to patients, under the supervision of clinical supervisors.[1,2] One of the clinical learning systems is done by the fulfillment of required clinical cases (numerical requirement system) or better known as 'requirement system'. This system aims to ensure that the students have had some experience in conducting clinical measures of dental care at times they pass the learning.[3-5]

Several studies have shown that the application of 'requirement system' has led to a variety of problems, such as lack of motivating students to perform a comprehensive treatment, provoking stress and increasing anxiety in students.[6,7] Due to these problems, many countries, such as countries in Europe and America, have left the system.[6-9] Although the 'requirement system' is not applied again in many countries, many Dental Schools in Indonesia are still using this system, one of which is the Dental School of Jenderal Soedirman University.

With the 'requirement system', students must meet the requirements in specified number; however, many clinical supervisors have not been satisfied with the preparedness of the students, especially in the preparation of knowledge aspect of learning. Therefore, this study was conducted aiming to explore

the influence of the 'requirement system' for student learning strategy of the dental clinical education in the study site, which was the Dental School of Jenderal Soedirman University.

Table 1. Observation guide

No	Explanations	
1	General purpose	To get an overview of students' learning behavior in clinical learning process that implements the compliance of clinical case number system.
2	Specific purpose	To describe students' learning behavior in completing one clinical case (requirement)
3		To describe students' learning behavior in completing more than one clinical case (requirement)
4	Observation aspects	Students' learning behavior in completing one clinical case (requirement) Students' learning behavior in completing one of the clinical cases in more than one requirement.
5	Observation details	For example: learning resources/ references, the interaction with patients, the response of feedback that is given by lecturer and patients, problem management, and others.

METHODS

This was a qualitative-phenomenography study with data collection techniques in form of observations and interviews.[10] This study was conducted at the Dental Teaching Hospital of Jenderal Soedirman University. The sample was determined by purposive sampling. The number of subjects was 13 people, consisting of 8 women and 5 men. The subjects were all students of the first batch of clinical education and were following the clinical study in the second semester. In this study, the students who did not work on the case in accordance with the provisions of observations were included in the exclusion criteria.

The data collection was done gradually, by observations and interviews. The observations were made during the first six weeks and then continued with the scheduled interviews. The observation involved two clinical supervisors as an observer. The choice of the observers was determined based on their duty schedule and their willingness. The results of the observations were written in the sheet provided, namely a written narrative of two observations. The number of data collected until the time limit was 47 narratives (90.4%) and fully analyzed qualitatively. The lack of data by 5 narratives (9.6%) could not be fulfilled because the subjects did not meet the criteria for observation until the specified time limit. The interviews on this study were carried out by an interviewer being experienced in conducting in-depth interviews. The interviews were conducted individually in turn corresponding to the willingness of time each subject. The duration of the interview was on average 60 minutes for each subject and completed within a period of 4 days. The interview process was recorded using a voice recorder. Table 1 shows the observation guide and Table 2 shows the interview guide.

The analysis of the study results began with the transcription process conducted by a research assistant. The transcription was followed by the coding process performed by two coders, namely the first author of this study and a lecturer of Jenderal Soedirman University experienced in conducting qualitative research analysis. The entire transcripts of observations and interviews were analyzed separately by each coder. The coding results were then discussed by the two coders to form the final result as a mutual agreement from the two coders. This process lasted for six months.

In this study, the trustworthiness was attempted through prolonged engagement, triangulation method, discussions with colleagues, member checks, the composing of a complete description, and an audit trail.[11]

RESULTS

The description on the effects of the 'requirement system' in this study was grouped into three focuses that were activities to get patients, effects of 'requirement system' on preparation of clinical learning, and students' performance in clinical learning. Figure 1 shows the effects of the 'requirement system' in general established in this study.

Activities to get patients

This study showed that the 'requirement system' had influenced the emergence of the learning process outside the clinic through the activity of searching for the patients. 'Requirement system' encouraged the students to actively seek patients. The activity was carried out with a personal approach by, for example, contacting friends, relatives and family or community by coming to door to door or with a personal and group approach by providing counseling and free check-ups on certain groups of prospective patients.

"…the requirement motivates me. I look for the patients seriously. I get some requirements, and then I look for that." (S-4)

Through getting the patients, the students gained a lot of experience to learn, among other things, 1) the students learned to manage strategy in seeking patients, 2) the students learned to coordinate with lecturers, friends, prospective patients and the community, 3) the students learned to communicate, negotiate and motivate prospective patients, and 4) the students learned to educate.

