LEARNING RELATED DEVICE USAGE OF GERMAN AND INDIAN STUDENTS

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ABSTRACT

This paper investigates learning related device usage of German and Indian students. For that purpose, an exploratory survey of students at the University of Hildesheim and the Symbiosis College of Arts and Commerce in Pune is executed. The aim of the research is to uncover basic patterns of overall device usage, studying behavior, employment of learning tools and assessment of e-learning. Collected data deliver a broad picture on students' needs with regard to e-learning support. Results show, students from Pune are engaged in e-learning more frequently than students from Hildesheim. For students from India, smartphones are the most important learning devices. For German students, laptops are more important. Although both groups are experienced in e-learning, the Indian students employ a wider range of resources. In addition, Indian students communicate more often with their peers and instructors via computer mediated communication channels than the Germans. Whereas German students talk about content related and organizational aspects of learning, Indians focus on content related topics when communicating with peers and instructors.

KEYWORDS

e-Learning, Online Survey, Studying Behavior, Device Usage

1. INTRODUCTION

According to Velayo (2012), in an increasingly interconnected world, there is a need to prepare students to become more knowledgeable of different cultures and global matters. One way to foster the internationalization of higher education is to employ information and communication technology to build up joint (cross-national) e-learning infrastructures. And there is a chance to do that as technology is no longer at the periphery of education, but increasingly influences teaching (Bates & Bates 2015). At part, learning has already become global as MOOCs (Massive Open Online Courses) offer a magnitude of location-independent learning opportunities for everyone interested (Zawacki-Richter et al. 2018). Still, research on cross-national learning infrastructures and learning cultures is not that common (Kasunic et al. 2015).

This is the starting point and motivation of our work. Our investigation generates data-based insights into learning related habits of students of two institutions of higher education in different countries. This information can then serve as a base to build joint learning infrastructures that consider the different needs and patterns of users in the two locations. In order to achieve this, user acceptance should be ensured beforehand.

The paper is structured as follows. First, we provide a short sketch of literature in the field. Following that, we lay out our research design. After that, the data is presented. The paper closes with an estimation of the results.

2. REVIEW OF LITERATURE

As a preliminary remark, it is important to state that writing a state of the art with regard to learning related device usage of students in different countries is no easy task. There are many studies on students' needs and technology employment that focus on local samples (e.g. Maifarth et al. 2013, Sharma, & Madhusudhan

2017). However, investigations that collect data on learning related device usage in different locations are rather scarce. In the following, we present the works of Kukulksa-Hulme et al. (2011), Viberg and Gronlund (2013), Khaddage and Knezek (2014), Ko et al. (2014), Arpaci (2015), and Shuter et al. (2016) to get an impression on learning related device usage from a transnational perspective.

Kukulksa-Hulme et al. (2011) surveyed 270 master and doctoral students in Australia, Hong Kong, Portugal, Sweden, and the United Kingdom. They collected data concerned with learners' usage of mobile technologies in the domains of learning, work, social interaction and entertainment. Data indicate a wide spectrum of mobile device usage. With regard to learning, the most frequent uses were communication, information access, consumption of learning material and organizing. Convenience of information access and the ability to contact others immediately were seen as the main advantages of mobile devices.

Viberg and Gronlund (2013) conducted an analysis of Swedish and Chinese students' attitude towards the use of mobile devices for second and foreign language learning in higher education. In their survey of 139 language students from Sweden and 206 learners from China, they find positive attitudes toward mobile learning. Students assess it as fostering personalization, collaboration, and the authenticity of learning processes. Concerning the impact of cultural dimensions (according to Hofstede 2001), the authors only found very weak correlations with students' attitude on mobile-assisted language learning. Thus, they argue that cultural background (nationality) has no significant influence.

In an online survey of 261 students from China, Lebanon, the United Arab Emirates and the United States, Khaddage and Knezek (2014) captured attitudes towards the integration of mobile technologies in education. Data indicates that students in all countries were receptive to the idea of using mobile devices in formal and informal learning. Nevertheless, differences between the four nations could be observed. Students from Lebanon reached the highest scores and students from the United Arab Emirates the lowest.

