

Demographic variables do not affect the use of mobile devices for study and learning purposes

Michael C. Cant, Johannes A. Wiid

Abstract

The use of mobile devices has become an everyday occurrence, and more and more higher education institutions have started adopting this technology in their interactions with students. Previous research has confirmed that mobile devices are becoming more widely used in learning. The sphere of formal education is not static but dynamic and evolving all the time, and central to this are developments in the technologies of teaching and learning. Educational institutions, which are seen as the bastion of new thoughts and thinking, need to ensure that these innovations and developments are incorporated in their teaching philosophies and mode of delivery – mainly to be able to accommodate the new generation of learners in the Industry 4.0, which impacts on their social and personal domains. Central to this, where the focus at tertiary institutions has shifted to, is the implementation of mobile learning technologies. This study investigates the views of learners regarding the use of mobile learning devices in their study and learning environments. In order to explore this aspect, the study aimed to determine the significance of age, gender and year of study in the use of mobile learning devices. No statistically significant differences were found between the identified demographic variables (age, gender and year of study) and uses of mobile devices in a study and learning environment.

Keywords: mobile device; e-learning; laptop; smartphone; tablet; higher education.

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INTRODUCTION

The teaching landscape has changed dramatically, compared to ten years ago, with almost every student having a smartphone or some other mobile device (Campbell, 2006). It has been statistically proven that most students (64%) regard the use of a mobile device as essential in their learning activities. It is further recorded that smartphone users constantly download applications, of which at least half are used in their learning activities; while those learners that use smartphones are 45% faster in the completion of their course material, than those using computers (Powell, n.d.).

There is a marked increase in the number of students who prefer to use mobile devices, rather than PCs and laptops, for their online coursework (Magda & Aslanian, 2018). According to Pew Research Center (2021), more than 96% of Americans own a mobile device of some kind, which is, therefore, not surprising that learners make more use of these devices in their learning endeavours, such as online courses and course-related activities (Clinefelter, Aslanian, & Magda, 2019; Magda, Capranos, & Aslanian, 2020).

Technology, as can be seen from the above discussion, has gradually become an integral part of a student's life, as highlighted by Han and Shin (2016), Fu and Hwang (2018), and Morris, Lambe, Ciccone, and Swinnerton (2016).

Looking at the millennials, who have access to all kinds of technology, and educational and recreational activities 24/7, it would seem that they are developing different ways of doing things, including learning in all spheres of life (Shamir-Inbal & Blau, 2016; Uzun & Kilis, 2019). These millennials are greatly dependent on the use of these technologies to function in all parts of their lives – to share information, to receive information, to explore new things, to create new things and to acquire knowledge, both from an educational and personal perspective. The potential for using digital technology in higher education is, therefore, great.

Having said this and knowing that users of mobile devices prefer to use these devices in learning, higher educational institutions should try to exploit this trend in their teaching activities. The pace at which technology is changing and new apps are developed have resulted in major changes in our culture and daily lives. Mobile devices have become a must for people, specifically the younger generation. This leads to the opening of tremendous opportunities in higher educational institutions and their ways of teaching. The traditional way of teaching has largely made place for the use of innovative ways to teach – due mainly to advances in technology (Karim, 2018). Many educators will, therefore, look at ways and means to incorporate the use of mobile devices in their teaching, and how they can use these electronic devices to support the learning experiences.

The purpose of this study was to investigate learners' views on the use of mobile electronic devices in their study and learning environments. The primary objective was to explore the differences in demographic variables, namely, age, gender and year of study relating to the extent to which students plan to use mobile devices in their learning processes. To achieve this objective, the study focussed on establishing if there was a significant difference between age, year of study and gender, and the use of mobile devices.

This article consists of two parts. The first focuses on theoretical concepts relating to the topic. The second section is empirical, which focuses on the methodology and findings, followed by a discussion of the findings.

