## Universiteit Utrecht

# Internal differentiation in an undergraduate Pharmacy course

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### Background

Differences in learning styles between students are related to their prefered way of learning. Students with a deep learning approach (DA) prefer more autonomy and open assignments, those with a superficial learning approach (SA) prefer structure and guidance. As most courses are designed for 'the average student', many students are out of their zone of proximal development, may become demotivated, and underachieve. We investigated whether, based on learning styles, internal differentiation within a course is possible, and how it affects learning motivation and academic achievement.

#### **Educational Intervention**

In the 10 weeks undergraduate course "Preparation and analysis of drugs" (year 2) two teaching designs were used that differed in teacher guidance, group-size and student autonomy; a structured design for the regular students, and an open design for the group of talented students with a supposed deep approach of learning. Students were assigned to the separate groups based on their grades in a first year course and their personal preferences. The course was evaluated by interviews, a science motivation questionnaire (SMQ)<sub>1</sub> and the Two Factor Study Process Questionnaire (R-SPQ-2F)<sub>2</sub>.

#### Conclusion

The first results and experiences with internal differentiation within a course are positive. (Dis)advantages and limitations of internal course differentiation need to be explored in more detail. This is in particular the case for the way how to divide students into different groups: on a voluntary basis, based on grades or maybe even based on a learning style test.

#### **Take Home Message**

Internal differentiation within a course seems a possible way to increase motivation and achievement.





Structured Design		Open Design					
Identical for both designs: Lectures (8), Theoretical workshops (3), Final Presentation Project, Individual exam							
Jucation	Example	Education	Example				
Workshops to prepare the practical work	The student has prepared a workshop on the	Project	The students prepare a task and design a protocol for				
Structured practical, laboratory, work (9)	preparaton of oral drugs (e.g. tablets). The given	<ul> <li>9 related tasks of a patient with complex</li> </ul>	the preparation and analysis of a drug. During a meet				
Discussion meeting practical work (6)	tasks are discussed with the teacher. After this	medication	this protocol is discussed with the teacher and the				
Project:	workshop the student prepares and analyses	3 Students/group	other students. After the meeting the protocol can be				
One project	the oral drug in the laboratory according to a	Design and execute protocols for the preparation	adjusted and the students perform the experiment(s)				
6 Students/group	structured, given protocol. The results of the	and analysis of drugs	the laboratory. The teacher deliberately leaves room t				
Preparation and analysis of a drug in different	practical work are discussed afterwards. The	Meetings to discuss the protocols, the progress of	make mistakes. After the first experiment(s) the result				
manners	knowledge of the workshops and the practical work	the work, and the final results of the tasks	are discussed and the students can adjust their protoc				
Skills lab days to work on the project (10)	are necessary to complete the groupproject.	<ul> <li>Laboratory days to work on the tasks (13)</li> </ul>	and perform the experiment again. In a final meeting				
Projectmeetings (7)		Three reports of the project (every 3 tasks), two	conclusions about the different tasks are drawn.				
One report of the project and one peerfeedback		peerfeedback sessions					

#### Results

Students in the group that participated in the open design scored significantly higher on DAlearning and course grades for the same exam. They reported a strong 'community-building', felt challenged and motivated. No differences in intrinsic motivation between groups were observed.

#### Comments of students about the open design

"It was a nice and motivated group, which stimulated me to ask questions and to go into depth".

"The nice thing is that you have the freedom to make your own choices".

"You really learn to understand instead of only remembering"

"We have increased each others level of understanding. Instead of going to the teacher, first we wanted to learn from each other".



	Cronbach's Alpha	Number of Items	Group structured design (N= 54)	Group open design (N= 26)	Ρ	Effect size	
Deep learning approach (DA)	0,77	10	3,29 ± 0.09	3,55 ± 0.09	0,037*	0.51	
Superficial learning approach (SA)	0.78	10	2,64 ± 0,06	2,27 ± 0,11	0,005*	0,67	
Intrinsic motivation	0.79	10	3,42 ± 0,07	3,57 ± 0.09	0,235		
Self regulation	0,68	4	3,72 ± 0,06	4,01 ± 0,10	0,018*	0,59	
Grade motivation	0,46	2	2,84 ± 0,14	2,70 ± 0,22	0,527		
Career motivation	0,75	5	3,07 ± 0.07	3,27 ± 0,12	0,147		
Grade individual exam			6,47 ± 0,14	7,18 ± 0,17	0,003*	0,79	
Learning styles and motivation were measured on a Five-point Likert scale. Results are mean values ± SEM. Statistical significance was determined with an independent t-test (* = (P < 0.05))							

#### References

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2. Biggs, J., Kember, D., Leung, D.Y.P (2001) The revised two factor study process Questionnaire: R-SPQ-2F. British Journal of Educational Psychology, 71, 133-149

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