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Beckers, Ronald; van der Voordt, Theo; DeWulf, Geert

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WHY DO THEY STUDY THERE? DIARY RESEARCH INTO STUDENTS' LEARNING SPACE CHOICES IN HIGHER EDUCATION.

Ronald Beckers

Faculty of Economics and Management, HAN University of Applied Sciences, Nijmegen, The Netherlands and Faculty of Engineering Technology, University of Twente, Enschede, The Netherlands

Theo van der Voordt

Faculty of Architecture, Delft University of Technology, Delft, The Netherlands

Geert Dewulf

Faculty of Engineering Technology, University of Twente, Enschede, The Netherlands

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Abstract

Higher education learning and teaching methods have changed while most educational buildings are still rather traditional. Yet, there is an increasing interest in whether we can educate today's higher education students in yesterday's buildings. This paper aims to contribute to this debate by studying the learning space choices of higher education students in relation to their learning activities, personal characteristics and other considerations that may play a role in choosing particular learning spaces. A diary research method was adopted, in which 52 business management students of a Dutch University of Applied Sciences participated. They reported which learning activities they worked on during a week, where, and why there. The diary format builds on literature from various disciplines and was used in combination with a questionnaire and interviews. The findings show significant correlations between the students' learning space choices and their learning activities, their personal characteristics and their individual preferences. Because of the shift from a teacher-led approach to a student-led approach, higher education institutions need to provide more informal learning spaces in open areas and quiet learning spaces for individuals and small groups.

Keywords: Higher Education, Learning Activities, Learning Spaces, Learning Space Use, Diary Research, Universities of Applied Sciences.

Introduction

Research into higher education shows an increasing interest in the physical learning environment (Matthews, Andrews & Adams, 2011; Jessop, Gubby & Smith, 2012; Salter, Thomson, Fox & Lam, 2013; Fisher & Newton, 2014). In the past two decades, developments such as the increasing use of information and communication technology (ICT) in higher education (Prensky, 2001; Collis & Van der Wende, 2002), new social constructivist learning approaches (Foster, 2008; Marais, 2011) and the phenomenon of learning communities (Smith & Bath, 2006), have led to new ideas about the university in the third millennium. These developments have resulted in many experiments with new physical learning environments such as Social Learning Spaces (SLS) (Matthews et al., 2011), technology-rich experimental learning and teaching environments (Salter et al., 2013), Technology Enabled Active Learning (TEAL) environments (Fisher & Newton, 2014) and Active Learning Classrooms (ALC) (Park & Choi, 2014).

On the topic of how educational futures should be configured and how learning spaces should be designed, Rudd, Gifford, Morrison and Facer (2006) stated that it is essential to understand the links between what students learn, how they learn, with whom they learn, when they learn and the requirements of the places where they learn. Oblinger (2005) raised similar questions such as: Where does learning take place on the campus? Do students use classrooms outside class times? Is learning taking place in small groups in the library or in a coffee bar? When is space used? To answer these questions, the students' experiences should be a key aspect of research into learning spaces. According to Jessop et al. (2012), the students' voice is still missing too often in research into this topic. Therefore, the purpose of the present study was to investigate the interaction between learning activities in higher education and the physical environment from a student perspective, focusing on: what, where and why. *What* refers to the learning activities of students in higher education. *Where* concerns the physical learning spaces which these students choose to perform these activities. *Why* is related to the reasons behind the use of these spaces. What, where and why are studied by using a diary research design.

Diary research design

A conclusive argument for using diaries or logbooks is that they provide the opportunity to examine regular activities in the participants' daily environment (Iida, Shrout, Laurenceau & Bolger, 2012). Using diaries gives a researcher more influence on the completeness of the reported information than using surveys would (Appel-Meulenbroek, 2014). The diaries in the current research focus on data that link learning activities and learning space choices. According to several sources, the heterogeneity of student characteristics regarding gender, study experience, work commitments and residence, can influence the decision to go to school for attending lessons and other learning activities or to stay at home (Gomis Porqueras & Rodrigues-Neto, 2010; Sawon et al., 2012). For example, according to Gomis Porqueras and Rodrigues-Neto (2010), senior students appear to attend fewer classes than junior students. Therefore, the students participating in the diary study were asked to attend one out of eight kick-off sessions at the start of the study to fill out a questionnaire with their personal characteristics. These sessions were also used to inform the participants about the diary method. Next, these students kept a diary for one week. The questionnaires and the data from the diaries were analysed using SPSS and Excel. The findings of the data-analysis have been discussed in interviews in small groups with students who kept a diary. The aim of the interviews was to reflect on the findings and to get additional information about why the students chose particular learning spaces for specific study activities. The interviews were tape recorded, transcribed and analysed based on open coding. The overall research design is presented in figure 1.

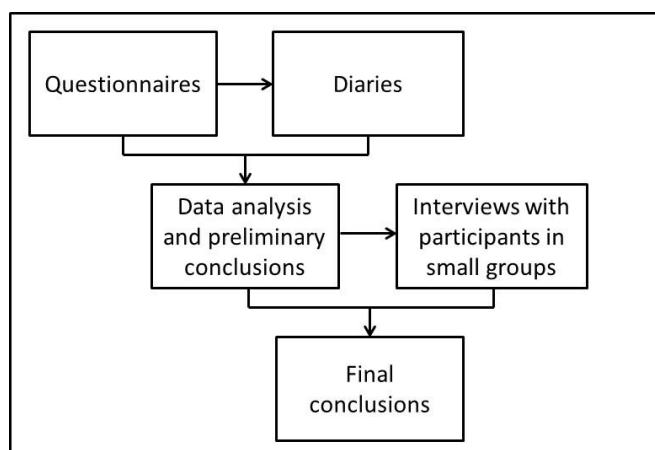


Figure 1. Overall research design of the empirical study

In the next sections, the theoretical background that has been used to define the diary format for studying *what*, *where* and *why* is described first. Then, the results of the empirical part of the study at a Dutch higher education institution are presented. Finally, the findings are discussed and linked to practical implications.