REVIEW OF LITERATURE

Mobile device defined

The definition of what a mobile device is, is an evolving process. As new technologies and tools come to light, so the definition of mobile device changes. Literature shows that in the early 21st century, a mobile device was seen as a PDA or personal digital assistant that was primarily used for taking notes and reading (Kukulka-Hulme, 2002). As stated by Milheim, Fraenza, and Palermo-Kielb (2021), mobile devices are described as mobile (or cellular) phones as well as devices such as PDAs, and gadgets that play videos and MP3 music files.

A fairly comprehensive definition of mobile devices is that it can be a mobile personal computer, which users can use in the same way as they would a desktop computer, although there will be limitations such as a smaller screen (PC Magazine,

2020). In this study, a mobile device refers to a smartphone or tablet device that is used by learners.

The use of mobile devices in learning

Several studies have been conducted with regards to the use of mobile devices by college students. In this regard, Clinefelter et al. (2019) found that 56% of online college students use a mobile device for at least some of their courses, while Vasudeva, Colthorpe, and Ernst (2017) categorised the use of mobile devices as “student initiated mobile learning”. Other researchers (Dabbagh, Fake, & Zhang, 2019; Heflin, Shewmaker, & Nguyen, 2017; Tang & Bradshaw, 2016) found that students place a high value on mobile devices as collaboration tools, which makes it possible for them to access coursework, contact and interact with students and academic staff at various times.

As can be expected, the use of mobile devices escalated during the Covid-19 pandemic from 2019 to 2022. Branscombe (2020) indicated that the use of mobile phones escalated across all age groups – more so than the use of normal personal computers. It is also a known fact that many businesses and educational institutions opted for a hybrid approach in their instruction and learning, and implemented remote contact and instruction, either, fully online or a combination of online and face to face contact.

It can be stated that, largely due to the pandemic, higher education institutions adapted to the changing environment and re-evaluated their modes of the delivery of learning material to students, to accommodate and encourage students who were using their mobile devices to access their learning material (Naciri, Baba, Achbani, & Kharbach, 2020). Needless to say, the pandemic impacted the world and by implication, daily routines, the business world and so forth, in different ways. Therefore, it impacted learners as well, changing their typical mode of learning.

Mobile learning in higher education

In simple terms, mobile learning refers to the use of mobile devices in the learning activities and interactions of learners. Over the years, with advances in technology and the growth of the internet, both computers and the internet became central to education; devices became more mobile, compact, smaller, affordable and less restrictive than a personal computer. Using mobile devices, its broad applications and uses, it is now possible for learners to access the web in more cost-efficient ways. Today, students are entering higher institutions with the knowledge of these technologies, therefore, these innovations must be incorporated by educational institutions. These mobile devices make it possible for learners to expediate learning outside the classroom, due to fast access to the internet to source information and resources. Over the past years, mobile devices have provided comprehensive learning experiences for learners, made learning resources convenient and readily available, enabled learners to multitask and gain easy access to information at any time, from any place.

Learners need to constantly refresh and update their knowledge of mobile devices and technology in order to assist themselves in their self-directed learning (Patil et al., 2016).

Studies by Pratama and Scarlatos (2020) indicate that both ownership and use of mobile devices varies significantly among students of different sex, age, location and socio-economic status. This view is supported by Daud, Wong, Ghani, and Ramli (2021) who found that the impact of multimedia learning could be different across genders, based on the use of mobile technologies, their interests and preferences. A study by Parveen and Zamir (2020) found that there was no significant difference between the behavioural intentions of male and female respondents for using mobile learning. No evidence of research has been found that has been conducted amongst the different years of study and the use of mobile devices. Due to the lack of research in the areas of age, gender and year of study, a gap was identified in the literature and is addressed in this study.

METHODOLOGY AND DATA COLLECTION

A quantitative approach was adopted for the study. Data was collected using a survey questionnaire, distributed online to undergraduate students at a leading South African institution of higher learning. An ethical clearance certificate was obtained from the institution before the distribution the questionnaire. The LimeSurvey platform was used for this purpose. A link to the survey was e-mailed to students, via their institutional e-mail addresses, inviting them to participate in the survey. The link was provided and sent out by a gatekeeper, the institutions ICT. Due to convenience and accessibility to data, convenience sampling was applied. The respondent's consent was obtained before completing the survey. The survey questions relate to e-learning and the use of mobile devices, such as laptops, smartphones and tablets. Demographic information, namely, age, gender and years of study were included in the questionnaire.

