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La influencia de entornos digitales sobre las estrategias de aprendizaje de estudiantes en Educación Obligatoria.

The influence of digital scenarios on learning strategies of Compulsory Education students.

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I certify that this dissertation for the award of MSc in Teacher Training and ICT, is entirely my own work and has not been taken from the work of others, save to the extent of the articles cited and acknowledged within the reference documents of this paper according to the styles laid down by APA 6th Edition.
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Abstract

This study embodies a quantitive methodology with a descriptive design that identifies and describes the use of learning strategies by 78 secondary school students, as well as determining the influence of digital scenarios, sex and age. In order to carry out this study, participants completed two Likert-scale questionnaires documenting their use of learning strategies and the use of digital technology in academic, work and free-time scenarios. Findings indicate how digital technologies are influencing learners inside and outside the classroom, as well as highlighting the differences between men and women and different age groups.

Keywords: Digital Scenarios, Learning Strategies, Digital Technologies, Compulsory Education.

Introduction

Technology-based Learning offers a vast range of educational prospects that would not arise from a traditional style classroom (Kalyuga & Liu, 2015). In effect, digital technologies have changed all aspects of our lifestyle and social customs, which have altered dramatically, in regards from those set in previous decades. For every society to develop, new members must be trained and taught to meet with social and labour demands. Consequent to these changes, educational systems are taking a step forward from an industrial age of schooling to an era of connectivity (Siemens, 2005). In parallel, these new advances are moulding, and defining, a new profile of learners (Presnky, 2001, 2007 & 2010; Cobo and Moravec, 2008 & Howe and Strauss, 2000), characterizing new learner capacities and contextualizing them in fresh learning scenarios (Beetham et al, 2009). Thus, challenging the constraints of formal education and traditional methodologies.

Over recent years, in the Spanish region of Extremadura, there has been an increase in investments and endowment towards digitalizing education in schools. Internet and device connectivity during the academic course 2015-2016, based on the briefs from the Secretary General of the State Education Department (2015), has risen to 93,3% in public primary schools and 98,4% in private and state-maintained schools. Nevertheless, Spain and Extremadura more so, is still a leading sector in premature school leavers (21,9%). This, therefor, raises several research topics that this study aims to answer, namely; How are students learning with technology? Or in other words, does technology-use influence students Learning Strategies? Previous research conducted (Kalyuga & Liu, 2015; Ozerbas & Erdogan, 2016; Kinash et al., 2015, Park et al., 2015 & Mayer, 2008) suggests that digital technologies and multimedia learning has a significant effect on a student's emotional and metacognitive ability, positively mediating the learner and their learning experience along with their emotional response. This paper summarizes a quantitative and descriptive design that employs two separate Likert-scale questionnaires measuring Digital Scenarios and Learning Strategies of 78 secondary school students. The results from this study align with the reviewed literature and also reveal other significant differences in regards to the cognitive process and specific learning strategies that learners use, along with identifying differences in regards to sex and age. The data permits researchers to draw several conclusions on learner profiles as well as, how digital technologies are influencing learners inside and outside the classroom. Underlining the importance of the pedagogical awareness of teacher and the need for advancing that knowledge to correctly use technology in the classroom.

Theoretical Framework

Digital Scenarios and Learners

The increasing inclusion and development of digital technologies and the rise of new pedagogical practises supposed that there has been a substantial change in the perception of education. Digital Technologies aid this process by providing a causeway for communication and access to information as well as, aiming to increase the quality and success of learning (Ozerbas & Erdogan, 2016). In addition, they also offer the possibility to adjust to individual preferences and learning styles (Akdemir & Koszalka, 2008) to bring about a scenarios that attends to equal opportunities. As such, digital technologies have had an impact on learning. They are enhancing educational contexts with a vast array of information in a wide range of formats. The teaching and learning process is no longer restricted to

a classroom setting with a traditional outlook where the focal point is on the teaching process. The incorporation and improvement of digital technologies in education has led to a new set of Learning Scenarios: PLE or Personal Learning Environments (van Hermelen, 2006; Dabbagh & Nitsantas, 2011) in which a person can use technology in order to select, share, solve problems on a personal, professional, social and academic scale relating the person to information and to knowledge, thus learning throughout life. On another note, SOLE or Self-Organized Learning Environments (Mitra, 2010) are harnessing devices to be mere motors of an academic journey where students use the internet in order to research and solve problems in a collaborative way. In regards to other learning modalities (Wang, et al., 2009; Cobo & Moravec, 2008, Gutiérrez & Mikiewicz, 2013) we can underline initiatives like Ubiquitous Learning (Jones & Jo, 2004), M-learning initiatives (Georgiev et al., 2004) and other ideas like edupunk, edupop, incidental learning… The core factor of these proposals highlights that classroom teaching can be complemented with academic expeditions in virtual spaces (Mikropoulos & Natsis, 2011) and the focus is set on learning and on the learner themselves. Thus causing a shift in the educational paradigm and the theoretical views of education today, providing a new concept of what it means to be a learner today.

Several authors (Howe & Strauss, 2000; Prensky, 2001, 2007 & 2010; Oblinger, 2005; Cobo & Moravec, 2008) have defined terms that refer to a new learner who is surrounded by digital technologies. These authors suggest that said persons demonstrate innovative, imaginative, creative and flexibility when solving problems using the information and tools given. *Millenials* (Howe & Strauss, 2000) are said to be more interconnected and autonomous when undertaking activities and are more prone to collaborating and interacting (Oblinger, 2005) in order to solve problems, learn, communicate and for entertaining themselves. Another trait for these new learners, i.e. *Digital Natives* (Prensky, 2001, 2007 & 2010) is that they are becoming more and more distant and less identified with the current educational system, having grown-up immersed in digital technology, videogames and the internet of things. Another profile, provided by Cobo and Moravec (2008) states that these new learners or "*Knowmads*" are similar to the historic nomads as demonstrating to be innovative, imaginative, creative as their constant movement provides new life opportunities enabling them to contextualize themselves and configure their surroundings in order to thrive and work effectively. Nowadays, students are not only accessing, managing, creating and sharing knowledge in dramatically different ways as their teachers often do, but also have radically new expectations regarding what a quality learning experience should be (Akdemir & Koszalka, 2008; Thiele, 2003). Learners today are immersed in a technologically-driven world, which supposes a problem for the educational community, as we do not know if this supposes a change in the way students set about solving problems, doing tasks or even understanding and processing information. In addition, Multimedia Learning (Mayer, 2008) is mediating unprecedented emotional and metacognitive influences on a learner's effort (Park et al., 2015) to undergo a task. As a result, learning styles, learning strategies as well as individual differences are taken into account by the diversity of formats and media provided (Gulbahar & Yildirim, 2006; Palloff & Pratt 2003).

Learning Styles, Strategies and Tactics

Keefe (1979) and Duff (2000) define a Learning Style as a compound of cognitive, affective and psychological characteristics that serve as a marker of how a person connects to and responds to a learning environment. Once connected to a learning environment i.e. digital scenario, learners employ a series of strategies and tactics in order to acquire, codify and recover information and knowledge. On one hand, Weinstein and Mayer (1986) describe learning strategies are conducts and thoughts that a learner uses as to influence the codification of information. On the other hand, Nisbet and Shucksmith (1987) consider them as integrated procedural sequences or activities that aim to aid in acquisition, storage and use of information. Nisbit and Shuchsmith (1987) as cited by Román and Gallego (1991) accept that learning cognitive strategies or processing strategies can be defined as mental activities used and activated with the propose of helping the acquisition, storage or use of information. Another perspective was brought forward by Shmeck (1988) which defines learning strategies as a sequence of procedures for accomplishing learning, and includes that specific procedures within a learning strategy are learning tactics. In addition, Monereo (1994) believes learning strategies as a conscious and intentional decision process in which students chose or recover the necessary knowledge in order to meet a demand or an objective, depending on the characteristics of the educational situation where learning is taking place. Meanwhile, Hasanbegovic (2006) stated that learning strategies refer to students' self-generated thoughts, feelings, and actions, which are systematically oriented toward

attainment of their goals. In summary, learning strategies can be considered as a group of specific procedural tactics linked to a general cognitive procedure of activities chosen intentionally by a learner in order to meet with a specific learning objective, namely for informational processing, self-knowledge, thoughts and feelings.

The abundance of research conducted on information processing reveals that when processing information, three cognitive process can be identified:

- Acquisition: this stage involves the reception of sensory information which is later selected, transferred, translates to a person's short-term memory with the intention of further processing (Atkinson and Shiffrin, 1968).
- Codification or Storage of Information: this step describes the transferal of information from short-term memory to long-term memory storage
- Recovery or Evocation: this phase embraces the retrieval of knowledge from a person's long-term memory, stored in the previous stages (Román and Gallego, 1991).

In addition to these three main processes involved in the processing of information, there are other actions that need to be factored as they guarantee an adequate climate for the workings of the process. There actions are those related to metacognition and socio-affective factors.

Empirical Study

Study Objectives and Hypothesis

The research design adheres to a quantitive study and a descriptive design. The following table displays the general and specific research objectives aligned with the working hypothesis of the study that are also justified by previous supporting research, in addition to the statistical analysis test used in the research.

Table 1: Research objectives and hypothesis.

	Research Objectives and Hypothesis	
General Objective	Identify Learning Strategy use of students of Compulsory Education and determine the influence of Digital Scenarios, sex and age.	
Specific Objective(s)	**Related Hypothesis**	**Supporting Research**
Analyse the differences in Learning Strategy use in regards to Digital Scenario use.	**As Digital Scenario levels increase so will learning strategy use:** Digital Scenario use will increase the use of Acquisition Learning Strategies. Digital Scenario use will increase the use of Codification Learning Strategies. Digital Scenario use will increase the use of Recovery Learning Strategies. Digital Scenario use will increase the use of Aid to Processing Learning Strategies.	ICT use enhances the quality of individual learning thus, influences learning and style of learning. (Pogarcic, Sepic & Raspor, 2009) Students clearly value the effect of ICT in regards to learning strategy development, thus easing academic work (Badía & Monereo, 2008 & Valcarcel & Tejedor, 2015). The design of e-learning need to address and accommodate diverse styles of learning. (Akdemir & Koszalka, 2008; Thiele, 2003)
Analyse the differences in learning strategy use in regards to sex	**There will be no significant difference between male and female students:** There will be no significant difference between male and female students when using Acquisition Learning Strategies. There will be no significant difference between male and female students when using Codification Learning Strategies. There will be no significant difference between male and female students when using Recovery Learning Strategies. There will be no significant difference between male and female students when using Aid to Processing Learning Strategies.	There are no significant differences in regards to the sex of participants using ACRA (Marugán, et al., 2013)
Analyse the differences in learning strategy use in regards to age	**As the age of participants increase so will their use of Learning Strategies:** The age of participants will increase the use of Learning Strategies of Acquisition The age of participants will increase the use of Codification Learning Strategies. The age of participants will increase the use of Recovery Learning Strategies. The age of participants will increase the use of Aid to Processing Learning Strategies.	With an increase of age there is also an increase in the use and efficiency of learning strategies (Marugán, et al., 2013)

Variables

Four variables were identified: I) Learning Strategies measured with the centile score of the ACRA Scale (detailed in Instruments section). II) Digital Scenarios measured with the Digital Scenarios Questionnaire (also detailed in Instruments section). III) Sex and IV) Age: divided into the following groups: 14-15 years old, 16-17 years old and >17 years old.