Ko et al. (2015) surveyed the usage of mobile devices for learning purposes of 267 Library and Information Science students from Hong Kong, Japan, and Taiwan. Results indicate that students from all regions employ mobile devices and tools for learning related purposes. The study could not detect substantial differences in mobile learning usage between the three regions with one exception. Students from Hong Kong access learning management platforms more frequently than students from Japan and Taiwan.

Arpaci (2015) investigated cultural differences on the adoption of mobile learning with the help of an online survey that collected data from 190 students in Turkey and 163 students in Canada with regard to cultural aspects and adoption behavior. Arpaci argues a connection between national culture and adoption behavior. Data indicates a higher adoption rate in Canada (a more individualistic and low uncertainty avoidance-based culture) than in Turkey (a more collectivistic and high uncertainty avoidance culture).

Shuter et al. (2016) examined the influence of cultural values and social context on the digital behavior of students from the United States and Denmark. Data from a survey with 534 students from two US universities and 361 students from one college in Denmark show that both groups differ in their device usage. Danish students use their laptops and tablets in class more often whereas American students employ their mobile phones more often than their Danish counterparts. This is true for teaching sessions as well as outside the classroom. These results are consistent with economic trends as U.S. cell phone services and equipment are cheaper than Danish ones. As a result, mobile devices exhibit a higher diffusion and usage rate in the United States. In addition, it seems that cultural values with regard to authority may influence preferred policies of digital media usage in the classroom. More students from Denmark believe there should be no policy for in-class use of digital media. This corresponds to Danish and United States citizen authority value differences with the Danish valuing equalitarianism more whereas the Americans being more hierarchical.

What have we learned from the literature presented? First, we gained insights into research approaches and methods. It is evident that online surveys are the dominant data collection method. The transnational participants can mostly be categorized as a kind of convenience samples. They often represent the population of specific learning institutions, but are not necessarily representative for wider learner populations. In addition, the collected data are of a rather self-declarative character and not objective. Furthermore, we see the focus of research mostly on the micro level of the individuum. Questions are often concerned with individual adoption and usage behavior. At times, meso- or even macro levels are also implied, e.g. when the students are asked on their assessment of classroom policies or when economic data on the macro-level is included into the argumentation. But it seems, there is no systematic research on meso and macro-levels. We also did not find investigations covering cross-national learning infrastructures. Currently such infrastructures might be rather scarce. In sum, seen from a methodological perspective research is not that comprehensive but rather limited. Basically, findings should be assessed as explorative.

Second, with regard to the findings of the research presented, we see a clear trend but overall there is no clear picture. On the one hand, one can easily recognize a great willingness of students to apply information and communication devices in learning contexts and for learning purposes. Indeed, it seems that such devices are already employed widely in learning contexts, at least as tools for information and communication management. On the other hand, with regard to the impact of individual, cultural, and socio-economic factors on learning related device usage and attitudes on e-learning, findings are not so clear-cut and even partly inconsistent. Some investigations argue culture as an important factor, whereas others do not. Such deviations are not surprising when considering the broad spectrum of the different research scenarios. Still, we have to take into account that we cannot rely on generalizable findings. It is important to consider the specific context of every scenario under investigation. This is also and especially true in a context that aims to design learning environments. As the cross-national learning space is still widely untapped territory, additional research should be welcomed.

3. RESEARCH DESIGN

The goal of this research is to get insights into learning related device usage of German and Indian students. For that purpose, we aim to find basic patterns of overall device and learning tool usage, studying behavior and estimations of e-learning. Specifically, we cover three research questions.

RQ1: What devices do students employ and what are the connected learning activities? This first research question is concerned with the types of devices used, usage frequency and types of learning activities.

RQ2: What are the basic characteristics of e-learning in both groups? The second research question explores which online learning resources are employed. It also investigates students' assessment of e-learning.

RQ3: How do students use technology to communicate with peers and instructors? The last research question's focus is on communication patterns.

The study was conducted with the help of an online survey. Table 1 shows the structure of the questionnaire and mentions literature consulted for item construction.