Demographic information

The overall sample for the study consisted of 660 respondents, with 30.2% (n = 199) males, 65.8% (n = 434) females and 2.4% (n = 16) of respondents preferred not to answer. In terms of age, the majority of the sample were between the ages of 19 and 30 (39.7%, n = 262), and 31 and 40 years old (30.3%, n = 200). Finally, a large portion of the sample were in their third year of study (29.8%, n = 197). For complete transparency, missing values for each demographic variable have been included in Table 1. A further detailed breakdown of the sample is below.

Table 1. **Demographic breakdown of sample**

Gender	N	%
Male	199	30.2
Female	434	65.8
LBGT	0	0
Prefer not to answer	16	2.4
Missing	11	1.7
Total	660	100
Age	N	%
18 - 30	262	39.7
31 - 40	200	30.3

Gender	N	%
41 - 50	139	21.1
51 - 60	40	6.1
61 - 65	2	0.3
Prefer not to answer	9	1.4
Missing	8	1.2
Total	660	100
Year of study	n	%
First year	170	25.8
Second year	134	20.3
Third year	197	29.8
Fourth year	54	8.2
Fifth year	12	1.8
Prefer not to answer	83	12.6
Missing	10	1.5
Total	660	100

Data analysis

The data for the current study was analysed using the Statistical Package for the Social Sciences version 28 (SPSS 28). Basic descriptive and frequencies, as well as a between-group analysis of variance (ANOVA) was used to explore and test for differences between i) age; ii) year of study and iii) gender and uses of mobile devices, respectively. All the results are presented below.

FINDINGS AND RESULTS

The results focus on the various uses of mobile devices for learning purposes and results from the various ANOVAs, where differences between various variables were tested for.

In order to explore the differences in demographic variables, age, gender and year of study, relating to the extent that students use mobile devices in their study and learning processes. The first aspect that needs to be determined is which mobile devices (smartphone, tablets and laptops) are being used for study and learning (Table 2).

Table 2. **Mobile devices used for studying and learning purposes**

Devices used for studying and learning purposes	Yes	No	Missing	Total
	n %	n %	n	n %
Smartphone	511 83.1	104 16.9	45	660 100
Tablet	103 19.1	436 80.9	121	660 100
Laptop	552 86.1	89 13.9	21	660 100

It is clear from Table 2 that students use multiple or a combination of devices. It appears that the majority of students use a laptop (86.1%, n = 552) and smartphone

(83.1%, n = 511) combination. It can be safely assumed that the (13.9%, n = 89) students might be using a smartphone or tablet for study and learning purposes. Table 2 provides a robust indication of the mobile device use and that students are in a position to answer the remainder of the survey questions.

Uses of mobile devices

Table 3, below, depicts the level of agreement among participants on how often they use mobile devices and what they use them for (question six from the survey). Respondents were required to select how often they use mobile devices, based on each use listed in question six with the following options: (1) = *never*; (2) = *rarely*; (3) = *sometimes*; (4) = *often* and (5) = *always*.

Table 3. Level of agreement on mobile devices' uses in terms of study and learning

Statement	Level of agreement					Mean (M)
	Never (1)	→			Always (5)	
	n %	n %	n %	n %	n %	
A mobile device is used to study for online exams	18 2.8	16 2.4	40 6.1	143 21.9	437 66.8	4.48
A mobile device is used to study for offline exams	1 7.8	47 7.2	88 13.5	156 23.9	311 47.6	3.96
A mobile device is used to prepare for class lectures in advance	38 5.8	52 8	116 17.8	156 23.9	290 44.5	3.93
A mobile device is used to submit assignments online	9 1.4	5 0.8	8 1.2	53 8.1	577 88.5	4.82
A mobile device is used to communicate with my lecturers and other students	15 2.3	33 5	64 9.8	93 14.2	449 68.7	4.42
A mobile device is used to watch video tutorials	14 2.1	33 5.1	89 13.7	138 21.2	378 58	4.28
A mobile device is used to interact on social networks about academic matters	41 6.3	68 10.5	110 17	124 19.1	305 47.1	3.90