Building the diary format on what, where and why

What: learning activities

The literature shows a long tradition of research into learning objectives and learning activities (Moseley et al., 2004). More than half a century ago, Bloom, Engelhart, Furst, Hill and Krathwohl (1956) developed their taxonomy of educational objectives. Nowadays, the elements of this taxonomy are still recognisable in studies on learning skills (Redecker, Ala-Mutka, Bacigalupo, Ferrari & Punie, 2009; Binckley et al., 2010). New studies added 21st century skills related to ICT developments in education, and skills regarding working together, innovation and responsibility. To show how student competencies, like critical thinking, communicating, self-organising and collaborating can be recognised in students' daily activities, Fisher (2005) used five pedagogical processes: delivering, applying, creating, communicating and decision making. These processes build on three main educational approaches: a teacher-led approach, a student-led approach and an interaction-led approach (Trigwell, Prosser & Waterhouse, 1999; Fisher, 2005; Illeris, 2007). Earlier, Moore (1989) introduced the interaction between the individual learner and the content. Wang (2008) added the relation between the learner and the interface. In line with the latter, Beckers, Van der Voordt and Dewulf (2015) defined four key learning configurations in higher education, namely: autonomous learning, programmed instructional learning, interactive/small group learning between students, and network learning. These four learning configurations were used to define the *what* part of the diary format. Nine learning activities of students derived from several literature sources were selected, sometimes rephrased and linked to the four learning configurations (table 1).

Table 1. Four learning configurations and nine learning activities (derived from: A = Nair & Fielding, 2005; B = Foster, 2008; C = Poole & Wheal, 2011; D = Gensler, 2012; E = Fisher, 2005).

Learning configurations: (Beckers et al., 2015)	Learning activities: (The letters in brackets refer to the used sources)
Autonomous learning; relation between the learner and the content	<ol style="list-style-type: none"> 1. Independent study for knowledge accumulation and critical thinking (A, C, D, E); 2. Autonomous working on assignments for applying knowledge outside scheduled lessons (C, E); 3. Routine activities – organising (E);
Programmed instructional learning; relation between the instructor and the learner	<ol style="list-style-type: none"> 4. Attending classes and lectures (A, D, E); 5. Cooperative learning activities, students working in small groups led by a teacher (B, D, E); 6. Tutorial consultation (B, E);
Interactive/small group learning; relation between the learner and other learners	<ol style="list-style-type: none"> 7. Collaborative learning activities, students working in small groups on project assignments without a teacher involved (B, C, D, E); 8. Social learning activities (face-to-face) with other students - communicating (A, C, D, E);
Network learning; relation between the learner and the interface	<ol style="list-style-type: none"> 9. Wireless networking with peers, teachers, digital learning environments and other digital sources (A, C, D);

Where: teaching and learning spaces

According to Oblinger (2005, p. 15), learning spaces are ‘regularly scheduled, physical locations designed for face-to-face meetings of instructors and students’. However, particularly the ICT developments of the past ten years have shed a different light on this definition. In the UK the Higher Education Space Management Project (Barnett & Temple, 2006) distinguished space for teaching and space for learning. Teaching space is the traditional timetabled classroom, whereas learning space refers to settings for individual learning or small group activities. Teaching and learning space have been the subject of many studies (Fisher, 2005; JISC, 2006; Marmot, 2006; Souter et al., 2011). These studies endorse the development of higher education institutions

‘providing more space for unstructured/ad hoc self-directed learning and peer-teaching among students’ (Barnett & Temple, 2006, p. 13). Besides specific spaces for vocational education, four main types of learning space are applied to support self-regulation and social interaction in learning by higher education students (Beckers et al., 2015). First, classroom space which supports large groups for the benefit of presentations and lectures. Second, collaborative spaces like project rooms that support small groups for face-to-face collaborative and cooperative learning activities. Third, individual study spaces to support self-study activities. Fourth, informal learning spaces that are scattered across the campus or buildings, in corridors, atria or coffee bars and restaurants. These informal learning spaces support individuals and small groups for study activities and social activities in the real world and in the virtual world. Nowadays, in this virtual world students can have access to study resources from anywhere, which means learning space is not limited to a school building. Analogous to the ‘city is the office’ (Harrison, 2002, p. 248), every square meter of the built environment has the potential to support the learning activities of a student, from home to the classroom and all kinds of other settings in between, such as a coffee house, café, restaurant, bar, museum, library and public spaces like streets, parks or public transport (Oldenburg, 2001; Radcliffe et al., 2008). This perspective on higher education learning spaces is shown in the framework of figure 2 and has been used to design the *where* part of the diary format.