Table 2. The interview guide

No	Purpose	Topic	Main questions	Probing questions
1	To explore more about the influence of the numerical requirement system on student learning.	The characteristic of student learning	Is the clinical learning system different with the learning system in undergraduate program?	Tell me about how and when you study while you are doing the clinical learning
			If there is a difference, tell me the difference. If there is no a difference, tell me about the clinical learning system that you have learnt	What motivates you to learn while you are having clinical education?
				Others
		The influence of requirement	Tell me about your preparation to comply with the requirement	Tell me where you get the patients to comply with the required cases? (if deliberately, what drives you to look for patients?)
				Have you ever deliberately been looking for easy cases to comply with the requirements? why?
				What do you do when the requirements have not been completed?
				Are you interested in adding the number of cases even though the target has been reached? why?
				Others
			Tell me about your learning strategy to face different cases	Do you apply a different strategy in different cases? Tell me the reason why you do that and explain the the difference!
				Do you use different strategy when facing one requirement and more than one requirement? Explain why you do that and what is the diference!
				Others
2	To explore more about the problems in numerical requirement system	Problems that influence the study	By applying the ruquirement system, do you have learning problems? Explain about it!	Tell me your efforts to solve the problems?
				Others
		Problems that are not related to the study directly	By applying the requirement system, do you face another problem? Explain about it!	If there are problems, tell me how you solve it?
				Does the problem give an impact on your study? What was the solution?
				Others

"…so, when having intercommunication with the patients or community, we adapt with them, so they will be more close with us. If they are still afraid, we will convince them by giving explanations about the cause and effect of their cases. Usually, we make a power point or printed materials. We also learn about the dental problems. People usually ask about it." (S-7)
Effects of 'requirement system' on preparation of clinical learning

The students performed learning with learning patterns in accordance with the case required. The learning activities undertaken were as preparing themselves to resolve cases of the patients. The students studied independently to perform activities on their own initiative, although the depth of the quality of learning was dependent on each individual.

"...the first was a little more directed, because there were lecturing and tasks, so we had to know about it, like or not. However, it is not like that now. It is based on the individual willingness. If I do not understand, I must know and search for the answer by myself..." (Subject S-8)

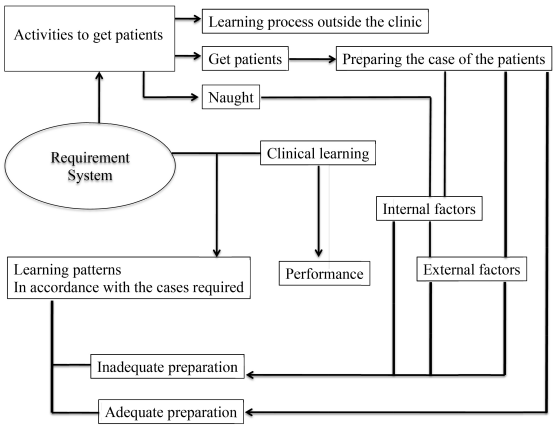

Figure 1. The effects of the 'requirement system' in general established in this study

The learning strategies referred to in this study were the effort made by the subjects before following the discussion in clinical learning. In this study, the clinical learning was conducted in four phases: 1) examining patients and formulating a diagnosis and treatment plan, 2) discussion, 3) management, and 4) evaluation of learning outcomes. The results showed that the students' pattern of learning was done in two variations of learning strategies that were inadequate preparation and adequate preparation. Table 3 shows the reasons for having adequate or in adequate preparation.

Inadequate preparation. There were internal and external factors causing inadequate preparation. The internal factors included feeling lazy and/or tired and having another focus other than doing the adequate preparation. Being tired was the strongest reason of the internal factors. The reason of being tired was expressed as a result of the many activities, including activities to get patients.

"Nowadays, I go home in the afternoon, sometimes I have overtime. The activities are looking for patients and giving assistance in clinics. After that, I am so tired. I prefer to sleep than study" (S-5)

The external factors had stronger influence than the internal factors. New cases, new patients and repetitive cases were the external factors that affected the subjects to not perform the adequate preparation. The factor of new patients was the strongest factor among three.

"... sometimes, new patients come. We do not know about it. It is a surprise. The patients and I have not had an appointment before. Usually, they have many problems in health, so we do not know about their specific problems. However, we know most of the problems. It is like a practicum when I was still in undergraduate program. I still remember a little about it..." (S-10)

When working on the same case in the second or third time and so on, the students could not do the adequate preparation.

"It is no preparation. I have learnt from the previous cases, from the patients that have the same problem.." (S-11)

Recalling the theory given in the undergraduate program or previous experiences and asking friends were the students' strategy in facing patients or discussions when they did not do the adequate preparation.