Table 3 shows that the most popular use of mobile devices for learning and study purposes is to “submit assignments online” (M = 4.82). A total of 88.5% (n = 577) of the sample said they always use their mobile device to do this. Even though the aforementioned use was the most popular one, the mean response (M) for the rest of the statements relating to how often mobile devices get used to perform the listed tasks, in question six, were all above 3.5. This insinuates that mobile devices get used more often than not for study and learning purposes.

Group differences

The three demographic variables that will be focussed on, in the next part of the report, are age, year of study and gender. Each variable will be tested using a one-way analysis of variance (ANOVA) to check if there is a significant difference between these demographic variables and the various uses of mobile devices for learning and studying purposes, as postulated in the questionnaire. These are: A mobile device is used to ...

1. ... study for online exams
2. ... study for offline exams
3. ... prepare for class lectures in advance
4. ... submit assignments online
5. ... communicate with my lecturers and other students
6. ... watch video tutorials
7. ... interact on social networks about academic matters.

The results of the findings are presented in the following section.

Analysis of Variance (ANOVA)

In the section that follows, the focus is on presenting descriptive statistics regarding the age, year of study and gender in terms of mobile device usage. The descriptive is followed by an analysis of variance (ANOVA) to determine whether there is any statistically significant difference regarding age, year of study and gender in terms of mobile device usages.

Age and use of mobile devices

An overview of participants per age category and how each category uses mobile devices for study and learning purposes (Table 4).

Table 4. Descriptive statistics for age and mobile device use

Question	Item content	Age category	N	Mean	Std. Deviation
6.1	A mobile device is used to study for online exams	18 - 30	246	4.41	.964
		31 - 40	184	4.46	.969
		41 - 50	133	4.48	.858
		51 - 60	40	4.63	.774
		61 - 65	2	5.00	0.000
		Prefer not to answer	9	4.67	1.000
		Total	614	4.46	.930
6.2	A mobile device is used to study for offline exams	18 - 30	246	3.96	1.233
		31 - 40	183	3.90	1.353
		41 - 50	133	3.98	1.209
		51 - 60	40	4.05	1.377
		61 - 65	2	5.00	0.000
		Prefer not to answer	9	4.22	1.093
		Total	613	3.96	1.269
6.3	A mobile device is used to prepare for class lectures in advance	18 - 30	246	3.82	1.190
		31 - 40	182	3.95	1.276
		41 - 50	133	3.98	1.121
		51 - 60	40	4.28	1.261
		61 - 65	2	4.50	.707
		Prefer not to answer	9	4.11	.928
		Total	612	3.93	1.204
6.4	A mobile device is used to submit assignments online	18 - 30	246	4.80	.657
		31 - 40	183	4.80	.677
		41 - 50	133	4.83	.525
		51 - 60	40	4.88	.404
		61 - 65	2	5.00	0.000

Question	Item content	Age category	N	Mean	Std. Deviation
		Prefer not to answer	9	5.00	0.000
		Total	613	4.81	.617
6.5	A mobile device is used to communicate with my lecturers and other students	18 - 30	247	4.40	.991
		31 - 40	183	4.43	1.061
		41 - 50	133	4.44	.916
		51 - 60	40	4.28	1.198
		61 - 65	2	5.00	0.000
		Prefer not to answer	9	4.22	1.302
		Total	614	4.41	1.013
6.6	A mobile device is used to watch video tutorials	18 - 30	245	4.25	1.013
		31 - 40	183	4.30	1.043
		41 - 50	133	4.27	.978
		51 - 60	40	4.23	1.050
		61 - 65	2	5.00	0.000
		Prefer not to answer	9	4.22	1.563
		Total	612	4.27	1.022
6.7	A mobile device is used to interact on social networks about academic matters	18 - 30	243	3.88	1.280
		31 - 40	183	3.88	1.325
		41 - 50	133	4.00	1.155
		51 - 60	38	3.68	1.397
		61 - 65	2	3.00	0.000
		Prefer not to answer	9	4.11	1.537
		Total	608	3.89	1.276

It is clear from Table 4 that regardless of age category, the mean response value for each use was always above 3. This means that participants use their mobile devices often, for all the uses listed, regardless of their age. The ANOVA results: age and mobile device use are presented in Table 5.