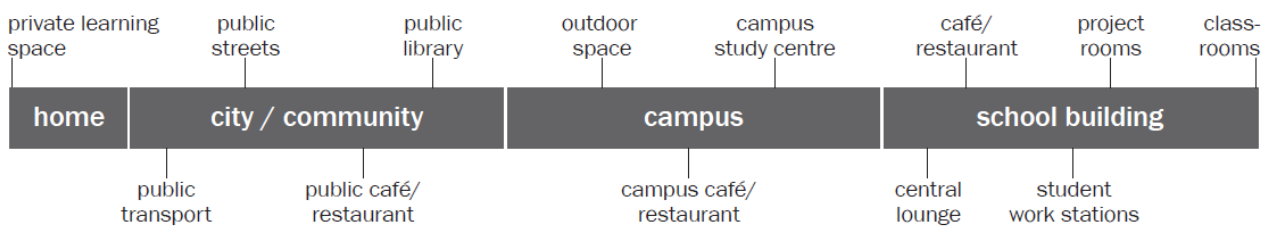


Figure 2. Higher education learning space framework

Why: considerations to choose particular learning spaces

To study the students’ reasons for choosing particular learning spaces, lessons can be learned from the research into workspace choices in office environments. Both are human decision-making processes which are influenced by psychological needs and non-psychological variables. Appel-Meulenbroek, Groenen and Janssen (2011) developed a framework with seven variables that may

influence the choice of workspaces that fit the working activities of office workers and/or their personal preferences best. This framework includes psychological needs such as (1) the preferred levels of privacy/concentration, (2) the preferred social interaction/communication and (3) the need to personally control one's choice of space. Next, it contains various characteristics of the physical environment such as (4) functional characteristics related to equipment, furniture and technology, (5) comfort characteristics regarding light, colour and the finishing of the environment, and (6) lay-out characteristics such as the location of the workspace and its spatial position towards other workspaces. Last (7), the framework includes variables concerning the availability of workspaces.

Most of the variables of this framework for workspaces are also elaborated in studies into higher education learning environments. According to Jamieson (2003), lay-out, fit-out, comfort and aesthetics are elements of the learning environment that should meet students' individual requirements. Comparable aspects were mentioned by Matthews et al. (2011), who studied social learning spaces and identified which aspects students perceived to be important for a welcoming atmosphere, such as comfortable furniture, controlled temperature and catering services. The availability of catering services was mentioned by Brett and Nagra (2005) too as an important reason for choosing particular learning space for 82.5% of the students in their study. Harrop and Turpin (2013) showed that successful higher education informal learning spaces should meet students' behavioural needs like interaction, conversation, community and the need for retreat.

The seven variables of the framework of Appel-Meulenbroek et al. (2011) were used to formulate the considerations behind the student's learning space choices in the *why* part of the diary format. Due to the mentioned importance of catering services as an additional consideration to choose learning spaces for study activities, these services were included in the diary format as well. In addition to consciously considered choices of learning spaces, the psychological literature shows that in peoples' decision making unconscious decisions also come to the fore (Dijksterhuis, Bos, Nordgren & Van Baaren, 2006). Therefore, 'habit' and 'unaware of the reason' were included in the *why* part of the diary format too.

The diary format

The foregoing leads to figure 3 which shows the diary format with the three main categories *what*, *where* and *why*, referring to the learning activities in higher education, the learning spaces, and the considerations for choosing particular spaces respectively. A short list with prescribed items was used to make a quantitative analysis of the data possible and because long and complex diary formats may reduce participant compliance (Iida et al., 2012). The diary format was tested in a small pilot study with students before the diary study was conducted.

What - learning activity	Where - learning space	Why - motivation
<p>Select one activity</p> <ol style="list-style-type: none"> 1 - Independent study 2 - Autonomous working on assignments outside lessons 3 - Routine activities 4 - Attending lessons and lectures 5 - Cooperative activities, working in small groups led by a teacher during lessons 6 - Collaborative activities, working in small groups without a teacher outside lessons 7 - Tutorial consultation 8 - Social activities 9 - Wireless networking 10-Activities other than mentioned above 	<p>Select one learning space used for that activity</p> <ol style="list-style-type: none"> A - At home B - In a classroom or in a lecture hall C - Open area at school with student work stations D - Project room at school E - Corridors, hallways, atria and lounges at school F - Campus open learning centre G - Restaurant/café in the school building or on the campus H - Outdoor spaces on the campus I - On the way to school or home J - Public restaurant/café K - Public library L - Spaces other than mentioned above 	<p>Select one or two reasons for the use of that learning space</p> <ol style="list-style-type: none"> 1 - I could not choose the learning space because it was scheduled 2 - Vicinity, this was the nearest learning space 3 - The preferred learning space was not available 4 - Comfort and aesthetics (<i>finishing</i>) of the environment 5 - Preferred privacy and concentration 6 - Availability of catering services 7 - Availability of equipment and technology 8 - Preferred social interaction, the role of group membership 9 - Habit 10-Unaware of the reason or with no specific reason 11-Reasons other than mentioned above

Figure 3. The diary format with three categories derived from the literature

The diary format was filled out by the students from Monday till Friday, in one out of two regular school weeks in the period from 12 till 24 May 2014. The participants reported the start and the finish time of each learning activity, the corresponding number of the activity itself (*what*), the letter for the learning space for that specific activity (*where*) and finally, the letter related to the motivation for using that space for that activity (*why*) (figure 4). Per activity, the respondents could mark two reasons maximally for why they chose the learning space. If necessary, the student could add items themselves in addition to the items in the diary format.