Table 1. Structure of the questionnaire and conducted literature for the item construction

Survey Topic	Items	Reference
Device usage	**Device Usage intensity**	Sharma & Madhusudan 2017
	Learning activities per device	Maifarth et al. 2013
Studying behavior	**Online learning resource access and purpose**	Kukulska et al. 2011, Martin & Bolliger 2018, Sandoval-Lucero et al. 2012, Sharma & Madhusudan 2017
Communication patterns	**Estimation of e-learning**	Biesenbach-Lucas 2005, Deng & Tavares 2015, Kukulska et al. 2011, Madge et al. 2009, Martin & Bolliger 2018, Trenkov 2014
	With fellows	Calvo et al. 2013, Deng & Tavares 2015, Goodwin et al. 2010, Kukulska et al. 2011, Martin & Bolliger 2018, Madge et al. 2009
	With instructors	Sandoval-Lucero et al. 2012, Sharma & Madhusudan 2017

The survey was designed in an iterative process in which one of the authors prepared a draft (a). After that, the other authors checked the draft and made suggestions for improvement (b). Finally, all authors discussed the current state in a video-conference (c). Overall, the survey was prepared in three cycles that included the stages a-c. During the process, pre-tests with German and Indian students were executed and improvements were integrated into the final survey design. The questionnaire was provided from the 25th of May to the 8th of September 2018. Participants were primarily recruited from the study programs on International Information Management in Hildesheim and Bachelor of Commerce in Pune. Recruiting was executed via mailing-lists, blogs, Facebook, WhatsApp and courses at both universities.

4. ANALYSIS

Overall, 172 students took part in the study and completed the online survey. Data from one participant had to be eliminated as this specific student was neither from Hildesheim nor from Pune. On the average, it took students 16 minutes to fill out the questionnaire. In the following, we first give an overview on the two samples. Then, the analysis is structured according to the research questions.

4.1 Overview of the Samples

Table 2 gives an overview of the participants that took part in the study.

Table 2. Overview of participants (*indicates a significant difference with p <=0.05 according to the Chi-square test #indicates a significant difference with p <=0.05 according to the Mann-Whitney U test)

Attribute	University of Hildesheim	Symbiosis College of Arts and Commerce in Pune
Number of participants	66	105
Gender*	27% male, 73% female	43% male, 56% female
Age in years#	below 25: 74%, above 25: 26%	below 25: 100%, above 25: 0%
Program: bachelor or master*	70% bachelor, 30% master	87% bachelor,3% master, 10% other
Internet experience* (scale: 1=”no experience”, 5=”expert”)	MW=4.15 (SD=0.63)	MW=3.81 (SD=0.65)
Intensity of online learning (scale: 1= ”never”, 7=”several times a day”)	MW=3.85 (SD=1.84)	MW=4.61 (SD=1,73)
University attendance in days per week	MW=3.80 (SD=1.09)	MW=5.22 (SD=1.14)

One can easily see that the German and Indian samples are different with regard to all important attributes listed. Whereas in the German sample are mainly women, the Indian sample is more balanced with regard to gender. The Indian students are younger, think of themselves as less internet experienced and exhibit a higher grade of online learning intensity and attendance at the university than the Germans do.

Naturally, a comparison of students from Hildesheim and Pune would seem to be easier, if both groups would be more similar. Nevertheless, these deviations are probably typical for groups with a different cultural and socio-economic background. Additionally, as the aim of this research is not primarily to “detect” such differences. It is to gain knowledge that can serve as a common ground when the aim is to build up joint learning structures. The analysis is therefore not handicapped by the fact, that both groups are very different.

4.2 Device Usage

The first research interest is on learning related device usage. What devices do students employ and what are the connected learning activities? Table 3 gives an overview on the types of devices used.

Table 3. Device usage for university purposes
(* indicates a significant difference with p <=0.05 according to the Mann-Whitney U test)

Attribute	University of Hildesheim	Symbiosis College of Arts and Commerce in Pune
Smartphone	92%	95%
Tablet*	27%	8%
Laptop	91%	67%

Table 3 indicates that nearly every student in both locations employs a smartphone for university purposes. With regard to larger devices, penetration is higher at the University of Hildesheim. The next question is, what the devices are used for? If we investigate the use cases according to Maifarth et al. (2013), we get the following picture as stated in Figure 1. Overall, we see a higher rate of multiple device usage by German students. With the exception of information gathering, they employ more device types to accomplish the learning related activities listed. Furthermore, data shows that different devices are preferred for different activities.