Table 5. ANOVA results: age and mobile device use

Question	Sum of Squares	df	Mean Square	F	Sig. p
6.1	2.718	5	.544	.626	.680
6.2	3.887	5	.777	.481	.791
6.3	9.322	5	1.864	1.289	.267
6.4	.707	5	.141	.370	.869
6.5	1.926	5	.385	.374	.867
6.6	1.353	5	.271	.257	.936
6.7	5.300	5	1.060	.649	.662

Table 5 shows that the one-way ANOVA that was performed to compare the effect of age on mobile device uses revealed no statistically significant differences ($p > 0.05$) across all uses (questions 6.1 to 6.7).

Year of study and uses of mobile devices

An overview of participants' year of study and how in each academic year, students make use of mobile devices for study and learning purposes are presented in Table 6 below.

Table 6. Descriptive statistics for year of study and mobile device use

Question	Item content	Year of Study	N	Mean	Std. Deviation
6.1	A mobile device is used to study for online exams	1st year	162	4.46	1.022
		2nd year	122	4.39	.876
		3rd year	188	4.49	.868
		4th year	50	4.44	1.013
		5th year	11	4.73	.467
		Prefer not to answer	79	4.47	.959
		Total	612	4.46	.930
6.2	A mobile device is used to study for offline exams	1st year	162	3.95	1.346
		2nd year	122	3.89	1.187
		3rd year	187	3.97	1.255
		4th year	50	4.00	1.262
		5th year	11	3.82	1.328
		Prefer not to answer	79	3.96	1.344
		Total	611	3.95	1.275
6.3	A mobile device is used to prepare for class lectures in advance	1st year	162	3.82	1.246
		2nd year	121	3.84	1.204
		3rd year	187	4.12	1.076
		4th year	50	3.84	1.376
		5th year	11	4.18	.874
		Prefer not to answer	79	3.91	1.221
		Total	610	3.94	1.193
6.4	A mobile device is used to submit assignments online	1st year	162	4.79	.691
		2nd year	122	4.80	.588
		3rd year	187	4.83	.595
		4th year	50	4.84	.422
		5th year	11	5.00	0.000
		Prefer not to answer	79	4.80	.705
		Total	611	4.81	.618
6.5	A mobile device is used to communicate with my lecturers and other students	1st year	163	4.44	1.031
		2nd year	122	4.39	.957
		3rd year	187	4.49	.941
		4th year	50	4.30	1.055
		5th year	11	4.55	.820
		Prefer not to answer	79	4.25	1.214
		Total	612	4.41	1.014
6.6	A mobile device is used to watch video tutorials	1st year	161	4.25	1.045
		2nd year	122	4.34	1.009
		3rd year	187	4.30	.971
		4th year	50	4.12	1.081
		5th year	11	4.55	.820
		Prefer not to answer	79	4.18	1.118
		Total	610	4.27	1.023
6.7	A mobile device is used to interact on social networks about academic matters	1st year	161	3.81	1.384
		2nd year	121	3.87	1.218
		3rd year	186	4.06	1.149
		4th year	50	3.76	1.287
		5th year	10	4.70	.675
		Prefer not to answer	78	3.71	1.406
		Total	606	3.90	1.274

It is evident from table 6 that the mean response value for each use was always above 3.5, regardless of which year of study the participant was in. This means that participants use their mobile devices often, for all the uses listed, regardless of their year of study. The ANOVA results: Year of Study and Mobile Device Use are presented in Table 7.