DAY 1 : <i>date</i>		NAME : <i>student</i>	
start and finish	What - learning activity	Where - learning space	Why - motivation
<i>8.20 - 8.50</i>	<i>1</i>	<i>I</i>	<i>10</i>
<i>8.50 - 9.00</i>	<i>8</i>	<i>E</i>	<i>2 and 9</i>
<i>9.00 - 9.30</i>	<i>6</i>	<i>C</i>	<i>7 and 9</i>
<i>9.30 - 10.15</i>	<i>4</i>	<i>B</i>	<i>1</i>
<i>10.15 - 10.30</i>	<i>8</i>	<i>G</i>	<i>6 and 8</i>
<i>10.30 - 11.15</i>	<i>4</i>	<i>B</i>	<i>1</i>

Figure 4. An example of one page of the filled out diary format

Research findings

Participants

The empirical study was conducted at HAN University of Applied Sciences (UAS) in the Netherlands and was carried out with 52 business management students in Nijmegen. The students were invited to participate with an announcement on Facebook and with an appeal by tutors during classes. The personal characteristics of the 52 students as retrieved from the questionnaires are presented in table 2.

Table 2. Numbers and percentages of the participants (N=52)

Variable	Number	Percentage	Variable	Number	Percentage
Gender			Living situation		
Male	13	25%	with parents	29	56%
Female	39	75%	students' house/dormitory	23	44%
Age			Traveling time from home to the campus		
17 years old	1	2%	< 15 minutes	16	31%
18 years old	6	12%	≥ 15 and < 45 minutes	12	23%
19 years old	18	35%	≥ 45 minutes	24	46%
20 years old	10	19%	Work commitments		
21 years old	7	13%	none	3	6%
22 years old	3	6%	< 8 hours per week	15	29%
23 years old	3	6%	≥ 8 and < 16 hours per week	30	58%
>23 years old	4	8%	≥ 16 hours per week	4	8%
Study year			Average scheduled time (hours:minutes)		
first year	21	40%	first-year students	18:51	
second year	22	42%	second-year students	15:33	
third year	9	17%	third-year students	9:00	
fourth year	0	0%	weighted average overall	15:44	

What and where

The 52 students reported a total number of 1,836 learning activities in connection to the chosen learning spaces in their diaries, as presented in table 3. The average time spent on each activity-space combination is shown in table 3 as well. To test statistically significant correlations between learning space choices and learning activities, several learning activities and several learning spaces in table 3 had to be clustered. The test showed a significant relationship between learning activities and chosen learning space, based on a Pearson Chi Square test ($\chi^2(36, N=1836) = 2375.231, p=0.000$). Cramer's V was used to assess the strength of the relationship between the two variables. Cramer's V is 0.46 ($p=0.000$), which shows a relatively strong association between students' learning space choice and their activities. Individual learning activities are mainly conducted at home, whereas collaborative learning activities and social interaction mostly take place at school. At school, students mainly use learning spaces in open areas such as corridors, hallways, atria and lounges. Virtual contact with peers and with school mostly occur at home. Notably, students hardly use public spaces for learning activities. Where public space is used, it mainly concerns public transport.

Table 3. The reported combinations of learning activities and used learning spaces in the diaries

Learning Activity (LA)		Learning Spaces							TOTAL
		A *)	B	C / E / F	D	G	H	I / J / K / L	
LA1: Independent study	count	107	5	10	2	0	1	56	181
	percentage	59.1%	2.8%	5.5%	1.1%	0.0%	0.6%	30.9%	100.0%
	average time	2:48:57	0:06:32	0:09:54	0:02:53	0:00:00	0:00:35	1:05:12	4:14:02
LA2: Autonomous working on assignments outside lessons	count	186	26	38	23	3	1	15	292
	percentage	63.7%	8.9%	13.0%	7.9%	1.0%	0.3%	5.1%	100.0%
	average time	4:22:13	0:39:48	0:47:57	0:38:10	0:03:39	0:00:35	0:16:09	6:48:31
LA4 / LA5 / LA7: Programmed instructional learning activities	count	0	429	8	13	0	10	2	462
	percentage	0.0%	92.9%	1.7%	2.8%	0.0%	2.2%	0.4%	100.0%
	average time	0:00:00	10:30:28	0:05:23	0:05:40	0:00:00	0:08:05	0:02:01	10:51:37
LA6: Collaborative learning activities outside lessons	count	4	7	59	27	1	0	4	102
	percentage	3.9%	6.9%	57.8%	26.5%	1.0%	0.0%	3.9%	100.0%
	average time	0:11:27	0:05:52	1:02:59	0:39:25	0:01:44	0:00:00	0:09:14	2:10:40
LA8: Social student activities	count	11	40	78	5	33	49	64	280
	percentage	3.9%	14.3%	27.9%	1.8%	11.8%	17.5%	22.9%	100.0%
	average time	0:09:21	0:12:28	0:35:58	0:05:06	0:17:12	0:15:17	0:55:01	2:30:22
LA9: Wireless networking	count	220	12	10	2	1	3	63	311
	percentage	70.7%	3.9%	3.2%	0.6%	0.3%	1.0%	20.3%	100.0%
	average time	0:59:46	0:04:31	0:02:14	0:00:17	0:00:06	0:00:23	0:14:55	1:22:13
LA3 / LA10: Miscellaneous learning activities	count	135	11	14	2	0	0	46	208
	percentage	64.9%	5.3%	6.7%	1.0%	0.0%	0.0%	22.1%	100.0%
	average time	0:37:29	0:12:01	0:04:47	0:02:53	0:00:00	0:00:00	0:37:25	1:34:36
TOTAL	count	663	530	217	74	38	64	250	1836
	percentage	36.1%	28.9%	11.8%	4.0%	2.1%	3.5%	13.6%	100.0%
	average time	9:09:12	11:51:40	2:49:12	1:34:25	0:22:40	0:24:54	3:19:58	29:32:01