Sample

The sample is made up of 78 students (n=78) in the last year of Compulsory Education in both public (38 students) and state-maintained private schools (40 students) in Mérida (Spain). Participants are aged from 14-15 (42,3%), 16-17 (53,8) and <17 (3,8%). The sample corpus in regards to sex is balanced, being composed by 38 men (48,7%) and 40 women (51,3%).

Research Design

The research follows a quantitative methodology with a descriptive design in which all data collected is analysed using non-parametric test in SPSS version 20.0. Specifically, in a descriptive and explanatory way in order to answer the research hypothesis, and generate conclusions towards digital scenario and the use of learning strategies.

Instruments

This study has collected data on Digital Scenarios and Learning Strategies by using two separate questionnaires. The former, measuring digital scenarios, is an original work designed for this specific research objective and the latter was created by Román & Gallego (1995) to measure the use of Learning Strategies.

Digital Scenarios Questionnaire (DSQ)

The research instruments used to collect data on the use of Digital Scenarios was a Likert-scale questionnaire, ranging: 5 (Always), 4 (Often), 3 (Sometimes), 2 (Hardly Ever) 1 (Never). The DSQ (see appendix II) is made up of 46 items that are grouped into three dimensions with several sub-dimensions: I) Sociodemographic and Identification Data, II) Digital Technology Use (which was consequently subdivided into free-time, classroom and study and project work use) and finally III) Device use (divided into free-time and classroom use). The DSQ was constructed ensuing the following steps:

1- Bibliographic revision of Digital Technologies and Scenarios.
2- Construction of a draft version.
3- Content validity via a group of experts (seven university lecturers from the Educational Science and Specific Education Departments of the Faculty of Education from the University of Extremadura). The DSQ was marked from 1 to 10 based on adequacy of the items and dimensions that make up the instrument. The analysis was conducted via Google Drive (Appendix III).

4- Reliability of the questionnaire was measured using Cronbach's Alpha ($\propto$=0,812) on the 46 items. No items of the questionnaire were considered for elimination (appendix V).

Table 2: Cronbach's Alpha of DSQ.

Cronbach's Alpha	*Nº Items*
.812	*46*

5- Finally, the DSQ was applied to the sample groups of this study and the data was collected (appendix IV).

ACRA Learning Strategies

The second instrument measures the use or application of Learning Strategies by participants. The questionnaire used is called ACRA- Learning Strategy Scales created by Román and Gallego (1995). The instrument is composed by four separate scales, with corresponding affirmations in each scale that are marked by participants depending on the degree of correspondence, ranging from A (never), B (sometimes), C (often) to D (always). The process of construction was similar to the DSQ, as it underwent a validation via group of scholars (from the Psychology department at the University of Valladolid) who also conducted Alpha's Cronbach reliability tests obtaining the following results: Acquisition ($\propto$=0.714), Codification ($\propto$=0.907), Recovery ($\propto$=0.838) and Aid in processing ($\propto$=0.899) when tested on a group of 650 students.

Acquisition of Information Strategies

This scale aims to identify learning strategies used when selecting, transforming or transporting information from the sensory system to short-term memory and it embraces two cognitive processes, which are *attentional processing* and *repetition*. This scale measures the use of associated Learning Strategies (*exploration, fragmentation* and *repetition*) and specific tactics used in order to acquire information such as: exploration, lineal or idiosyncratic underlining, epigraphy or out-loud, reiterated and mental reviews.

Table 3: Acquisition Classification Table. Own design translated from ACRA Manual (Román & Gallego, 1995).

Classification of Acquisition of Information Learning Strategies

Cognitive Process	Learning Strategy		Acquisition Tactics
Acquisition	Attentional	Exploration	Exploration
		Fragmentation	Lineal underlining
			Idiosyncratic underlining
			Epigraphy
	Repetition	Repetition	Out-loud review
			Mental review
			Reiterated review

Codification Strategies

This dimension identifies strategies used by learners when transferring acquired information to long-term memory storage and it comprehends three main cognitive processes (*mnemonics, elaboration* and *organization*) which are associated with corresponding learning strategies and tactics, such as: *mnemonic techniques* (acronyms, tag or key words, rhymes…), *relations, imagery, metaphors, applications, self-questions, paraphrase, groupin*gs (outlines or abstracts), *sequencing* (temporal or logical), *mapping and diagrams* (Cartesian, V diagrams or infographic).

Table 4: Classification Table of Codification and Storage. Own design translated from ACRA Manual (Román & Gallego, 1995).

Classification of Codification and Storage of Information Learning Strategies.

Cognitive process	Learning Strategies		Codification Tactics
Codification	Mnemonics	Mnemonics	Acrostics
			Acronyms
			Rhymes
			Tags
			Loci
			Keywords
	Creation	Relations	Intra-content
			Shared
		Images	Images
		Metaphor	Metaphor

		Applications	Applications
		Self-questioning	Self-Questions
			Inference
		Paraphrasing	Paraphrasing
	Organization	Grouping	Summaries
			Outlines / maps
		Sequencing	Logical
			Temporal
		Mapping	Conceptual maps
		Diagrams	Cartesian Matrix
			V diagrams
			Infographics

Recovery Strategies

This scale identifies and assesses to what measure a learner uses recovery strategies, i.e. in the search, retrieval and generation of answers. In other words, the capacity a student has to recovery information from long-term memory. The two cognitive process involved in this scale are: *Search* and *generation of answers*, which, like the other scales, have a series of learning strategies and tactics coupled to them, that include: *codification searches* (mnemonics, metaphors, maps, matrix, sequences…), *incitation or clues* (key, states…), *planning to answer* (free association, organization…) and finally, *written answering* (writing, or explanation, application and transferal...).

Table 5: Recovery of Information Classification Table. Own design translated from ACRA manual (Román & Gallego, 1995).

Classification of Recovery or evocation of information Learning Strategies			
Cognitive Process	**Learning Strategies**		**Recovery Tactics**
Recovery or evocation	Searching	Codification searching	Mnemonics
			Metaphor
			Maps
			Matrix
			Sequencing (etc.)
		Clue searching	Keys
			Groups
			Stages
	Answer or response generation	Response planning	Free association
			Organization
		Written response	Write or say
			Do
			Apply or transfer

Aid to Information Processing Strategies

This scale identifies aid to information processes that support and strengthen the previous three scales (acquisition, codification and recovery of information). In short, these strategies guarantee the correct functioning of the cognitive system. The learning strategies and tactics involved in doing so, are: *Metacognitive* (self-knowledge and self-management, e.g. knowing what, how, when and why, planning and managing…) and *Social-Affective* which include self-controlling aspects that help control anxiety, expectancy and distractions. It also involves social aspects that capacitate people to obtain help, avoid conflicts, cooperate, compete and motivate others. Finally, motivational tactics that can be extrinsic, intrinsic and escape (activates, regulates and controls study capacity).

Table 6: Aid to Information Processing Classification Table. Own design translated from ACRA Manual by Román & Gallego (1995).

Classification of Aid of Information Processing Learning Strategies.			
Non-cognitive process	**Aiding Strategies**		**Aid of Information processing tactics**
Aid	metacognitive	Self-knowledge	What and how
			When and why

		Self-management	Planning
			Management / assessment
	Socio-affective	Affective	Self-instructions
			Self-control
			Counter-distractive
		Social	Social interactions
		Motivational	Intrinsic motivation
			Extrinsic motivation
			Escape motivation

Results

The following section is focused on providing answers for the research hypothesis of this study (for more details see Annex IV & V). The data collected was analysed using the latest version of SPSS (20.0). The results found are from non-parametric test as the study variables are measured as percentiles. The following tables and extracts detail each of the specific hypothesis results and conclusions.

Digital Scenarios and Learning Strategies

Table 7: Research hypothesis (1-4) and results for Digital Scenarios and Learning Strategies.

Research Hypothesis and Results				
Specific Objective	**Specific Hypothesis**		**Results**	**Conclusions**
Analyse the differences in Learning Strategy use in regards to Digital Scenario use	Digital Scenario use will increase Learning Strategy use.	Digital Scenario use will increase the use of Acquisition Learning Strategies.	Correlation coefficient: 0.179 Sig. (bilateral): p=0.117 Accept Null Hypothesis. Reject working hypothesis	The results show that there is no relation between Digital Scenarios and Acquisition Learning Strategies.
		Digital Scenario use will increase the use of Codification Learning Strategies.	Correlation coefficient: 0,175 Sig. (bilateral): p=0,125 Accept Null Hypothesis. Reject working hypothesis	The results show that there is no relation between Digital Scenarios and Codification Learning Strategies.
		Digital Scenario use will increase the use of Recovery Learning Strategies.	Correlation coefficient: 0.157 Sig. (bilateral): p=0.170 Accept Null Hypothesis. Reject working hypothesis	The results show that there is no relation between Digital Scenarios and Recovery Learning Strategies.
		Digital Scenario use will increase the use of Aid to Processing Learning Strategies.	Correlation coefficient: 0.253 Sig. (bilateral): p=0.025 Reject Null Hypothesis and accept working hypothesis. (p<0,05)	The results show that there is a positive relation. This means as Digital Scenario use increases so does the use of Aid of Processing Learning Strategies.

Table 8: Spearman's Rho Correlation Results

Spearman's Rho Correlations

			Mean Total	Acquisition	Codification	Recovery	Aid
Spearman's rho	Mean Total	Correlation Coefficient	1,000	,179	,175	,157	,253*
		Sig. (2-tailed)	.	,117	,125	,170	,025
		N	78	78	78	78	78
	Acquisition	Correlation Coefficient	,179	1,000	,668**	,512**	,547**
		Sig. (2-tailed)	,117	.	,000	,000	,000
		N	78	78	78	78	78
	Codification	Correlation Coefficient	,175	,668**	1,000	,672**	,581**
		Sig. (2-tailed)	,125	,000	.	,000	,000
		N	78	78	78	78	78
	Recovery	Correlation Coefficient	,157	,512**	,672**	1,000	,745**
		Sig. (2-tailed)	,170	,000	,000	.	,000
		N	78	78	78	78	78

Aid	Correlation Coefficient	,253*	,547**	,581**	,745**	1,000
	Sig. (2-tailed)	,025	,000	,000	,000	.
	N	78	78	78	78	78

The results of the *Spearman's Rho* non-parametric test show that the relationship between *Digital Scenarios* and *Learning Strategies* is significant at 0,05 level in the dimension related to *Aid of information Processing Learning Strategies* (*p≤0,05)*. Thus leading to the rejection of the null hypothesis and the acceptance of the working premise. The remaining dimensions are not significant, thus do not the follow predicted outcome. In other words, Digital Scenarios influence the participants by increasing their use of Aid for information processing Learning Strategies.