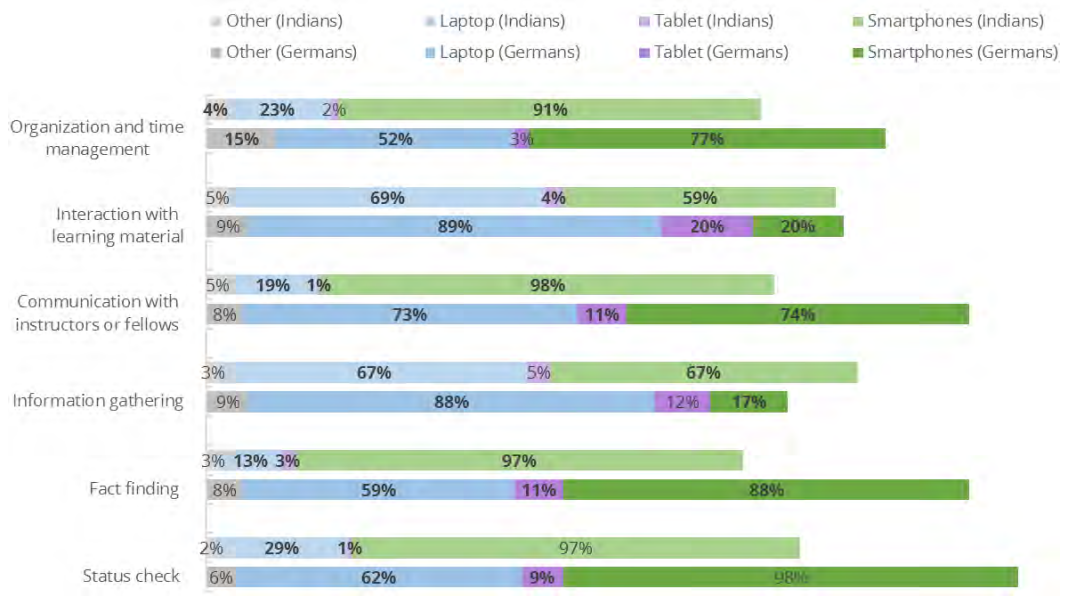

Figure 1. Device usage patterns. patterns (German students, n=66, Indian students, n=105, numbers marked bold indicate a significant difference with p <=0.05 according to the Mann-Whitney U test)

While tablets and other devices are used only marginally by the Indian sample, such devices nearly reach 30% usage fraction in the use case *interaction with learning material* for the students from Germany. For both groups, it seems that the more complex the use case the more often devices with larger screens are used. For *information gathering* and *interaction with learning material,* smartphones are used by only a small fraction of the German learners (17% and 20%). For the Indian students these two use cases are those with the most intense employment of large screen devices. Still, a majority of the Indian students uses smartphones to accomplish these tasks.

4.3 Basic Characteristics of e-Learning

How do students learn and how do they allocate their time to use different online learning resources? First of all, if we look at the expenditure of study-time, we see no significant differences between German and Indian students, neither with regard to weekly study time for lectures, seminars, etc. nor concerning the time allocated for self-study (*preparing lectures, presentations, term papers, exam preparation* etc.). Most of the students are spending either 11-20 hours or 21-30 hours attending lectures etc. And the majority allocates up to 20 hours for self-studying purposes. Most of the time, both student groups prefer to self-study alone rather than in groups. This means that although there are differences with regard to the intensity of online learning and the attendance at university between both groups, their overall learning effort is rather similar.

With regard to learning resource usage, both groups behave differently as all tests for significance are positive (according to the Mann-Whitney U test, p<=0.05). This can be seen in Figure 2. Videos are learning resources used most often for both groups followed by E-Books and E-Papers. MOOCs and special e-learning applications are less popular. Overall, we see a kind of similar ranking for both groups but a much more intense resource usage on part of the Indian students. This resembles the results from Table 1. Overall, we see that e-learning is an important part of learning especially for students from Pune. Acceptance rate is quite high as 88% of the German students and 96% of the Indian students declare that they like e-learning. Asked for reasons why they like it, most answers fall into a convenient information access category, providing easy and flexible information access. In addition to that, some of the students also mention factors directly related to learning, e.g. the possibility of clarifying questions and to deepen and widen the knowledge beyond what is provided in class.