Table 7. ANOVA results: year of study and mobile device use

Question	Sum of Squares	df	Mean Square	F	Sig. <i>p</i>
6.1	1.720	5	.344	.396	.852
6.2	.937	5	.187	.114	.989
6.3	10.534	5	2.107	1.487	.192
6.4	.648	5	.130	.338	.890
6.5	4.028	5	.806	.783	.562
6.6	3.372	5	.674	.642	.668
6.7	16.369	5	3.274	2.033	.072

Table 7 shows that the one-way ANOVA that was performed to compare the effect of year of study on mobile device uses revealed no statistically significant differences ($p > 0.05$) across all uses (questions 6.1 to 6.7).

Gender and use of mobile devices

An overview of participants' gender and how each gender makes use of mobile devices for study and learning purposes is presented in Table 8.

Table 8. Descriptive statistics for gender and mobile device use

Question	Item content	Gender	N	Mean	Std. Deviation
6.1	A mobile device is used to study for online exams	Male	191	4.48	.876
		Female	404	4.46	.953
		Prefer not to answer	16	4.31	1.078
		Total	611	4.46	.932
6.2	A mobile device is used to study for offline exams	Male	190	4.05	1.240
		Female	404	3.91	1.294
		Prefer not to answer	16	4.00	1.033
		Total	610	3.96	1.271
6.3	A mobile device is used to prepare for class lectures in advance	Male	190	4.01	1.177
		Female	403	3.89	1.212
		Prefer not to answer	16	4.06	1.124
		Total	609	3.93	1.199
6.4	A mobile device is used to submit assignments online	Male	191	4.82	.580
		Female	403	4.81	.644
		Prefer not to answer	16	4.88	.342
		Total	610	4.81	.618
6.5	A mobile device is used to communicate with my lecturers and other students	Male	191	4.49	.940
		Female	404	4.37	1.043
		Prefer not to answer	16	4.25	1.125
		Total	611	4.41	1.014
6.6	A mobile device is used to watch video tutorials	Male	191	4.39	.869
		Female	402	4.22	1.070

Question	Item content	Gender	N	Mean	Std. Deviation
6.7	A mobile device is used to interact on social networks about academic matters	Prefer not to answer	16	4.00	1.414
		Total	609	4.27	1.024
		Male	188	3.99	1.208
		Female	401	3.84	1.308
		Prefer not to answer	16	4.00	1.265
		Total	605	3.89	1.277

It is clear from the mean response values (Table 8) that there are minimal differences in each gender's level of use of mobile devices across all uses. Additionally, the mean responses show that each gender makes use of mobile devices more often than not, for every use listed in question six of the survey. The ANOVA results: Gender and Mobile Device Use are presented in Table 9.

Table 9. ANOVA results: gender and mobile device use

Question	Sum of Squares	df	Mean Square	F	Sig. p
6.1	.406	2	.203	.233	.792
6.2	2.439	2	1.220	.754	.471
6.3	2.298	2	1.149	.799	.450
6.4	.094	2	.047	.123	.884
6.5	2.225	2	1.113	1.082	.340
6.6	5.087	2	2.543	2.438	.088
6.7	3.341	2	1.671	1.025	.359

Table 9 revealed no statistically significant difference between gender and any of the mobile device uses listed. Remember that a significant difference requires $p < 0.05$.

DISCUSSION

The primary objective was to explore the differences in demographic variables, age, gender and year of study relating to the extent to which students plan to use mobile devices in their learning processes. A self-completion survey was conveniently sent to undergraduate students at a leading South African institution of higher learning. A total of 660 usable responses were received back. Thus, the number of responses regarding the demographic variables of age, gender and years of study were sufficient for the purpose of analysis.

The descriptive analysis showed that the entire sample made regular use of mobile devices to study online and offline for exams, to prepare for class lectures in advance, to submit assignments online, to communicate with lecturers and other students, to watch video tutorials and to interact on social networks about academic matters. When differences between age, year of study and gender, and various uses of mobile devices were tested using ANOVAs, no statistically significant differences were found. The findings are in contrast with that of Daud et al. (2021) who found that the impact of multimedia learning could be different across genders, based on the use of mobile technologies, as their interests and preferences could be different. It does, however,

support the study of Parveen and Zamir (2020) who found that there was no significant difference between the behavioural intentions of male and female respondents for using mobile learning.