Sex and Learning Strategies

Table 9: Research hypothesis (5-8) and results for Sex and Learning Strategies.

Research Hypothesis and Results				
Specific Objective	**Specific Hypothesis**		**Results**	**Conclusions**
Analyse the differences in learning strategy use in regards to sex	There will be no significant difference between male and female students when using Learning Strategies	There will be no significant difference between male and female students when using Learning Strategies of Acquisition	*U Mann-Whitney*: 577,500 Sig. *p*=0.073 Accept Null Hypothesis and accept working hypothesis.	The results show that there is no significant difference between men and women.
		There will be no significant difference between male and female students when using Learning Strategies for Codification.	*U Mann-Whitney*: 602,000 Sig. *p*=0.122 Accept Null Hypothesis and accept working hypothesis.	The results show that there is no significant difference between men and women.
		There will be no significant difference between male and female students when using Learning Strategies for Recovery.	*U Mann-Whitney*: 446,500 Sig. *p*=0.02 Average Women: 46,87 Average Men: 30,90 Reject Null Hypothesis and Reject working	The results show that there is a significant difference between men and women. Women use more Recovery Learning Strategies than men.
		There will be no significant difference between male and female students when using Learning Strategies for Aid.	*U Mann-Whitney*: 496,000 Sig. *p*=0.009 Average Women: 45,69 Average Men: 32,28 Reject Null Hypothesis and Reject working hypothesis	The results show that there is a significant difference between men and women. Women use more Aid Learning Strategies than men.

Table 10: Mann-Whitney U Test Results. Sex and Learning Strategies

Test Statistics

	Acquisition	Codification	Recovery	Aid
Mann-Whitney U	577,500	602,000	446,500	496,000
Wilcoxon W	1243,500	1268,000	1112,500	1162,000
Z	-1,792	-1,546	-3,108	-2,611
Asymp. Sig. (2-tailed)	,073	,122	,002	,009

a. Grouping Variable: Sex

The results of the *Mann-Whitney U Statistic* test show that there are significant differences (*p≤0,05)* between men and women's Learning Strategy use in regards to *Recovery and Aid of processing information.* Results show that women use more learning strategies to recover and process information than men. In other words, women are more proficient in recovering information and de-codifying content. They are also more adept to generating solutions or answers to a problem than their male counterpart. The remaining hypothesis have been accepted as they show no significant difference. In summary, there is a gender equality of learning strategy use in regards to acquisition and codification of information. However, the recovery and aid processing information learning strategies are used more by women than by men.

Age and Learning Strategies

Table 11: Research hypothesis (9-12) and results for Age and Learning Strategies.

Research Hypothesis and Results				
Specific Objective	**Specific Hypothesis**		**Results**	**Conclusions**
Analyse the differences in learning strategy use in regards to age	The age of participants will increase the use of Learning Strategies.	The age of participants will increase the use of Acquisition Learning Strategies.	Chi-square: 0.990 Assynt. Sig. *p*=0,610 Accept Null Hypothesis	The results show that age does not increase Acquisition Learning Strategy use.
		The age of participants will increase the use of Codification Learning Strategies.	Chi-square: 7.272 Assynt. Sig. *p*=0,026 Reject Null Hypothesis Levene Statistic: ,625 (*p=0,539)* All >17 year olds *p*>0,05	The post hoc analysis (TSD Tukey) proves that there is a significant difference between the over seventeen year olds and the other age groups.
		The age of participants will increase the use of Recovery Learning Strategies.	Chi-square: 5.540 Assynt. Sig. *p*=0,063 Accept Null Hypothesis.	The results show that age does not increase Recovery Learning Strategy use
		The age of participants will increase the use of Aid to processing Learning Strategies.	Chi-square: 4.692 Assynt. Sig. *p*=0,096 Accept Null Hypothesis	The results show that age does not increase Aid Learning Strategy use

The previous table projects the results of the *Kruskal-Wallis Test*, that analyses the different learning strategy use in regards to age. It highlights that the proposed relation with the *Codification Dimension* is the only hypothesis to show significant differences. The remaining hypothesis, although close, do not demonstrate the same characteristics.

Table 12: Kruskal Wallis Test results.

Test Statistics[a,b]

	Acquisition	Codification	Recovery	Aid
Chi-Square	,990	7,272	5,540	4,692
df	2	2	2	2
Asymp. Sig.	,610	,026	,063	,096

a. Kruskal Wallis Test

b. Grouping Variable: Age

Table 13: Homogeneity of Variances. Codification and Age groups

Test of Homogeneity of Variances

Codification

Levene Statistic	df1	df2	Sig.
.624	2	75	.539

Table 14: Multiple comparison of Age groups for DV: Codification.

Multiple Comparisons

Dependent Variable: Codification

Tukey HSD

(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
14-15 years' old	16-17 years' old	-6.613	6.087	.525	-21.17	7.94
	>17 years' old	38.697*	15.778	.043	.97	76.42
16-17 years' old	14-15 years' old	6.613	6.087	.525	-7.94	21.17
	>17 years' old	45.310*	15.637	.014	7.92	82.70
>17 years' old	14-15 years' old	-38.697*	15.778	.043	-76.42	-.97
	16-17 years' old	-45.310*	15.637	.014	-82.70	-7.92

*. The mean difference is significant at the 0.05 level.

The posthoc results (appendix V) show that there is a significant difference between age groups when using codification learning strategies. The *Tukey HSD Multiple Comparison* of the *Codification Dimension* and Age groups show that there is a significant difference ($p \leq 0,05$) when involving the over 17 ages group. In keeping with the results displayed in previous studies, the multiple comparison analysis of age groups with learning strategies shows that the use of codification strategy increases in older age groups. It is also important to underline that other dimensions are extremely close to being statistically significant. Therefore, it is probable that with a larger, and thus more representative, sample these results would be significant. Taking this into account, we partially accept the working hypothesis that age relates with the use of Learning Strategies.

Conclusions

There is an overwhelming amount of research on Learning Styles and Strategies, however since the fast-paced development of digital technologies and devices, there has been little literature on how these new trends are influencing the cognitive processes and learning abilities of students. This paper set out to identify learning strategies uses and determine the influence of digital scenarios, sex and age of students in Compulsory Education.

The findings, in regards to the hypothesis (1-4), that related to the relationship between digital scenarios and learning strategies, indicate a significant difference in processing-aid strategies e.g. metacognitive and socio-affective abilities as affirmed previously by Mayer (2008) and Ozerbas & Erdogan (2016). This highlights that students who are more connected to digital scenarios tend to comprehend and use self-regulatory, self-management and emotional awareness strategies more efficiently. Therefore, students employ a series of motivational and socio-affective safeguards as to self-control their learning process, consistent with previous research (Dekker, Krabbendam, Lee, Boschloo, de Groot & Jolles, 2016). This is probably connected also with both emotional stability i.e. becoming more resilient and with achieving a greater educational repertoire of strategies along with a better understanding of oneself. All in all, teachers and academic staff are faced with the challenge of making education not only attractive, but useful and in step with learners' realities, motivations and attentive to learner's moods (Liew and Tan, 2016). Now more than ever, educators face the challenge of promoting students' integral development, though knowledge acquisition and skills development, so they are able and set-up for future life stages. In other words, with digital technologies students are more equipped to recognize their abilities as a learner and thus gain motivation and manage an affective economy to enhance their learning process and finally become able lifelong learners. With respect to the second set of hypothesis (5 -8) that measure the difference between men and women as to the four dimensions of learning strategies. The results partially coincide with Marugán (2013) and Cardoso (2013), pointing to the equality between sexes in the use of learning strategies, expect when talking about recovery and aid in processing strategies. This means that women are better apt at recovering information from memory and they are also more skilled at regulating emotions and self-regulating in comparison to their male

counterparts. The case can be made that women are better planners and abstract thinkers than men. Finally, as to hypothesis (9-12) that relate age with learning strategies, we can point out that there is a significant difference as to the codification dimension with older age groups. The data, as shown, points in this direction and would probably show more significant differences if the research sample contemplated a broader participant scope. Further research would include a larger group of study in order to be more representative. In addition, it could include observational techniques as to attain quantitive data about classroom pedagogy and how digital technologies and learning strategies are used. The inclusion of data regarding what tasks or activities are adopted in the classroom and in what situation a student chooses to uses a learning strategy or another in regards to the context e.g. a traditional or digital scenario, to be able to understand how a new learner actually learns and which learning tasks are better suited to their profile. Previous research (Howe & Strauss, 2000; Prensky, 2001, 2007 & 2010; Oblinger, 2005; Cobo & Moravec, 2008) have characterized new learner profiles of the new education panorama, however the responsibility lies with teachers and researchers not only to digitalize classroom environments but also to adapt teaching methods and practises as to empower students to problem-solve, to collaborate, to interact with each other and with different formats of information in order to meet their learning goals. After all, bringing technology into the classroom does not necessarily mean the integration of technology with education (Coklar, Kılıçer, & Odabaşı, 2007), emphasis must also be given to ICT competence and to socio-economic factors that can influence learning (Aesaert, van Braak, van Nijlen & Vanderlinde, 2015). If we wish to create new learners of our time and society, we cannot repeat educational processes of the past.

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APPENDIX DOCUMENTS:

I. REVISION OF CURRY'S ONION MODEL OF LEARNING STYLES
II. DIGITAL SCENARIOS QUESTIONNAIRE
III. SCREENSHOT OF VALIDATION PROCESS VIA GOOGLE DRIVE
IV. DESCRIPTIVE ANALYSIS OF STUDY
V. RESEARCH DATA AND SPSS PROCEDURE RESULTS

Annex I: Revision of Curry's Onion Model of Learning Styles

Comparative table: Theoretical Classification of Learning Styles.