Home	School	Elsewhere
A At home	B In a classroom or lecture hall	I On the way to school or home
	C Open area with student work stations	J Public restaurant/café
	D Project room at school	K Public library
	E Open space in corridors, hallways, atria, lounges at school	L Other spaces
	F Campus open learning centre	
	G Restaurant/café in the school building or on the campus	
	H Outdoor spaces on the campus	

*) the students reported 107 independent study activities (LA1) at home (A) during the week that they kept their diary, which implies 59.12% of all independent study activities. These activities took an average time of 2 hours and 48 minutes during that week.

Where and why

The 52 students indicated 2,200 reasons to motivate their learning space choices in the diaries. Only twice no motivation was reported for the choice of a learning space and 366 times two motivations were mentioned. The overall picture of the motivations for why students chose particular learning spaces is presented in table 4.

Table 4. Motivations for choosing learning spaces, at home, at school/campus or elsewhere

LEARNING SPACE		MOTIVATIONS FOR CHOOSING LEARNING SPACES											Total
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	
at home (A)	count	1	290	4	208	71	4	37	7	86	168	5	881
	percentage	0.1%	32.9%	0.5%	23.6%	8.1%	0.5%	4.2%	0.8%	9.8%	19.1%	0.6%	40.0%
at school (B, C, D, E, F, G, H)	count	489	116	21	78	61	9	28	125	63	36	15	1041
	percentage	47.0%	11.1%	2.0%	7.5%	5.9%	0.9%	2.7%	12.0%	6.1%	3.5%	1.4%	47.3%
elsewhere (I, J, K, L)	count	1	66	1	9	11	5	2	12	7	127	37	278
	percentage	0.4%	23.7%	0.4%	3.2%	4.0%	1.8%	0.7%	4.3%	2.5%	45.7%	13.3%	12.6%
Total	Count	491	472	26	295	143	18	67	144	156	331	57	2200
	percentage	22.3%	21.5%	1.2%	13.4%	6.5%	0.8%	3.0%	6.5%	7.1%	15.0%	2.6%	100.0%

M1	The learning space was scheduled	M7	The availability of equipment and technology
M2	Vicinity, this was the nearest learning space	M8	The preferred social interaction and the role of group membership
M3	The preferred learning space was not available	M9	Habit
M4	Comfort and aesthetics (finishing) of the learning space	M10	Unaware of the reason (no specific reason)
M5	Preferred privacy and concentration	M11	Reasons other than mentioned above
M6	The availability of catering services		

The differences in motivation per type of learning space were shown to be statistically significant according to a Pearson Chi Square test ($\chi^2(20, N=2200) = 1324.85, p=0.000$). Cramer's V is 0.55 ($p=0.000$), which shows a strong, significant association between motivations and chosen learning spaces. So, students had different motivations for studying at home, at school/campus or elsewhere. The main reasons for students to conduct learning activities at home were related to (M2) vicinity (32.9%), to (M4) comfort (23.6%), to (M9) habit (9.8%) and to (M10) no specific reason (19.1%). Learning space at school was often chosen because it was scheduled (mainly classrooms) by the institution (47%) or due to social aspects (12%). For choosing learning space at school/campus, comfort (M4), available equipment/technology (M6) and catering services (M7) seemed to be minor motivations.

Impact of personal characteristics

Learning space choices are also correlated with personal characteristics. A Pearson Chi Square test showed that the chosen learning spaces are significantly associated with gender. Females studied more at home and male students more at school ($\chi^2(2, N=1836) = 12834, p=0.002$). Cramer's V = 0.084 ($p=0.002$). Significant differences between the age of the students showed up in the Pearson Chi Square test as well ($\chi^2(20, N=1836) = 45889, p=0.001$; Cramer's V = 0.112 ($p=0.001$)). Yet, the results do not clearly show why age is correlated with learning space use. Additional analyses

showed that second-year students chose learning spaces at school significantly more often than first-year and third-year students, whereas third-year students studied significantly more often at home ($\chi^2(4, N=1836) = 10215, p=0.037$); Cramer's $V = 0.053$ ($p=0.037$). The living situation, the travelling time between home and school, and work commitments next to study activities, did not show any significant correlations with the choice of learning space at home, at school or elsewhere. The low Cramer's V values refer to very weak associations between the tested variables. The overall correlations between the variables from the questionnaires and the diaries are presented in figure 5.

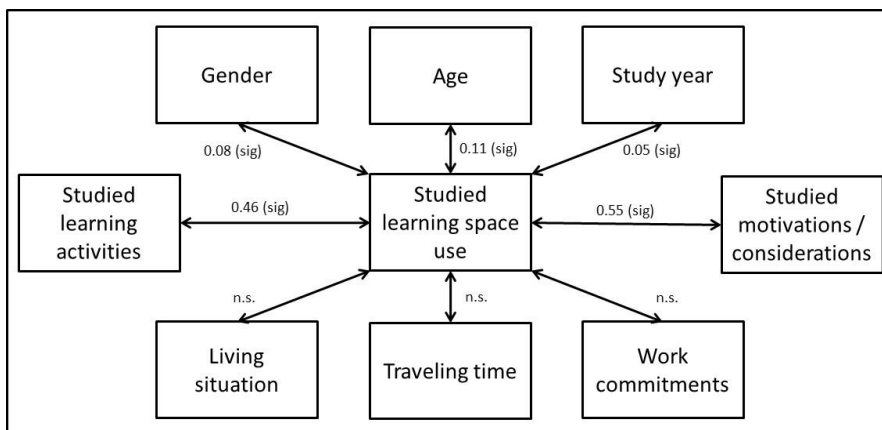


Figure 5. The main Cramer's V associations between the *what*, *when* and *why* ($p < 0.05$).