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CONCLUSION AND RECOMMENDATIONS

Finally, no statistically significant differences were found between the identified demographic variables (age, gender and year of study) and uses of mobile devices in a study and learning environment. It is evident from the findings that the respondents embraced mobile learning devices, however, it is recommended that tuition as well as non-tuition material be provided by the institution to ensure it is device friendly. This means that material should display correctly on all the mobile devices, especially material that is mathematical in nature, such as statistics and accounting. Prescribed software, for example, software used for statistical analysis and accounting, should be device friendly, in case that software cannot be tailored to be device friendly, institutions should accommodate students by making alternatives workstations available. Although there are no statistically significant differences in terms of age, it is advisable that the institution provide users with clear guidelines/instructions on how to use the device effectively for learning and study purposes.

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REFERENCES

- Branscombe, M. (2020). The network impact of the global COVID-19 pandemic. *The new stack*. Retrieved from <https://thenewstack.io/the-network-impact-of-the-global-covid-19-pandemic/>.
- Campbell, R. (2006). Teenage girls and cellular phones: discourses of independence, safety, and rebellion. *Journal of Youth Studies*, 9(2), 195–212. DOI: <https://doi.org/10.1080/13676260600635649>.
- Clinefelter, D. L., Aslanian, C. B., & Magda, A. J. (2019). *Online college students 2019: Comprehensive data on demands and preferences*. Louisville, KY: Wiley edu, LLC. Retrieved from <https://edservices.wiley.com/wp-content/uploads/2019/07/OCS-2019-FINAL-WEB-Report.pdf>.
- Dabbagh, N., Fake, H., & Zhang, Z. (2019). Student perspectives of technology use for learning in higher education. *Revista Iberoamericana de Educación a Distancia*, 22(1), 127–152. DOI: <https://doi.org/10.5944/ried.22.1.22102>.
- Daud, W. A. A. W., Wong, K. T., Ghani, M. T. A., & Ramli, S. B. (2021). Gender differences in Learning Arabic Language Proficiency via M-learning among Malaysia University Students. *Journal of Language and Linguistic Studies*, 17(Special Issue 2), 1069-1082. Retrieved from <https://www.jlls.org/index.php/jlls/article/view/2087>.
- Fu, Q.-K. & Hwang, G.-J. (2018). Trends in mobile technology-supported collaborative learning: a systematic review of journal publications from 2007 to 2016. *Computers & Education*, 119, 129–143. DOI: <https://doi.org/10.1016/j.compedu.2018.01.004>.
- Han, I. & Shin, W. S. (2016). The use of a mobile learning management system and academic achievement of online students. *Computers & Education*, 102, 79–89. DOI: <https://doi.org/10.1016/j.compedu.2016.07.003>.