Curry's Onion Model (Curry, 1987)	Referred models	Descriptive outline.
First Model: Refers to all that is observable. This model is based upon the instructional and environmental preferences of learning in which students obtain guidance for study and their contextual needs to be able to work.	Dunn & Dunn Learning Style Inventory (1985).	This model is based on the idea that every student learns in their own way and there are certain factors that condition study (influencing the student in a determined way). There are 21 identified factors, so called "personal tastes" that influence that way students learn.
	"Keefe's Learning Style Profile" (1986).	This model evaluates secondary students cognitive style. There are 23 identified variables that influence learning, that are groups into three factors: 1) Cognitive Abilities 2) Information perception and 3) Study and Learning.
	"Canfield's Learning Styles Inventory" (1988).	This model categorizes students into four groups; 1) referred to learning conditions 2) referred to area interest 3) referred to the way of learning and 4) referrers to the Degree of knowledge in regards to others.
	Social Interaction Preferences: Grasha & Riechman (1975).	This model analyses student interaction in the classroom. This supposes the existence of three bi-polar dimensions: 1) Dependant and Independent, 2) Collaborative or Competitive and 3) Participative or Non-Participative.
Second Model: This model is based on a student's preference of how to process information. Students therefor obtain orientations about the way in which they learn in the classroom.	Herrmann's Brain Quadrants (1989).	This model sees the brain as four quadrants representing four different ways to operate, think, create and learn. Which are: Left Cortical (logical and analyst), Right Cortical (holistic and intuitive), Left Limbic (organizer and sequential) and finally, Right Limbic (interpersonal and emotional).
	Kolb's Model (1981).	This model assumes that learning is a procedural analysis of the received information. The process of a direct and concrete experience (active student) or an abstract experience (theoretical student), which is transformed into knowledge when reflecting (reflective student) and think and when students experience it actively with information (pragmatic student).
	Honey & Momford (1992)	This model is based on Kolb model, establishing four learning styles, which are: active, reflective, theoretical and pragmatic.
	Catalina Alonso's Model (1992).	This model is based on the model Honey & Momford specifying the characteristics of including four learning styles. It is determined that the styles are not presented with the same degree of significance. The first level (main features) corresponds to the most relevant characteristics (the result of factor analysis) and the rest appear categorized as other features.
	McCarthy's Model (1987).	This model is based on Kolb's Model. However, it highlights individual differences in the perception or processing of information. Learning styles are grouped into four categories: 1) Imaginative or divergent, 2) Analytical or assimilator, 3) Common or convergent and 4) Dynamic or accommodated.
	Neurolinguistics Programming (PNL) (1998).	This model sustains that the brain has two hemispheres. The author states that the current educational system develops the left hemisphere of the brain, where there is a need for assimilation of information. The model endeavours to balance the hemisphere use. These authors develop the "Edmond Learning Style" and the "Swassing-Barbe Perceptual Modality Instrument" also called VAK considering the route of entry of information (visual (eye), hearing (auditory) and the body (kinaesthetic)).
	Brain hemisphere's model (2001).	This model is based on the separation of the brain into two parts (though interrelated) to associate information and learn. The left hemisphere deals with the convergent thinking, e.g. the analytical and logical. While the right hemisphere deals with divergent thinking, e.g., the holistic and analogue
	"Felder_Silverman Learning Style" (1998).	This model classifies learning styles depending on the combination of five-dimensional responses. The characteristics of the five dimensions are: sensory, intuitive, visual, verbal, active, reflective, sequential, global, inductive and deductive
Third Model: Relates to the preferences of Learning in relation to personality. This model is the deepest level of the Onion Categorization. The student in this layer has access to information about self-knowledge, context and the way to learn.	Myers-Briggs's Model (1962).	This model is based on the study of personality, for it defines four categories: sensation, intuition, thinking and feeling. The study of Learning Styles is about learning how individuals and their preferences in the thought processes affect learning behaviours. There are 16 possible types depending on the combination of the four bipolar dimensions: 1) feeling vs. intuition, 2) reason vs. emotion, 3) judgment vs. perception and 4) extroversion vs. introversion.
	Witkin's Model (1977).	This model is based on the dual categorization of two fields; the first called field-dependent tends to perceive the whole, without separating an element of the total visual field. Meanwhile, the second, called field-independent, perceives individual, isolated parts of the overall pattern.
	Gardner's Multiple Intelligences (2002).	This model is based on the categorization of eight different modes of learning of an individual. Which they are: linguistic, logical-mathematical, naturalist, spatial, musical, kinaesthetic, interpersonal and intrapersonal verbal.

Specific Learning Style Reference Index

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Annex II: The Digital Scenarios Questionnaire (DSQ). *Original version.*

CUESTIONARIO PARA ESTUDIANTES DE EDUCACIÓN SECUNDARIA OBLIGATORIA
SOBRE EL USO DE TECNOLOGÍAS DIGITALES

APELLIDOS		***NOMBRE***	
CENTRO		***CURSO***	
LOCALDIAD			

DATOS SOCIO-DEMOGRÁFICOS

Sexo	( ) Hombre / ( ) Mujer
Edad	( ) <12 / ( ) 12 -13 / ( ) 14-15 / ( ) 16-17 / ( ) >17
Lugar de Residencia	( ) Zona centro de ciudad / ( ) Barrio de ciudad / ( ) Pueblo cercano / ( ) Pueblo lejano (>20km/ciudad)
Localización del Centro	( ) Urbano / ( ) Rural
Tipo de Centro	( ) Público / ( ) Concertado / ( ) Privado
¿Compartes dispositivo electrónico con alguien en casa?	( ) Sí / ( ) No
En caso afirmativo, Indica el número de personas con quien compartes dispositivo electrónico en casa	

FRECUENCIA DE USO DE TECNOLOGÍAS DIGITALES

Señala de 1 a 5 según la frecuencia de uso: 1 (nunca), 2 (casi nunca), 3 (a veces), 4 (frecuentemente), 5 (siempre)

1. ¿Con qué frecuencia usas las siguientes tecnologías en tu tiempo libre?

Facebook	1	2	3	4	5
Twitter	1	2	3	4	5
Instagram	1	2	3	4	5
Snapchat	1	2	3	4	5
Mensajería instantánea (WhatsApp, Telegram…)	1	2	3	4	5
Vine	1	2	3	4	5
Periscope	1	2	3	4	5
Página web Personal	1	2	3	4	5
Entornos virtuales (eScholarium, SaviaDigital, OxfordPlus…)	1	2	3	4	5
Videojuegos	1	2	3	4	5
Blog	1	2	3	4	5
Páginas de consulta de información (Wikipedia, rincón del estudiante…)	1	2	3	4	5
Otro(s)	1	2	3	4	5

2. ¿Con qué frecuencia usas las siguientes tecnologías para estudiar?

Facebook	1	2	3	4	5
Twitter	1	2	3	4	5
Instagram	1	2	3	4	5
Snapchat	1	2	3	4	5
Mensajería instantánea (WhatsApp, Telegram…)	1	2	3	4	5
Página web Personal	1	2	3	4	5
Blog	1	2	3	4	5
Entornos virtuales (Escolarium, SaviaDigital, OxfordPlus…)	1	2	3	4	5
Videojuegos	1	2	3	4	5

Páginas de consulta de información (Wikipedia, rincón del estudiante…)	1	2	3	4	5
Otro(s)	1	2	3	4	5

3. ¿Con qué frecuencia usas las siguientes tecnologías para realizar trabajos?

Facebook	1	2	3	4	5
Twitter	1	2	3	4	5
Instagram	1	2	3	4	5
Snapchat	1	2	3	4	5
Mensajería instantánea (WhatsApp, Telegram…)	1	2	3	4	5
Página web Personal	1	2	3	4	5
Blog	1	2	3	4	5
Entornos virtuales (Escolarium, SaviaDigital, OxfordPlus…)	1	2	3	4	5
Videojuegos	1	2	3	4	5
Páginas de consulta de información (Wikipedia, rincón del estudiante…)	1	2	3	4	5
Otro(s)	1	2	3	4	5

FRECUENCIA DE USO DE DISPOSITIVOS.

Señala de 1 a 5 según la frecuencia de uso: 1 (nunca), 2 (casi nunca), 3 (a veces), 4 (frecuentemente), 5 (siempre)

4. ¿Con qué frecuencia utilizas los siguientes dispositivos en clase?

Ordenador sobremesa	1	2	3	4	5
Ordenador portátil	1	2	3	4	5
Tabletas (inc. *All-in-one*)	1	2	3	4	5
Teléfono móvil (Smartphone)	1	2	3	4	5
Pizarra digital	1	2	3	4	5
Otro(s)	1	2	3	4	5

5. ¿Con qué frecuencia utilizas los siguientes dispositivos en tu tiempo tiempo libre?

Ordenador sobremesa	1	2	3	4	5
Ordenador portátil	1	2	3	4	5
Tabletas (inc. All-in-one)	1	2	3	4	5
Teléfono móvil (Smartphone)	1	2	3	4	5
Pizarra digital	1	2	3	4	5
Otro(s):	1	2	3	4	5

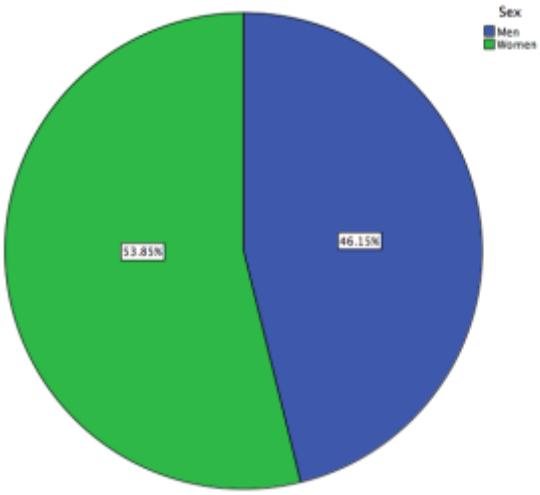
Annex III: Screenshot of validation process via Google Drive.

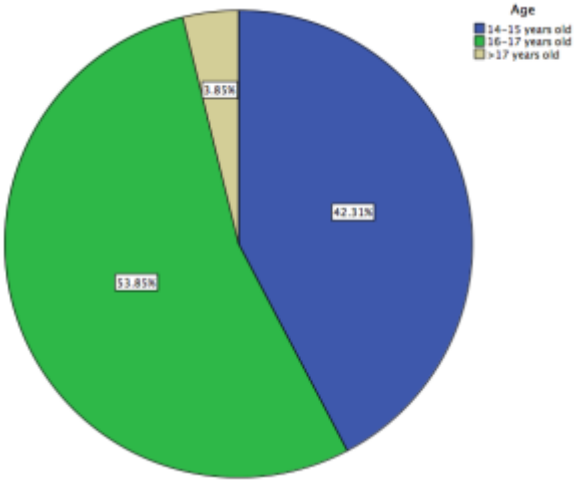
The validation process of the DSQ was undertook via a group of experts i.e. seven university professors from the Educational Science and Specific Education Departments of the Faculty of Education of the University of Extremadura. The DSQ was marked from 1 to 10 based on adequacy of the items and dimensions that make up the instrument. The analysis was conducted on Google Drive.

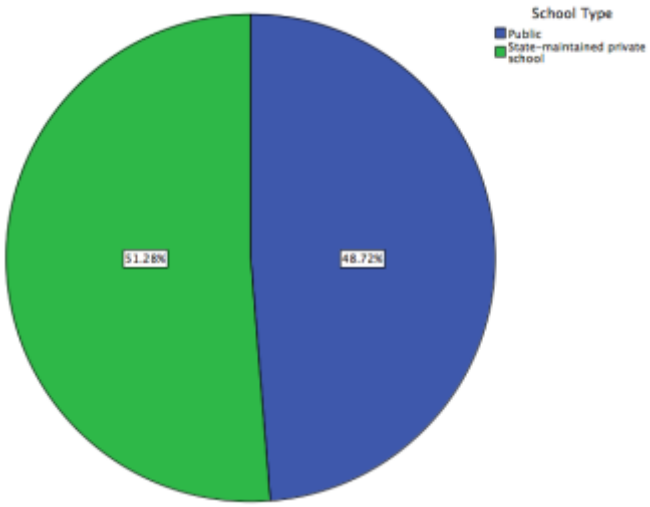
Annex IV: Descriptive Analysis

Dimension: Sociodemographic and Participant Identification.