"...After checking the patient, I know the problems. If I must do dental filling, I'll do it. If I have not faced the problem like this before, I'll do the same thing like in the skill lab. If I need more help, I ask my friends who had the same experiences before." (S-9)

The students who did not have adequate preparation tended to be unable to complete a good discussion with the clinical supervisor. Therefore, the supervisor would provide consequences in the form of postponing patients' treatment. The postpone period would increase the number of patients on the next visit, however could provide additional time for the students to learn more about the case.

"If the discussion is not enough, I'll learn by searching in the internet or reading books. So, I must postpone in treating the patient..." (S-9)

The students could postpone treatments on personal choice. The postponements could be done by directing the patients to receive other types of treatments that in theory had been mastered by the students. However, other treatments offered should be a type of care needed by the patients.

"I suggest the patients about another treatment based on their need. If I know the treatment that they need, like scaling, I'll ask the patients if they would like to get treatment first..." (S-10)

In certain types of care cases, the lecturer could provide no consequences. However, in these circumstances, the students would bear the burden of unresolved discussion. This could affect their concentration for continuing patient care.

"Before I do it, I must follow the discussion first. If there is a question that I can't answer, sometimes I think about it when caring for the patient" (S-6)

Adequate preparation. Motivations in the preparation of learning varied from one student to another. There were three categories of motivation: discussions, patients and experience. Discussion was the strongest motivation for the preparatory study. The students

Table 3. The coding of the reasons for having adequate or inadequate preparation

Coding	Sub category	Category
Lazy Moody	Lazy	
Tired	Tired	Internal factor
Hobby Busy	Another focus	
Personal problem New cases	New cases	
Surprising cases New patients Not appointment-based patients	New patients	
		External factor
No preparation Not the patient that will check up Repetitive cases The same-treated cases	Repetitve cases	
Learning for discussion Learning based on the lecturers' character Discussion to run well	Discussion	
Answering the questions from patients The responsibility to the patients	Patients	
Being not serious in learning Having failed experience Doing mistakes	Experience	

The coding of the reasons for not having adequate preparation

The coding of motivations in the adequate preparation

peformed the adequate preparation in order to answer the lecturers' questions during the discussion.

"If I have an appointment with lecturer in discussion, I will learn first. But if there is no discussion session and no schedule, I do not learn. Because patients do not come every day" (S-7)

The discussion that went well benefits both parties; thus, the patients did not have to wait long to get treatment and the students could be more effectively resolve the case.

"If the discussion is not good, I will not be able to do the next step. It must be postponed. So, I'll study first to pass it well." (S-13)

In addition to the discussion with the teachers, the students do the preparation of learning based on the presence or absence of the patients.

"I seldom learn nowadays. If there are no patients, I don't do a preparatory study. However, if I'll face patients, of course I do a preparatory study." (S-8)

Treatment to patients involved aspects of communication, both to provide information and to answer the patients' questions. This motivated the students to learn in order to have preparedness in facing the patients well.

"The thing that motivates me is to make the patients satisfied. It is to minimize the complaint from the patients." (S-4)

Experiences in the form of discussion with the teachers that had been done as well as experiences in performing treatments could provide motivation for the students to do preparation of learning to face the next patients. Once doing a negligence in patient-care

due to lack of theory mastery or anything else could be a valuable example of experience that spurred the spirit of learning.

"I think, I have not studied well. I will learn harder. Usually, I just study a little part of certain subject. So, if the lecturer asks me about something that I have not studied yet, I cannot answer that and realize that I have not studied about that." (S-6)

The results of this study demonstrated the activities of the adequate preparation carried out by the activity of reading, sharing, and combination of reading and sharing.

"...If I have read the subject materials, I'll discuss it with my friends to convince myself. Perhaps my friends have cared for patients like what I have read." (S-10)

The students performed learning activities with different intensities. This was related to two factors: the type of cases encountered and factors of discussion with the teachers. Learning activities were conducted maximally in the two types of cases, ie, when the case was already known and when the subjects got a perceived 'special case'. The students could know the case before the examination of patients in the clinic if the subjects had been preparing the patients. This was allowed by the institution, as long as not causing any harm to the patients.

"If I know the problem of the patients, I'll learn the detail about it. I will learn from the beginning until the indication, contradiction, and the reason to care for the patients. However, if I have not known about the cases yet, I just learn superficially." (S-4)

In this study, factor of 'discussion with the teachers' was stronger than 'the types of cases', in affecting the depth of learning of the students. The students perceived to have the more intensive learning when they would discuss with the lecturers.