Zooming in on the choice of learning spaces at school, apart from classrooms, significant differences were found in the use of learning spaces at school between first-year and elder-year students ($\chi^2(2, N=267) = 16535, p=0.000$). Second-year and third-year students chose enclosed project rooms significantly more often than first-year students, whereas first-year students more often chose open learning spaces in corridors and catering areas. However, Cramer's V is 0.249 ($p=0.000$), which refers to a significant but a weak association between the choice of learning space at school and the study phase. The other variables from the questionnaires do not show any significant associations with the choice of different learning spaces inside the school building.

Interviews

In December 2014, eight students who filled out a diary participated in one of the interviews in small groups of 2 or 3 students. The eight students responded to an invitation for the interviews through email. The interviews aimed to inform the students about the main results and to further explore the motivations the students had had for their learning space choices. These students emphasised the significant relationship between learning activities and learning spaces, for instance: *'You want learning spaces that are effective for your learning activities. I always choose the most suitable learning space for my learning activities'*. To determine the most suitable learning space, the students said that they make deliberate choices based on what they consider most valuable for their learning activities. Student: *'I find the lounge seats in the restaurant very comfortable, but when there are no electrical power outlets for my laptop, or when it is crowded and noisy, I will not choose to sit there'*.

The diaries showed that most learning activities occur at home. Besides comfort, another important reason that emerged from the interviews for studying at home was the autonomy to do what you want to do at the moment that you want to do it. Student: *'Home is the place where I can be alone. I hate it when everybody can see me doing things'*. Students find it important to listen to their own music and to have the possibility to turn it off when they want to, or to control the temperature in their room to feel comfortable. The combination of activities, like doing the laundry or eating and drinking whenever one wants, while doing school work, makes home a preferred learning space.

Studying at school often occurs because of group dynamics. Student: *'I go to school for working together. When I work alone, I stay at home'*. Working together online was not widely endorsed by the students who participated in the interviews. The general opinion of the interviewed students is that the output of face-to-face communication is higher than when using digital media. Yet, students told that a digital medium like WhatsApp is very popular for short messages related to project group work or mutual questions during self-study activities at home. Student: *'Perhaps WhatsApp is so obvious that students do not even notice that they use it all the time to communicate*

about their learning activities'. That shows that WhatsApp might be considered as a kind of virtual learning space.

Discussion, implications and next steps

The literature suggests, that the campus of the future and the city will increasingly merge and that students are going to use public spaces to conduct their learning activities more often. However, the findings from the present diary study show a different picture. Students mainly conduct their learning activities at school or at home. Apart from public transport, and sometimes a public library, 'the city as the campus' does not seem to be close at hand yet. However, higher education buildings contain a growing diversity of learning spaces with similar characteristics to public spaces (Fisher, 2005; Marmot, 2006; Souter et al., 2011). Traditional classroom space is being replaced by a variety of informal learning spaces to support contemporary learning activities (Beckers et al., 2015). These informal learning spaces support interaction of students with their peers and their teachers outside the classroom (Matthews et al., 2011). Park and Choi (2014) argue, that the *combination* of traditional classrooms and new learning spaces will facilitate developments in education best. The findings of the current diary study support this statement. Many of the lecturer-driven learning activities still occur in traditional learning environments. When students work together outside classes, or conduct solitary learning activities, they mainly use informal learning spaces in open areas within the school building. Research by Matthews et al. (2011, p. 114) showed that students appreciate these spaces because they 'can make noise, talk, eat and socialise'. The disadvantage is that this makes these kinds of learning spaces very busy. The interviews in the present study emphasise that students additionally need learning spaces where they can concentrate and work individually or in small groups. Many higher educational buildings particularly focus on facilitating collaborative and social activities but lack sufficient learning spaces for retreat. As a consequence, students stay at home for solitary learning activities. If the shift from a teacher-led approach to a student-led approach continues, this will lead to an increasing need for quiet informal learning spaces in higher education buildings. The future challenge for higher education institutions will be to permanently align learning space at school with learning activities and take into account the

increasing diversity of students' preferences, regarding how and where to learn and, the required physical and social characteristics of learning spaces. Because school attendance has been shown to be of great importance for students' learning results (Gomis Porqueras & Rodrigues-Neto, 2010; Sawon et al., 2012), it is important that both informal open areas and quiet learning spaces for individuals and small groups are provided in combination with traditional classrooms. New learning space designs have to match new ways of learning and teaching (Beckers & Van der Voordt, 2013; Fischer & Newton, 2014). On the one hand, new learning environments with continuing traditional learning and teaching approaches can frustrate students and teachers. On the other hand, new pedagogical practices in a yesterday's learning environments will also lead to a misfit between educational practice and learning space. Appropriate learning space requires an integral approach in which space planners, teachers, staff and students cooperate to align the physical learning environment with educational developments and end-user needs.