The total number of participant of the study is 78, of which 53,85% are women and 46,15% men. All participants are in the last year of Compulsory Education aged between the ages of 15 and over 17. The age ranges established in the study were: 14-15 years old (42,31%), 16-17 years old (53.85%) and over 17 years old (3,85%). Furthermore, the sample was collected in both public (48,72%) and state-maintained private schools (51.28%)







Dimension: Digital Technology Use

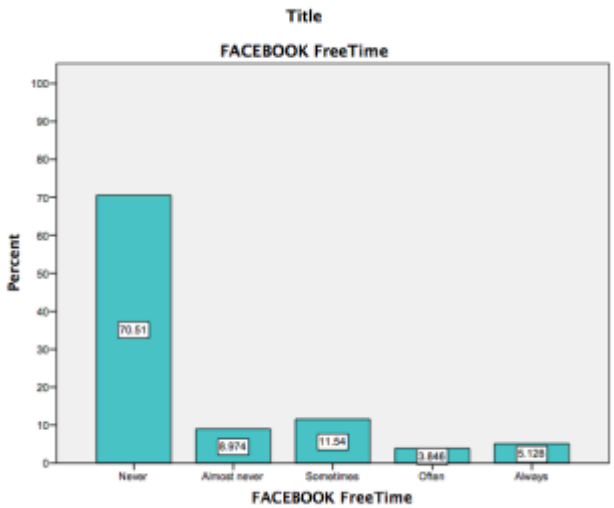
Free-time sub-dimension

Descriptive Statistics

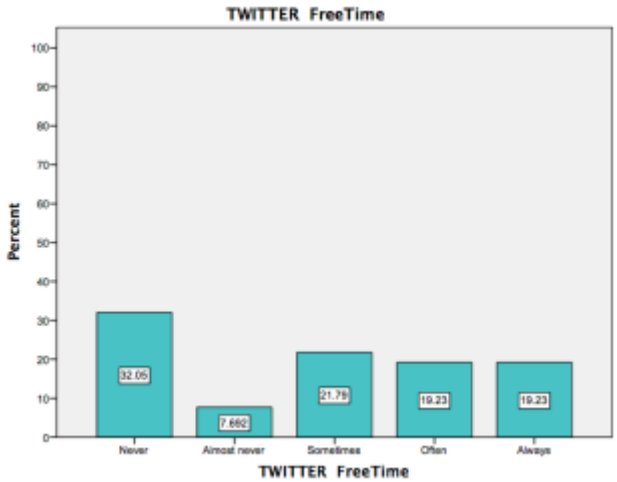
Items	N	Min.	Max.	Mean	Std. Deviation
FACEBOOK FreeTime	78	1	5	1.64	1.151
TWITTER FreeTime	78	1	5	2.86	1.527
INSTAGRAM FreeTime	78	1	5	4.13	1.333
SNAPCHAT FreeTime	78	1	5	3.76	1.653
IM FreeTime	78	3	5	4.86	.386
VINE FreeTime	78	1	5	1.44	.891
PERISCOPE FreeTime	78	1	5	1.45	.935
Web Page FreeTime	78	1	3	1.10	.381
Virtual Environments FreeTime	78	1	3	1.31	.565
Videogames FreeTime	78	1	5	2.77	1.476
Blog FreeTime	78	1	5	1.74	.999
Info consultation pages FreeTime	78	1	5	3.18	1.054
Valid N (listwise)	78				

Table 14: Descriptive statistics of Digital Technology Use (free-time)

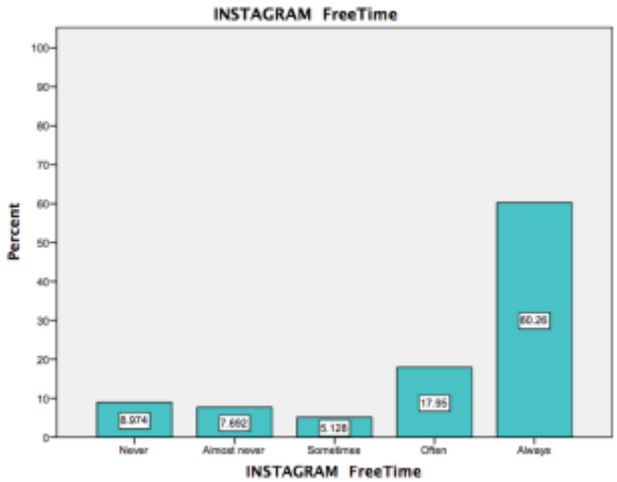
The sub-dimension is comprised by twelve items that were answered by 78 participants scoring on a 1-5 Likert Scale. The mean average shows that students are more prone to use instant messaging (4.86), Instagram (4.13) and Snapchat (3.76) in their free-time. Meanwhile they are least disposed on using webpages (1.10), virtual environments (1.31) and vine (1.44). The following graphs show in detail the data collected on each item referred to free-time digital technology use:



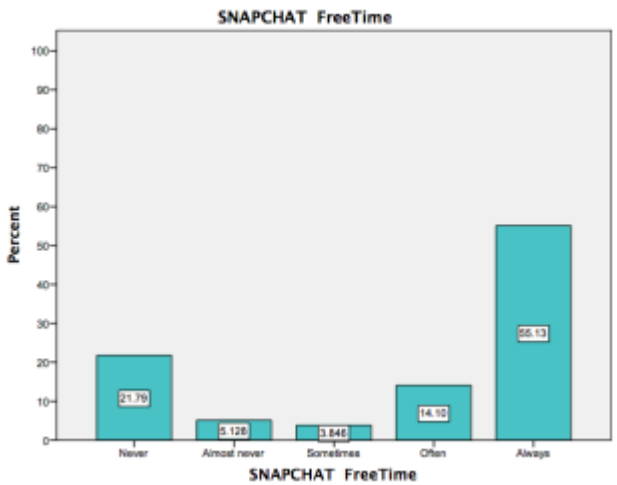
When asked about the use of Facebook in participants free-time activities they answered the following: never (70,51%), almost never (8,97%), sometimes (11.54%), often (3.84%) and always (5.12%).



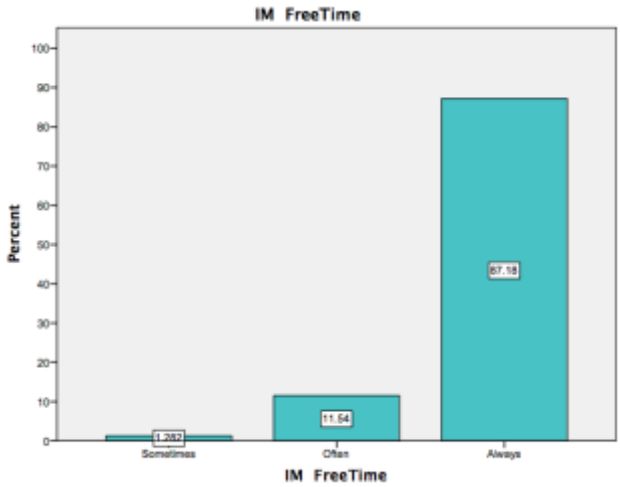
When asked about the use of Twitter in participant's free-time they answered the following: never (32.05%), almost never (7.69%), sometimes (21.79%), often (19.23%) and always (19.23%).



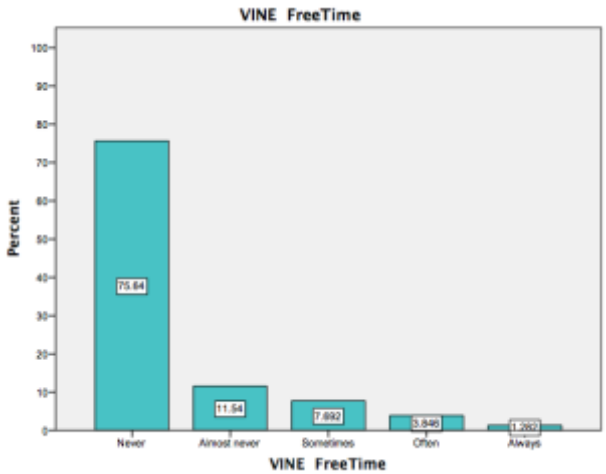
When asked about the use of Instagram in participant's free-time they answered the following: never (8.97%), almost never (7.69%), sometimes (5.12%), often (17.95%) and always (60.26%).



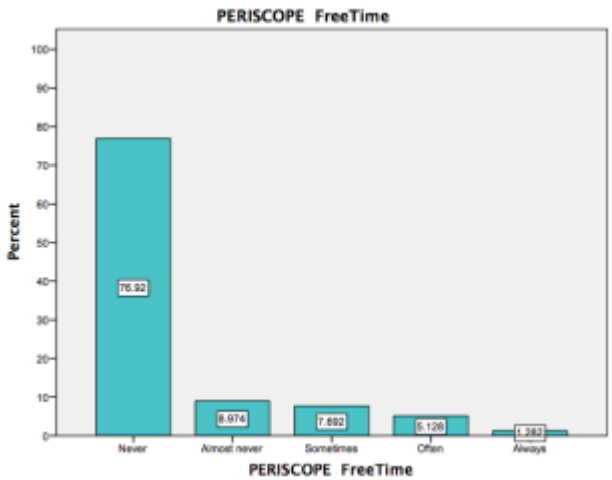
When asked about the use of Instagram in participant's free-time they answered the following: never (21.79%), almost never (5.12%), sometimes (3.84%), often (14.10%) and always (55.13%).



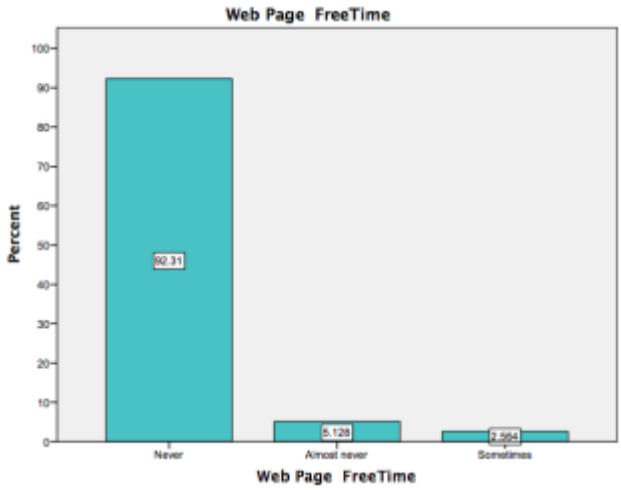
When asked about the use of Instant Messaging in participant's free-time they answered the following: never (0%), almost never (0%), sometimes (1.28%), often (11.54%) and always (87.18%).