"I will study harder if I have a discussion with the lecturer. Sometimes the questions are so detail." (S-6)

The process of discussion with the teachers that remained unsolved or unanswered could made the students study in more detail, although lots of preparation had been carried out prior to the discussions.

"...I have studied for the discussion. However, if I do not know the detail of certain cases, so the lecturer will tell me to learn more. I will do the suggestion and read more until details." (S-1)

Students' performance in clinical learning

The observation showed that there were two kinds of variations of the students' performance in purpose to fulfill the requirements. Such variations were 'well-done' and 'less than expected'. Table 4 shows the coding of students' performance in completing the requirements.

"student can answer and perform the stages of making removable partial denture well." (O-1,S-5)

'Less than expected' performances could be divided into two categories, ie, 1) 'unprepared' and 2) 'prepared in theory but unable to put it into practice'. The results of this study revealed that preparation for learning did not consequently lead to students' performance in doing clinical work.

"student can explain the principles of crown preparation but that did not utimatetly led to a well-performance in accordance with the principles described." (O-2,S-6)

"student can answer the questions about the composite filling material but he/she might making a mistake in doing polishing" (O-1,S-3)

DISCUSSION

Variations in learning strategies shown in the results of this study had characteristics consistent to the concept of approach to learning stated by Marton, ie, deep approach and surface approach.[12] The intended characteristics are in terms of the viewpoint of the learning process as the basis for the emergence of an active or passive attitude to learn.[13,14] In this study, the initiative to do adequate preparation for learning was a form of active attitude, while the inadequate preparation for learning was considered a passive attitude that led the students to learn for granted. Students' who have adequate preparation of their learning strategies have the character of 'deep approach learning', whereas students with inadequate preparation of their learning strategies have the character of 'surface approach learning'.

Many studies have studied the effects of the application of these two learning approaches. If the purpose of the learning process is understanding, then deep approach learning is a better than the surface approach.[13-16] Therefore, in clinical learning, the implementation of learning strategies should be done with adequate preparation rather than inadequate preparation. However, this study found a higher tendency of the students towards the learning strategies with inadequate preparation.

Some published reports state that the 'requirement system' is considered to have a negative effect on the learning process for students.[6,17] In this study, in addition to the negative effects of the requirement system, some positive effects were also found.

The negative effects of the 'requirement system'

The negative effects of the application of the 'requirement system' on clinical learning is the emergence of learning strategies with inadequate preparation. In addition of having the characteristics of the surface approach, applying this strategy leads to the consequences of postponing the treatment; this will give students the opportunity to learn more so that they might provide a better learning outcomes. However, this can be a bad habit for not studying when it is not requested. Patients can also get disadvantages as a result of the delay in patient-care, ie, as a consequence, postponing the treatments may increase the frequency of patients' visits.

Activity to search for patients in the ;requirement system' may fostering learning experience, but on the other hand it can also effecting students' motivation and learning strategies. Spending the time, effort and expense to seek patients may psychologically affect the students in terms of consuming so much energy and therefore decreasing motivation to learn. Students may choose not to do adequate preparation of learning. Minimizing the inadequate preparation can be done by minimizing the causes. Aside from the individual student, the emergence of the causative factor is the impact of the activity of searching for the patients. It is like an interrelated circle so thus it needs to consider the existence of a new method or the requirement that the activity of getting the patients does not give a negative influence on student learning.[18,19]

The positive effects of the 'requirement system'

'Requirement system' encourages students to undertake activities to get patients. Encouragement to the need to meet the requirement target causes students to perform a variety of creative activities in the form of dissemination and education to the community. In this study, communication process and motivating prospective patients or the public were the two things that were often mentioned by the students as learning experience gained from the activity of searching for the patients. The experience was perceived different from the learning experience in the clinic although communicating and motivating activities are also conducted in the clinic. In the activity to get patients, first of all students will plan and carry out a strategic approach to the community and then learn to understand the circumstances and needs of the community on healthy teeth and mouth. The next step is the student will try to give awareness to the propesctive patients for dental and oral care needs according to the conditions and try to persuade the prospective patients for treatment. Students tend to choose a strategy of learning by doing adequate preparation after getting the patient or case. By having a prospective patient with particular case, students will have an overview of the topic of discussion so that the students will be more focused on learning.