The present study allows us to reflect on the value of using diaries for data-collection. According to Whiteside and Fitzgerald (2009, p. 5), the diary method meets the need to supplement traditional research methods with innovative tools: 'New approaches such as student logs [...] may provide data that better and more completely answer researchers' questions, leading to evidence-based solutions'. Fisher and Newton (2014) argue that both quantitative and qualitative methods should be used to study the usability of learning spaces in order to collect data that support the development of new learning environments. A common limitation of diary research methods is that they mainly produce correlational data and hardly establish causal mechanisms (Iida et al, 2012). Yet, by not only asking *what* and *where* but also *why* for the period of a week the present diary study provided insight into cause and effect relationships as well. The study showed that students deliberately choose their learning space based on their study activities. The present study did not show if and how the chosen learning settings contribute to students' performance though and which settings suit to acquire new knowledge and skills best. To explore the impact of learning spaces on learning performance in depth, additional research is needed. A particular point of attention too is how students share social spaces such as atria, espresso bars and restaurants, and how these spaces

can be considered real learning spaces for working informally in groups or how these fulfil the need for silence and concentration. Besides, the current study had its focus on students from one case in the Netherlands. However, there are many similarities between Dutch higher education and other contexts such as the UK studied by e.g. Foster (2008), Barnett and Temple (2006), Marmot (2006), and the Australasian region with work from e.g. Park and Choi (2014), Matthews et al. (2011) and Souter et al. (2011). Although it is always questionable to extrapolate and generalise the findings of a specific study, the similarities indicate that the results may apply for other universities and countries as well. Extension of the current research with students from different institutions, other programmes and different countries could further endorse this statement and would therefore be a preferable next step. Expanding the number of diaries and collecting data from other periods during the year would add value to our study as well. A final suggestion for further research is to explore the factors that influence students' learning space preferences in connection to different learning activities in depth, by using additional research methods.

Conclusion

This research has shown significant correlations between the chosen learning spaces and learning activities of business management students, their psychological needs and the preferred characteristics of the physical learning environment. The study found that students mainly conduct individual learning activities at home because of the opportunity to personally control the environment regarding concentration and comfort and to enable combining learning with other activities such as listening to music. On days that students are not obliged to go to school it saves travel time as well. In addition to teacher-led learning activities, students go to school to work in small groups with other students and for social activities. For these learning activities they mainly use learning spaces in open areas, corridors, hallways, atria and lounges. Besides public transport, students hardly use public spaces outside school for their learning activities. The choice of learning spaces has been shown to be influenced significantly by student characteristics such as gender, age and study year. Surprisingly, the students' living situation and the travel time to school are not

correlated to the choice of where to study. Also, the research did not support the idea that network learning activities are replacing face-to-face meetings or classical lessons. For students virtual contact is mainly used additional to face-to-face meetings. The view that students' learning activities mainly consist of surfing on the internet to learn from anywhere at any time is not (yet) confirmed.

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References

- Appel-Meulenbroek, R., Groenen P., & Janssen I. (2011). An end-user's perspective on activity-based office concepts. *Journal of Corporate Real Estate*, 13(2), 122 – 135.
- Appel-Meulenbroek, R. (2014). *How to measure added value of corporate real estate and building design. Knowledge sharing in research building (PhD dissertation)*. Eindhoven University of Technology.
- Barnett, R., & Temple, P. (2006). *Impact on space of future changes in higher education*. Space Management Group (SMG). Higher Education Space Management Project. Retrieved May 31, 2012, from: <http://www.smg.ac.uk/documents/FutureChangesInHE.pdf>
- Beckers, R., & Van der Voordt, T. (2013). Facilitating New Ways of Learning in Dutch Higher Education. *International Journal of Facilities Management, EuroFM Journal*. Conference papers 12th EuroFM Research Symposium. Prague, Czech Republic, 25-35.
- Beckers, R., Van der Voordt, T., & Dewulf, G. (2015). A conceptual framework to identify spatial implications of new ways of learning in higher education. *Facilities*, 33(1/2), 2-19.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., & Rumble, M. (2010). *Draft White Paper 1 Defining 21st Century Skills*. The University of Melbourne.
- Bloom, B.S., Engelhart, M.D., Furst, E.J., Hill, W.H., & Krathwohl, D.R. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain*. New York: David McKay Company.
- Brett, P., & Nagra, J. (2005). An investigation into students' use of a computer-based social learning space: lessons for facilitating collaborative approaches to learning. *British Journal of Educational Technology*, 36(2), 281-292.