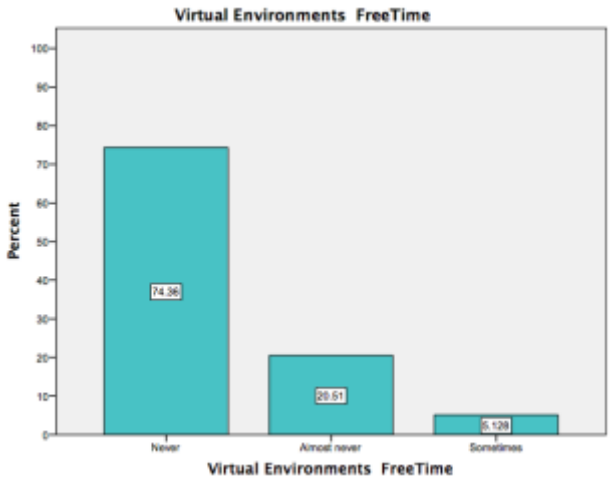
When asked about the use of Vine in participant's free-time they answered the following: never (75.64%), almost never (11.54%), sometimes (7.69%), often (3.84%) and always (1.28%).



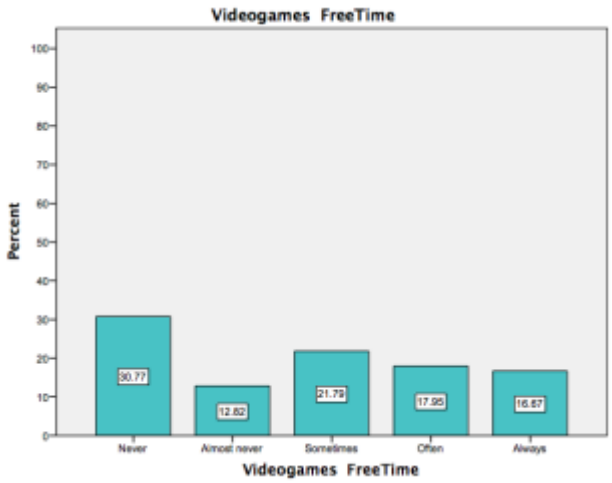
When asked about the use of Periscope in participant's free-time they answered the following: never (76,94%), almost never (8.97%), sometimes (7.69%), often (5.12%) and always (1.28%).



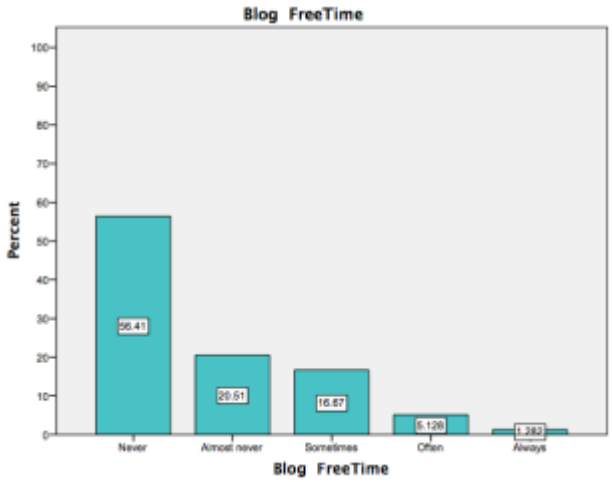
When asked about the use of webpages in participant's free-time they answered the following: never (92.31%), almost never (5.12%), sometimes (2.56%), often (0%) and always (0%).



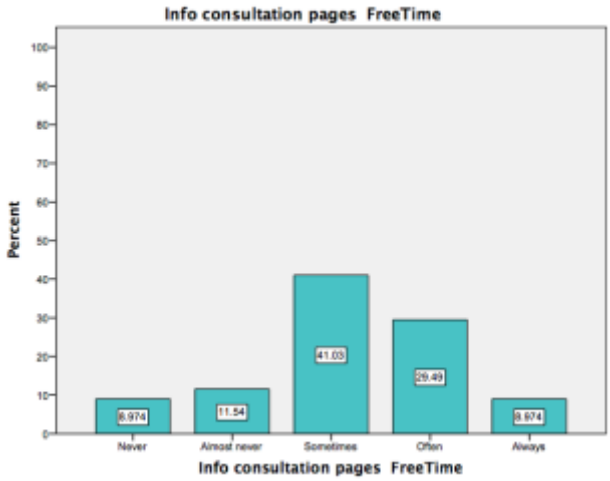
When asked about the use of virtual environments in participant's free-time they answered the following: never (74.36%), almost never (20.51%), sometimes (5.12%), often (0%) and always (0%).



When asked about the use of videogames in participant's free-time they answered the following: never (30.77%), almost never (12.82%), sometimes (21.79%), often (17.95%) and always (16.67%).



When asked about the use of blogs in participant's free-time they answered the following: never (56.41%), almost never (20.51%), sometimes (16.67%), often (5.12%) and always (1.28%).



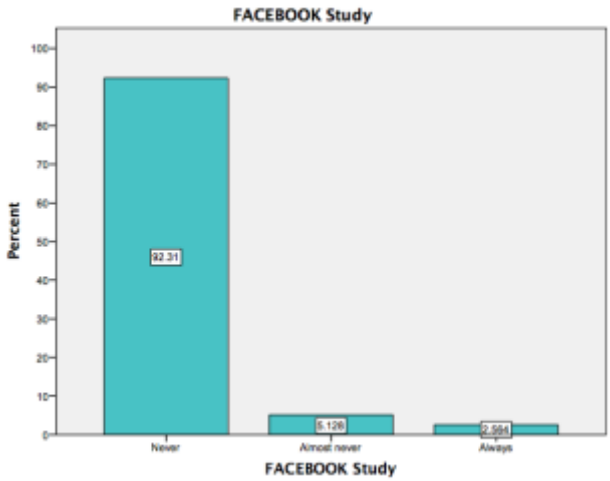
When asked about the use of information consultation pages in participant's free-time they answered the following: never (8.97%), almost never (11.54%), sometimes (41.03%), often (29.49%) and always (8.97%).

Study sub-dimension

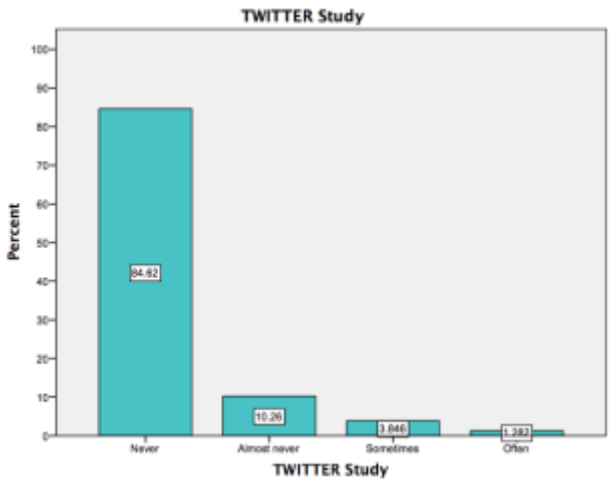
Descriptive Statistics

	N	Min.	Max.	Mean	Std. Deviation
FACEBOOK Study	78	1	5	1.15	.666
TWITTER Study	78	1	4	1.22	.573
INSTAGRAM Study	78	1	5	1.53	1.078
SNAPCHAT Study	78	1	5	1.77	1.289
IM study	78	1	5	3.40	1.313
VINE Study	78	1	3	1.03	.226
PERISCOPE Study	78	1	2	1.04	.194
Web page Study	78	1	5	1.14	.575
Blog Study	78	1	5	2.09	1.416
Virtual Environments Study	78	1	5	1.63	1.033
Videogames Study	78	1	5	1.15	.666
Info consultation pages Study	78	1	5	3.99	1.075
Valid N (listwise)	78				

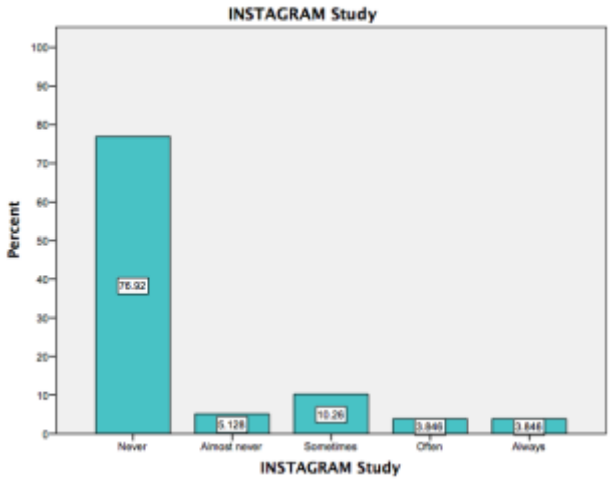
The results in the table above, based on a Likert scale 1 to 5, show Digital Technology use in study time, we can point out that the three most used TD are: information consultation pages (3.99), which were described as information and knowledge sources on the internet; the second is instant messaging (3.40) and thirdly, Blogs (2.09). Meanwhile the three digital technologies used least are: vine (1.03), periscope (1,04) and general webpages (1.14)



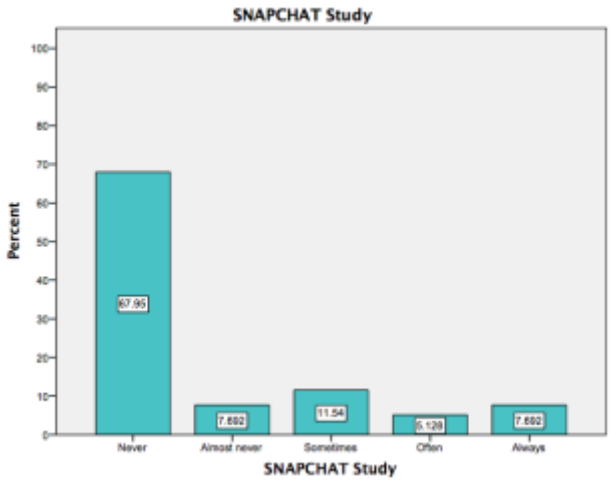
When asked about the use of Facebook for study use, participants answered the following: never (92.3%), almost never (5.12%), sometimes (0%), often (0%) and always (2.56%).



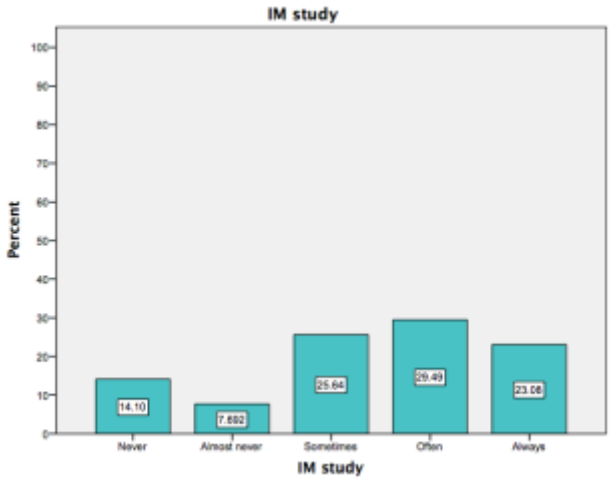
When asked about the use of Twitter for study use, participants answered the following: never (84.62%), almost never (10.26%), sometimes (3.84%), often (1.28%) and always (0%).