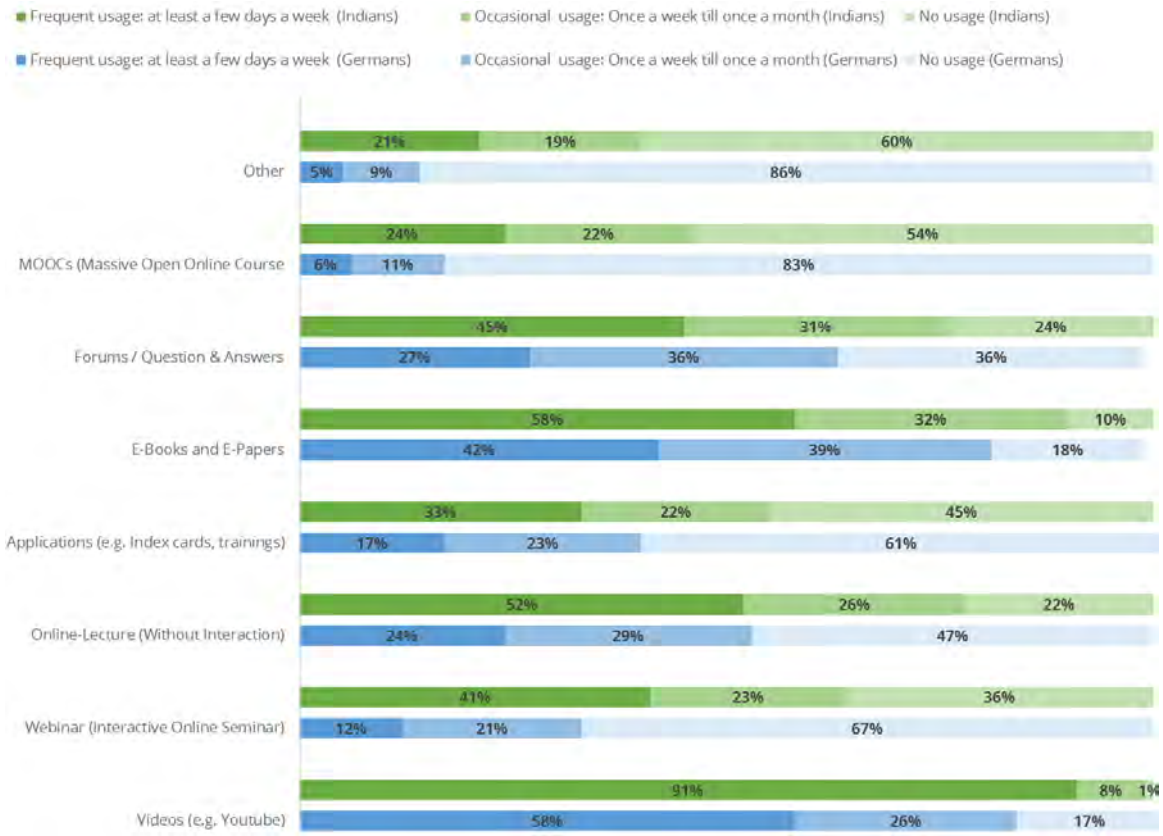

Figure 2. Usage of learning resources (German students, n=66, Indian students, n=105, all group comparisons significant according to the Mann-Whitney U test)

4.4 Communication related Technology Employment

The last research question is concerned with technology usage for communication purposes. With regard to student-to-student communication, the questions were related to communication purposes, frequency and tools used. Data shows, Indian students (90%) communicate daily more frequently with their peers (Mann-Whitney U test, p=0,01) than Germans do (68%). In addition, both groups are distinct with regard to learning related communication purposes. Germans have a stronger impetus to use communication technology as a tool to organize learning. Indians, on the other hand, use these tools for content related discussions more often e.g. 61% of Germans use technology to make appointments whereas only 16% of the Indian students are employing technology for this purpose. Asking for the tools they employ, we see that WhatsApp is very popular among students of both groups. In addition, E-mail and Facebook are also frequently used. While the majority of students in Germany employs a platform provided by the university for communication purposes, only a minority of students from India also behave this way.