- Collis, B., & Van der Wende, M. (2002). *Models of Technology and Change in Higher Education*. Enschede: CHEPS.
- Dijksterhuis, A., Bos, M. W., Nordgren, L. F., & Van Baaren, R. B. (2006). On making the right choice: The deliberation-without-attention effect. *Science*, 311(5763), 1005-1007.
- Fisher, K. (2005). Research into identifying effective learning environments. Paper for *OECD/PEB, Evaluating Quality in Educational Facilities*, 159-167.
- Fisher, K., & Newton, C. (2014). Transforming the twenty-first-century campus to enhance the net-generation student learning experience: using evidence-based design to determine what works and why in virtual/physical teaching spaces. *Higher Education Research & Development*, 33(5), 903-920.
- Foster, C. (2008). *Learning for understanding: Engaging and Interactive Knowledge Visualization*. Durham: Durham University, Technology Enhanced Learning Research Group.
- Gensler (2012) *Changing Course. Connecting Campus Design to a New Kind of Student*. Retrieved March 10, 2014, from: http://www.gensler.com/uploads/documents/Changing_Course_Survey_10_08_2012.pdf
- Gomis Porqueras, P., & Rodrigues-Neto, J. A. (2010). *Adopting New Technologies in the Classroom. Working paper 528*. Canberra: Australian National University, College of Business and Economics, School of Economics.
- Harrison, A. (2002). Accommodating the new economy: The SANE space environment model. *Journal of Corporate Real Estate*, 4(3), 248-265.
- Harrop, D., & Turpin, B. (2013). A study exploring learners' informal learning space behaviors, attitudes, and preferences. *New Review of Academic Librarianship*, 19(1), 58-77.
- Iida, M., Shrout, P.E., Laurenceau, J.P., & Bolger, N. (2012). Using diary methods in psychological research. In M. Iida et al. (Eds.), *APA handbook of research methods in psychology, Vol 1: Foundations, planning, measures, and psychometrics* (pp. 277-305). Washington DC: American Psychological Association.
- Illeris, K. (2007). *How we learn*. London and New York: Routledge.
- Jamieson, P. (2003). Designing more effective on-campus teaching and learning spaces: A role for academic developers. *International Journal for Academic Development*, 8(1-2), 119-133.
- Jessop, T., Gubby, L., & Smith, A. (2012). Space frontiers for new pedagogies: a tale of constraints and possibilities. *Studies in Higher Education*, 37(2), 189-202.
- JISC (2006). *Designing Spaces for Effective Learning. A guide to 21st century learning space design*. Joint Information Systems Committee. London: Higher Education Funding Council for England.
- Liu, S., Joy, M., & Griffiths, N. (2010, July). Students' perceptions of the factors leading to unsuccessful group collaboration. In *Advanced Learning Technologies (ICALT), 2010 IEEE 10th International Conference on* (pp. 565-569). IEEE.

- Marais, N. (2011). Connectivism as learning theory: the force behind changed teaching practice in higher education. *Education, Knowledge and Economy*, 4(3), 173-182.
- Marmot, A. (2006). *Spaces for learning. A review of learning spaces in further and higher education*. Alexi Marmot Associates and haa design by order of Scottish Funding Council. Retrieved April 15, 2013, from: http://www.sfc.ac.uk/publications/spaces_for_learning_report.pdf
- Matthews, K.E., Andrews, V., & Adams, P. (2011). Social learning spaces and student engagement. *Higher Education Research & Development*, 30(2), 105-120.
- Moore, M.G. (1989). Editorial: Three Types of Interaction. *The American Journal of Distance Education*, 3(2), 1-6.
- Moseley, D., Baumfield, V., Higgins, S., Lin, M., Miller, J., Newton, D., Robson, S. Elliott, J., & Gregson, M. (2004). *Thinking Skill Frameworks for Post-16 Learners: An Evaluation. A Research Report for the Learning and Skills Research Centre*. London: Learning and Skills Development Agency.
- Nair, P., & Fielding, R. (2005). *The language of School Design: Design Patterns for the 21st Century Schools*. Minneapolis: DesignShare.com, The International Forum for Innovative Schools.
- Oblinger, D. (2005). Leading the transition from classrooms to learning spaces. *Educause Quarterly*, (1), 14-18.
- Oldenburg, R. (2001). *Celebrating the third place: inspiring stories about the 'great good places' at the heart of our communities*. New York: Marlowe and Company.
- Park, E.L., & Choi, B.K. (2014). Transformation of classroom spaces: traditional versus active learning classroom in colleges. *Higher Education*, 68(5), 749-771.
- Poole, P., & Wheal, A. (2011). *Learning, spaces and technology*. Canterbury Christ Church University.
- Prensky, M. (2001). *Teaching digital natives*. London: Sage.
- Radcliffe, D., Wilson, H., Powell, D., & Tibbetts, B. (2008). *Designing next generation places of learning: Collaboration at the pedagogy-space-technology nexus*. Brisbane: The University of Queensland.
- Redecker, C., Ala-Mutka, K., Bacigalupo, M., Ferrari, A., & Punie, Y. (2009). *Learning 2.0: The impact of Web 2.0 innovations on education and training in Europe. Final Report*. Seville (Spain): European Commission-Joint Research Center-Institute for Prospective Technological Studies.
- Rudd, T., Gifford, C., Morrison, J., & Facer, K. (2006). *Opening Education. What if...? Re-imagining learning spaces*. Bristol: Futurelab.
- Salter, D., Thomson, D. L., Fox, B., & Lam, J. (2013). Use and evaluation of a technology-rich experimental collaborative classroom. *Higher Education Research & Development*, 32(5), 805-819.
- Sawon, K., Pembroke, M., & Wille, P. (2012). An analysis of student characteristics and behaviour in relation to absence from lectures. *Journal of Higher Education Policy and Management*, 34(6), 575-586.

Smith, C., & Bath, D. (2006). The role of the learning community in the development of discipline knowledge and generic graduate outcomes. *Higher Education*, 51(2), 259-286.

Souter, K., Riddle, M., Sellers, W., & Keppel, M. (2011). *Spaces for Knowledge Generation, final report*. Strawberry Hills: Australian Learning & Teaching Council.

Trigwell, K., Prosser, M., & Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning. *Higher Education*, 37(1), 57-70.

Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International*, 45(4), 411-419.

Whiteside, A., & Fitzgerald, S. (2009). Designing Spaces for Active Learning. *Implications*, 7(1). Retrieved April 6, 2015, from: <http://www.informedesign.org/Implications/Issues-of-Implications>