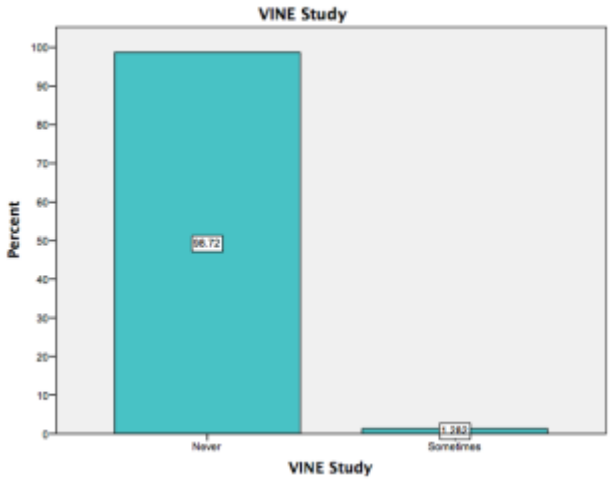
When asked about the use of Instagram for study use, participants answered the following: never (76.92%), almost never (5.18%), sometimes (10.26%), often (3.84%) and always (3.84%).



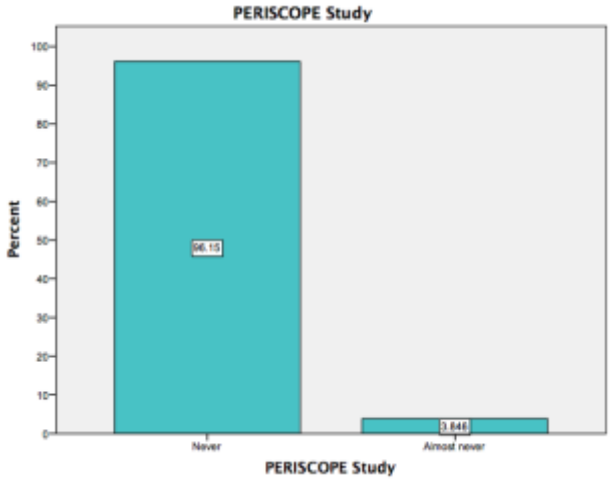
When asked about the use of Snapchat for study use, participants answered the following: never (67.95%), almost never (7.69%), sometimes (11.54%), often (5.12%) and always (7.69%).



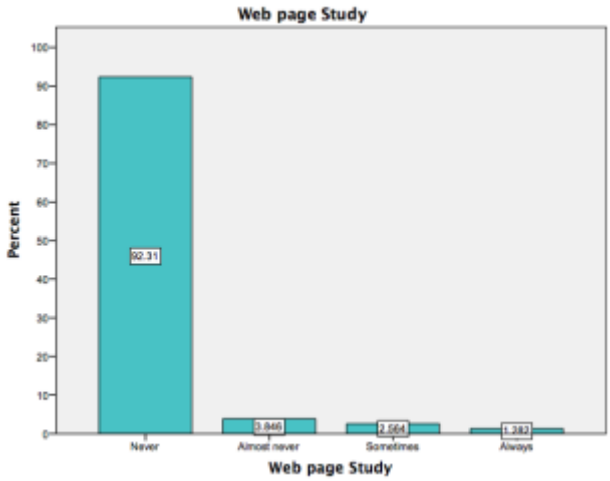
When asked about the use of Instant Messaging for study use, participants answered the following: never (14.10%), almost never (7.69%), sometimes (25.64%), often (29.49%) and always (23.08%).



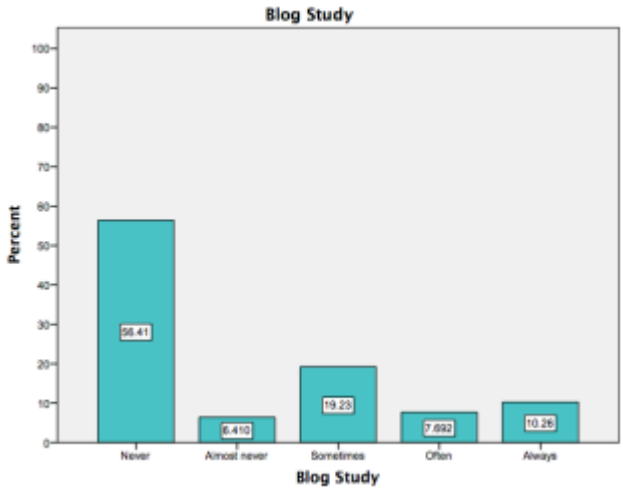
When asked about the use of Vine for study use, participants answered the following: never (98.72%), almost never (0%), sometimes (1.28%), often (0%) and always (0%).



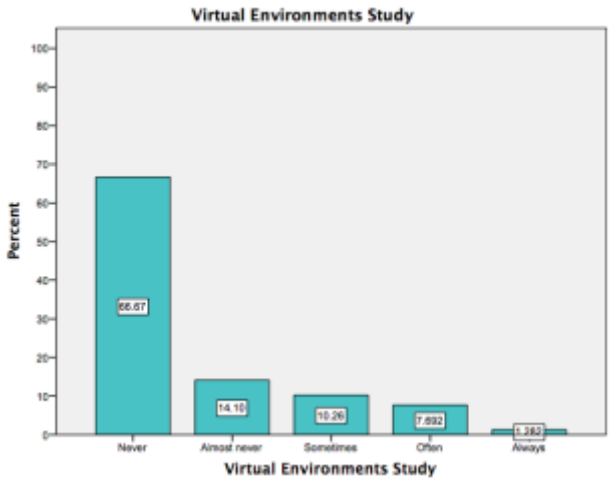
When asked about the use of Periscope for study use, participants answered the following: never (96.15%), almost never (3.84%), sometimes (0%), often (0%) and always (0%).



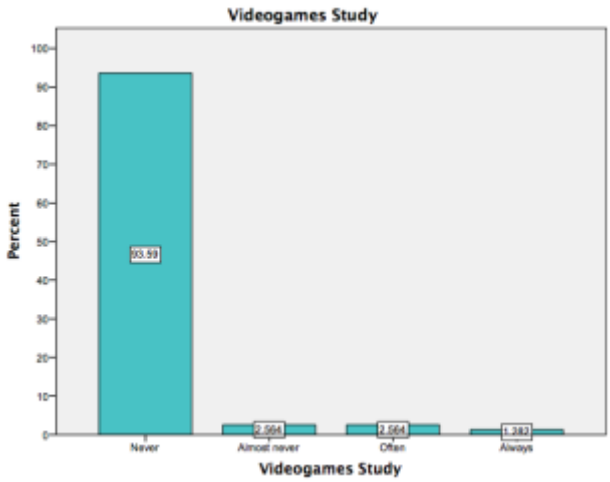
When asked about the use of web-pages for study use, participants answered the following: never (92.31%), almost never (3.84%), sometimes (2.56%), often (0%) and always (1.28%).



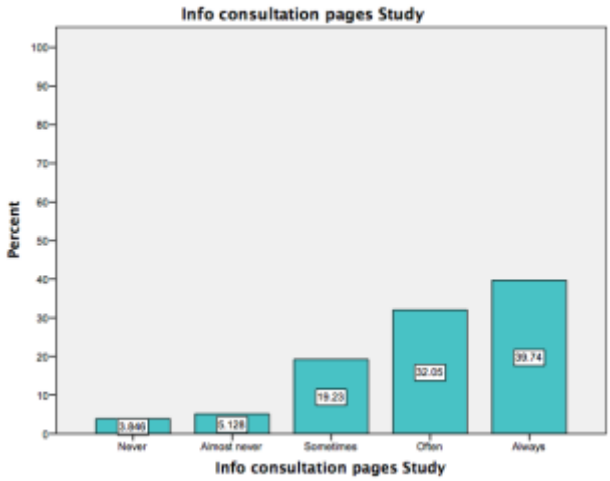
When asked about Blog use for study use, participants answered the following: never (56.41%), almost never (6.41%), sometimes (19.23%), often (7.69%) and always (10.26%).



When asked about the use of Virtual Environments for study use, participants answered the following: never (66.67%), almost never (14.10%), sometimes (10.26%), often (7.69%) and always (1.28%).



When asked about the use of videogames for study use, participants answered the following: never (93.59%), almost never (2.56%), sometimes (0%), often (2.56%) and always (1.28%).



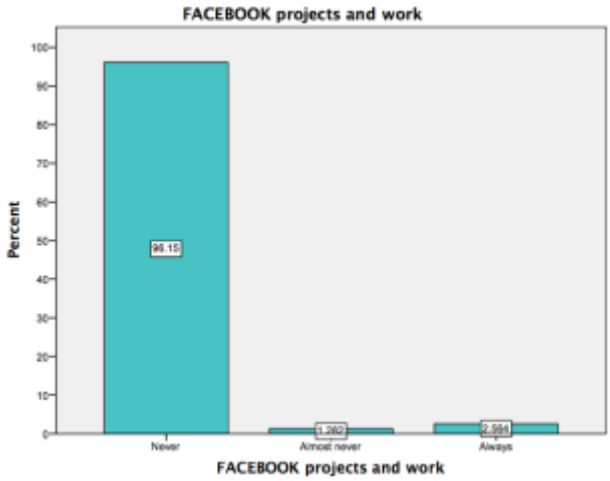
When asked about the use of Information and Consultation pages for study use, participants answered the following: never (3.84%), almost never (5.12%), sometimes (19.23%), often (32.05%) and always (39.74%).

Work and projects sub-dimension

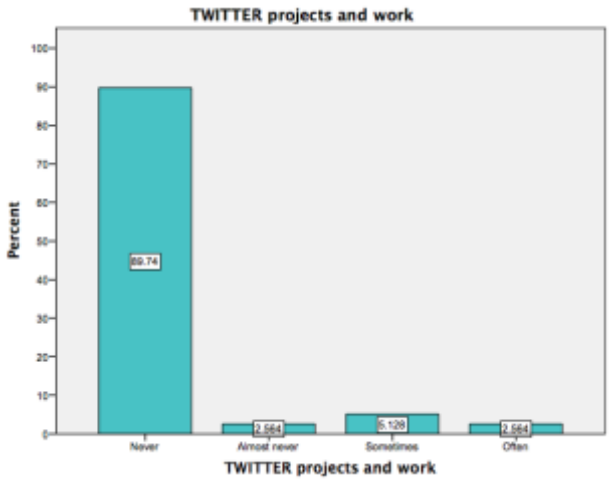
Descriptive Statistics

	N	Min.	Max.	Mean	Std. Deviation
FACEBOOK projects and work	78	1	5	1.12	.644
TWITTER projects and work	78	1	4	1.21	.652
INSTAGRAM projects and work	78	1	5	1.29	.899
SNAPCHAT projects and work	78	1	5	1.32	.987
IM projects and work	78	1	5	3.19	1.433
VINE projects and work	78	1	2	1.01	.113
PERISCOPE projects and work	78	1	1	1.00	.000
Web page projects and work	78	1	5	1.31	.872
Blog projects and work	78	1	5	2.28	1.376
Virtual Environments projects and work	78	1	5	1.86	1.266
Videogames projects and work	78	1	4	1.06	.372
Info consultation pages projects and work	78	1	5	4.65	.699
Valid N (listwise)	78				