In addition to being the strongest factor for choosing the preparatory strategy of learning, the discussion with the teachers is also the strongest factor affecting the depth of learning. Maximizing the positive effects of the 'requirement system' can be done by improving the quality of the discussion. In other words, students in this study had succesfully articulated the need of good clinical supervision, which is characterized by friendly communication and provide the kind of questions that focused on the case (good quality of questions).[20]

In addition to positive and negative sides, the impacts of the requirement system can be seen from its compliance with the principle of six conceptions of learning. These learning conceptions are proposed by Säljö as many as five conception and by Van Rossum and Taylor as many as one additional conception.[15,21] The six conceptions are: a) learning as the increase of knowledge, b) learning as memorising, c) learning as the acquisition of facts or procedures, d) learning as the abstraction of meaning, e) learning as an interpretative process aimed at the understanding of reality, f) learning as a conscious process, fuelled by personal interests and directed at obtaining harmony and happiness or changing society. The six conceptions of learning is found in the implementation of the 'requirement system' in this study, ie, in the activity of getting the patients and in the clinical learning with a learning strategy with adequate preparation and a learning strategy with inadequate preparation.

The results of the observation on student performance during the learning showed the emergence of a similar variation in the type of requirement restricted to one and more than one. The subjects' performances in this study were categorized as 'well-done' and 'less than expected'. For the 'less than expected' performances, two subcategories were said as a) 'unprepared' and b) 'prepared in the theory but unable to put it into practice'. The emergence subcategory 'prepared in the theory but unable to put it into practice' indicates the fact that mastering theory alone cannot guarantee the success of clinical action. This confirms that any clinical learning must always be escorted by the quality supervision and mentoring so that the learning process can run maximally for the students as well as for the advantage of the patients.[22-24]

In addition to emphasize the importance of maximizing the process of discussion and supervision in the clinical study, the authors formulated modifications to the application of the 'requirement system' to minimize the negative effects and maximize the positive effect in accordance with the findings in this study. Three changes proposed in the modification of the 'requirement system' are: a) tiered regulation, b) provision of a minimum number of required cases, and c) addition of special requirements on comprehensive care. Moreover, training for clinical teachers in the area of mentor-percepthorsip e.g. using one-minute

perceptor or Mini Clinical Examination, is highly important to make the effective dialogue in clinical education settings.[25-27]

Tiered regulation aims to regulate the availability of the patients in the learning. In the early stages of clinical education, students should be directed to get patients and bring the patients in the learning so that this can direct the students to apply learning strategies to make adequate preparation. There should be minimum requirements before a student is allowed to do learning with patients in the outpatient clinic. For example, after fulfilling the 60% of the requirement, students are allowed to serve patients in the outpatient visits; thus, even without adequate preparation, students have had the experience as much as 60% of the requirements that have been taken.[28]

The provision of the required number of cases needs to be reviewed. The repetitive effects of cases are more likely to lead to the learning process with inadequate preparation. Therefore, the authors suggest changes to the provisions of the minimum number of the required cases to be one for one diagnosis or special characteristics with some notes: treatment actions are fully completed and in accordance with the standards of oral health care. Repetition may be an option if the student did not complete the specified action or not in accordance with the established standards.[28,29]

Maximum health outcomes of the patients has not been a priority in the 'requirement system'. Several studies have conducted an analysis and concluded that the application of the 'requirement system' may ultimately lead students to pay more attention on their needs of achieving the requirements than on meeting the needs of the patients.[6,17] Principles and philosophy of comprehensive care can be neglected so that students may lose the opportunity to learn to provide continuity of care as well as lose some other advantages of comprehensive care-based learning.[28,30] The comprehensive care-based learning can be added as a special requirement with a category of the entire treatment plan achievements. For example, the minimum provisions to do the special requirement of comprehenive care is applied for two patients so that students will have at least two patients who should be taken care comprehensively throughout their clinical education considering patient preferences on long term continuous care. In completing the entire treatment plan, any treatment action can still be considered as a requirement component corresponding to the list of the required cases.[28-30]

One of the limitations of the study was the small sample size. However, by excluding the other level of clinical students who were there in the study settings in the period of this study, we aimed to give a clear unbiased sample of students in the same level of ability (the same class/ year). Therefore, a future study may using subjects who have different characteristics to add new evidence about the types of learning strategies that have not been revealed through this study. To assess the effects of the application of 'the modified requirement system' further research is needed.

CONCLUSION

'Requirement system' driven students' preparation for learning. However, by simply depend on number of cases, will not drive the students for adequate learning. We recommend two things to the Dental Schools in Indonesia. The first recommendation is that the Dental Schools are expected to modify the 'requirement system' in order to minimize the negative impacts and maximize the positive impacts on learning. Three things proposed as a form of modification are tiered regulation, provisions of the required minimum cases to be simplified into one case for each diagnosis or specific characteristics, and the addition of special requirements in the form of a comprehensive patient care. The second recommendation is that the Dental Schools should work on improving the quality of clinical supervisor to improve the quality of discussion and supervision.

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