Finally, the investigation also aims at insights concerning student-instructor communication. To start, we see a strong difference with regard to the overall frequency of student-instructor communication (Mann-Whitney U test, p=0,00). 30% of the Indian students communicate every day and another 30% a few days a week with the instructor. This is the case for only 2% and 8% of the German students. The majority of these communicate on a weekly (42%) or monthly (27%) basis with the instructor. With regard to the purpose of communication, again, we see that in contrast to the students from Germany the students from India are rather not used to make appointments (Chi-square test, p=0,00) with the instructor via computer mediated communication but are more prone to ask learning related questions (Chi-square test, p=0,00).

5. RESULTS AND DISCUSSION

What have we learned in this study? How can we estimate this research and in which ways can we use it?

To start, the goal of this investigation was to uncover learning related patterns of device usage in two distinct locations to get a picture of students needs with regard to e-learning support. In the literature section it was shown that research on transnational learning infrastructures and learning cultures is not that common. The investigations presented imply that students all over the world show a great willingness to apply digital devices for learning purposes. Still, findings relating to individual, cultural, and socio-economic factors on learning related device usage and attitudes on e-learning, are not so clear-cut and even partly inconsistent. Thus, in the context of our investigation, prefabricated notions should be avoided.

In this investigation, we focused on actual behavior and assessments of the participants as provided by participants' self-declaration. Items used in the survey were adopted from a collection of literature that investigates e-learning related behavior and patterns. The aim was to provide answers to three research questions. The first covers device usages and types of learning activities (RQ1), the second investigates the usage of learning related online resources and assessments of e-learning (RQ2), and the third concentrates on device usage and behavior in student-to-student and student-to-instructor communication (RQ3).

What are the main results of our investigation? First and foremost, the participants resemble two rather deviant samples. They differ with regard to all important attributes listed, not only on socio-demographic factors but also in relation to attendance at the university and intensity of online learning. The students from Pune are more often engaged in e-learning activities than the students from Hildesheim.

Concerning RQ1 (devices and learning activities), we see that both groups differ with regard to their equipment. They also show different devices usage patterns. For the German students, laptops are the primary learning devices. For the Indian students, smartphones are the most important ones. Although there is a tendency to use larger screens for more complex tasks, Indian students still use smartphones frequently. Thus, when one thinks about joint learning infrastructures, we can reason that all communication platforms and all of learning material provided needs be accessible and usable with smartphones.

With regard to RQ2 (use of learning resources, assessment of e-learning), we can hypothesize that students will have no problem to accept transnational e-learning as both groups like e-learning. Furthermore, the vast majority of students is already experienced in e-learning. Nevertheless, when one designs and executes a concrete conjoint learning scenario, one has to be aware that both groups exhibit different patterns of online resource usage. Whereas learning videos are a popular learning resource for most of the students from both groups, nearly half of the German students have no experience with online-lectures, learning applications, webinars, or MOOCs. Thus, one cannot assume that every learning resource is already known and ready to be employed immediately. In contrast, there probably is a need to introduce and train students about online resources, that they are not familiar with. In our case, the Indian students could operate as tutors for the German students. This could also help students to get familiar with each other and to build some basic trust.

In relation to RQ3 (communication behavior), we see substantial differences between both groups. The Indian students communicate much more frequently and use different tools than the Germans. The latter is especially obvious with regard to student-instructor communication. It seems that WhatsApp is the tool of choice for both groups for student-to-student related communication. This is also the case with regard to student-instructor communication for the Indians but not for the Germans. In Germany this tool is used scarcely for student-instructor communication. This can not only be connected to behavioral preferences but also to legal conditions as WhatsApp usage is not in concordance with the General Data Protection Regulation. In addition, the pragmatics of communication seems to be different too. German students communicate about content related and organizational aspects of learning. Indian students focus primarily on content related topics when communicating with peers and instructors. It is probably not going too far to assume that such differences in behavior could lead to some serious misunderstandings in common learning environments. Therefore, it seems to be a sensible approach to inform the students (and instructors) about these differences at the start of such a common learning endeavors.

In sum, although only of an explorative character, we can clearly see the knowledge value of this investigation. Besides delivering additional knowledge in a still largely unexplored field, this work provides directly applicable clues on how to build joint learning infrastructures.

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