- Heflin, H., Shewmaker, J., & Nguyen, J. (2017). Impact of mobile technology on student attitudes, engagement, and learning. *Computers & Education*, 107, 91–99. DOI: <https://doi.org/10.1016/j.compedu.2017.01.006>.
- Karim, R. A. (2018). Technology-assisted mind mapping technique in writing classrooms: an innovative approach. *International Journal of Academic Research in Business and Social Sciences*, 8(4), 1075–1085. DOI: <http://doi.org/10.6007/IJARBSS/v8-i4/4146>.
- Kukulska-Hulme, A. (2002). Cognitive, ergonomic, and affective aspects of PDA use for learning. In *European Workshop on Mobile and Contextual Learning (mLearn 2002)*, 20-21 Jun 2002, Birmingham, University of Birmingham. Retrieved from <http://oro.open.ac.uk/49020/2/kukulska-hulme%20-%20mlearn2002.pdf>.
- Magda, A. J. & Aslanian, C. B. (2018). *Online college students 2018: Comprehensive data on demands and preferences*. Louisville, KY: The Learning House, Inc. Retrieved from <https://tacc.org/sites/default/files/documents/2018-07/learninghouse-online-students.pdf>.
- Magda, A. J., Capranos, D., & Aslanian, C. B. (2020). *Online college students 2020: Comprehensive data on demands and preferences*. Louisville, KY: Wiley Education Services. Retrieved from <https://edservices.wiley.com/ocs2020/>.
- Milheim, K., Fraenza, C., & Palermo-Kielb, K. (2021). Supporting student-initiated mobile device use in online learning. *Online Learning*, 25(3), 267–288. DOI: <https://doi.org/10.24059/olj.v25i3.2438>.
- Morris, N. P., Lambe, J., Ciccone, J., & Swinnerton, B. (2016). Mobile technology: students perceived benefits of apps for learning neuroanatomy. *Journal of Computer Assisted Learning*, 32(5), 430–442. DOI: <https://doi.org/10.1111/jcal.12144>.
- Naciri, A., Baba, M. A., Achbani, A., & Kharbach, A. (2020). Mobile learning in higher education: unavoidable alternative during COVID-19. *Aquademia*, 4(1), ep20016. DOI: <https://doi.org/10.29333/aquademia/8227>.
- Parveen, N. & Zamir, S. (2020). Factors affecting behavioural intentions in the use of mobile learning in higher education. *International Journal of Distance Education and E-Learning*, 6(1), 198–216. DOI: <https://doi.org/10.36261/ijdeel.v6i1.1430>.
- Patil, R. N., Almale, B. D., Patil, M., Gujrathi, A., Dhakne-Palwe, S., Patil, A. R., & Gosavi, S. (2016). Attitudes and Perceptions of Medical Undergraduates Towards Mobile Learning (M-learning). *Journal of clinical and diagnostic research : JCDR*, 10(10), JC06–JC10. DOI: <https://doi.org/10.7860/JCDR/2016/20214.8682>.
- PC Magazine. (2020). *Definition of smartphone*. Retrieved from <https://www.pcmag.com/encyclopedia/term/smartphone>.
- Pew Research Center. (2021). *Mobile fact sheet*. Retrieved from <https://www.pewresearch.org/internet/fact-sheet/mobile/>.
- Powell, M. (n.d.). 10 stats that prove mobile learning lives up to the hype. *Docebo*. Retrieved from <https://www.docebo.com/learning-network/blog/10-stats-mobile-learning/>.
- Pratama, A. R. & Scarlatos, L. L. (2020). Ownership and Use of Mobile Devices Among Adolescents in Indonesia. *Journal of Educational Technology Systems*, 48(3), 356–384. DOI: <https://doi.org/10.1177/0047239519886584>.
- Shamir-Inbal, T. & Blau, I. (2016). Developing digital wisdom by students and teachers: the impact of integrating tablet computers on learning and pedagogy in an elementary school. *Journal of Educational Computing Research*, 54(7), 967–996. DOI: <https://doi.org/10.1177/0735633116649375>.
- Tang, C. M. & Bradshaw, A. (2016). The role of text messaging in team collaborative learning. In *Proceedings of the 15th European Conference on E-Learning* (pp. 672–679). Academic Conferences International. Retrieved from <https://researchonline.jcu.edu.au/46307/>.

Uzun, A. M. & Kilis, S. (2019). Does persistent involvement in media and technology lead to lower academic performance? Evaluating media and technology use in relation to multitasking, self-regulation and academic performance. *Computers in Human Behavior*, 90, 196–203. DOI: <https://doi.org/10.1016/j.chb.2018.08.045>.

Vasudeva, S., Colthorpe, K., & Ernst, H. (2017). Student-initiated mobile learning in higher education. In F. Loizides, G. Papadopoulos, & N. Souleles (Eds.), *Proceedings of the World Conference on Mobile and Contextual Learning* (Article No. 34). DOI: <https://doi.org/10.1145/3136907.3136914>.

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About the authors:

Michael C. Cant, University of South Africa, Pretoria, South Africa.
ORCID: <https://orcid.org/0000-0002-6925-8822>. Cantmc@unisa.ac.za

Johannes A. Wiid, University of South Africa, Pretoria, South Africa.
ORCID: <https://orcid.org/0000-0002-2195-532X>. jwiid@unisa.ac.za