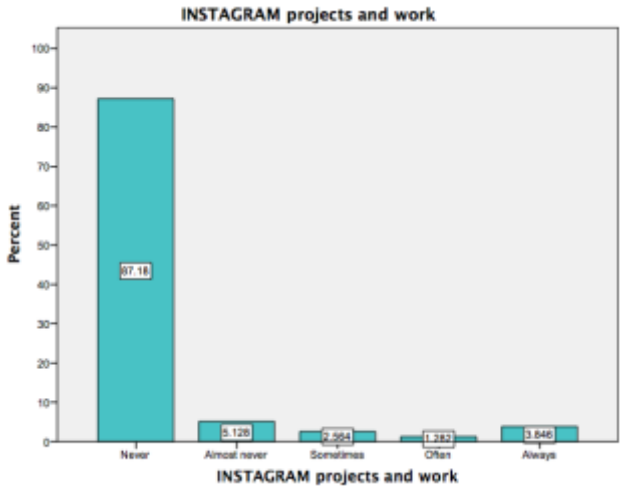
The results in the table above, based on a Likert scale 1 to 5, show Digital Technology use when doing work or projects, we can point out that the three most used TD are: information consultation pages (4.65), instant messaging (3.19) and blogs (2.28). Meanwhile, the three least used are: Periscope (1.00) which means all participants have never used this technology in order to do work or projects, vine (1.01) and finally, videogames (1.06)



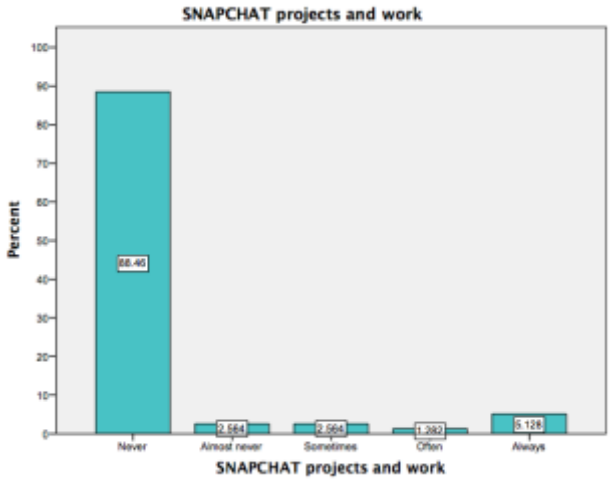
When asked about the use of Facebook for work or project use, participants answered the following: never (96.15%), almost never (1.28%), sometimes (0%), often (0%) and always (2.56%).



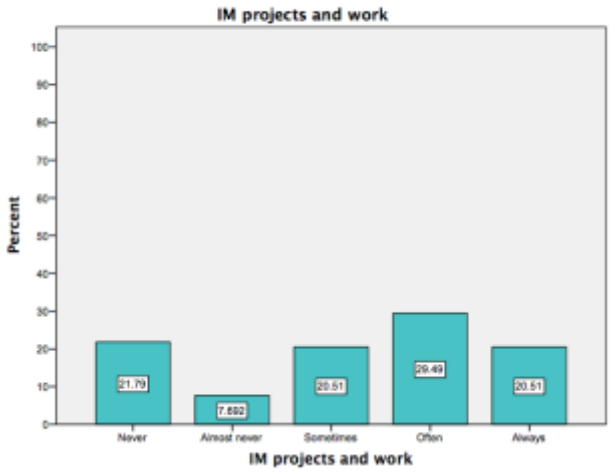
When asked about the use of Twitter for work or project use, participants answered the following: never (89.74%), almost never (2.56%), sometimes (5.12%), often (2.56%) and always (0%).



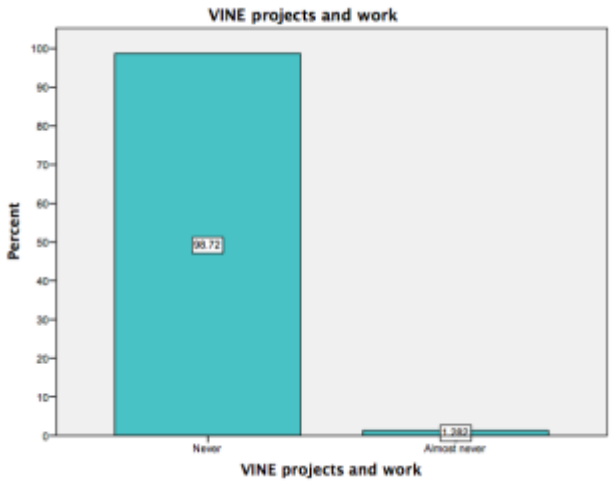
When asked about the use of Instagram for work or project use, participants answered the following: never (87.18%), almost never (5.12%), sometimes (2.56%), often (1.28%) and always (3.84%).



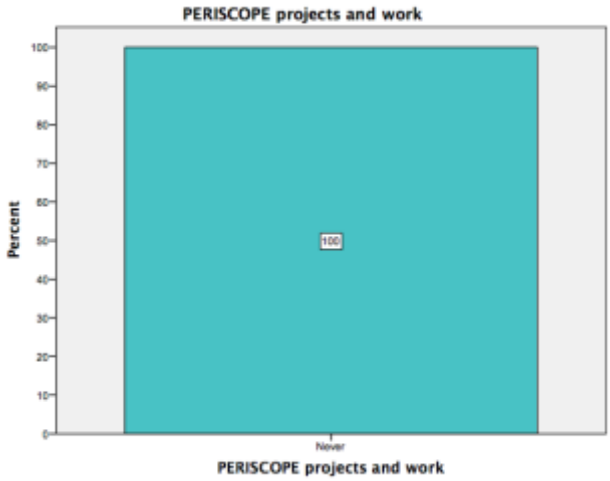
When asked about the use of Snapchat for work or project use, participants answered the following: never (66.67%), almost never (14.10%), sometimes (10.26%), often (7.69%) and always (1.28%).



When asked about the use of Instant Messaging for work or project use, participants answered the following: never (21.79%), almost never (7.69%), sometimes (20.51%), often (29.49%) and always (20.51%).

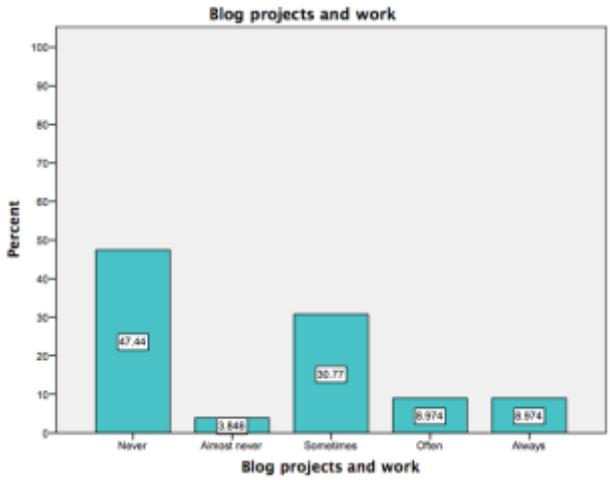


When asked about the use of Vine for work or project use, participants answered the following: never (98.72%), almost never (1.28%), sometimes (0%), often (0%) and always (0%).

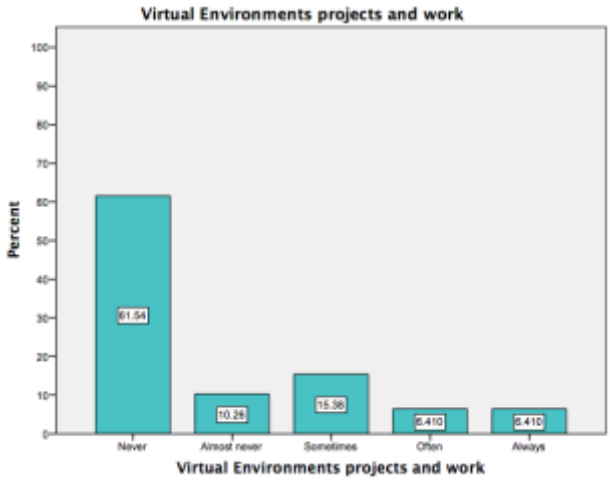


When asked about the use of Periscope for work or project use, participants answered the following: never (100%).

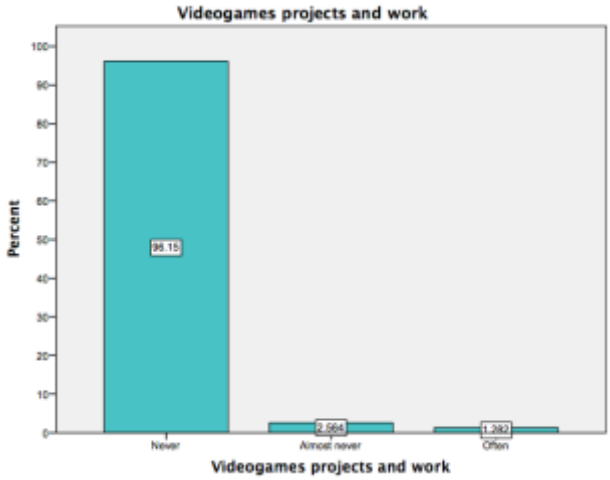
When asked about the use of Web-pages for work or project use, participants answered the following: never (85.90%), almost never (5.12%), sometimes (3.84%), often (2.56%) and always (2.56%).



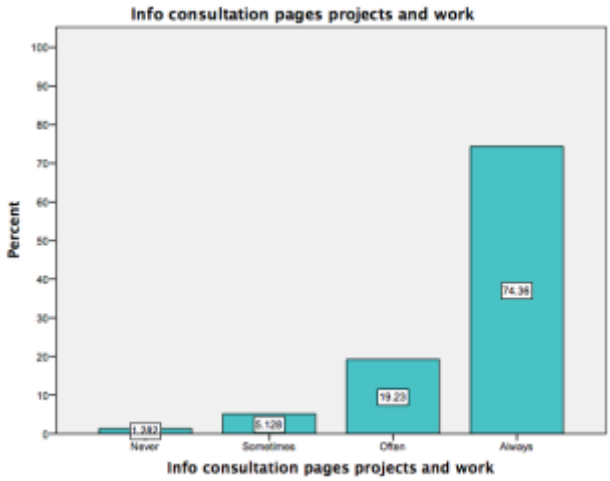
When asked about the use of Blogs for work or project use, participants answered the following: never (47.44%), almost never (3.84%), sometimes (30.77%), often (8.97%) and always (8.97%).



When asked about the use of Virtual Environments for work or projects, participants answered the following: never (61.54%), almost never(10.26%), sometimes(15.38%), often(6.41%) and always (6.41%).



When asked about the use of videogames for work or project use, participants answered the following: never (96.15%), almost never (2.56%), sometimes (0%), often (1.28%) and always (0%).



When asked about the use of Information and consultation pages for work or project use, participants answered the following: never (1.28%), almost never (5.12%), sometimes (19.23%), often (0%) and always (74.36%).

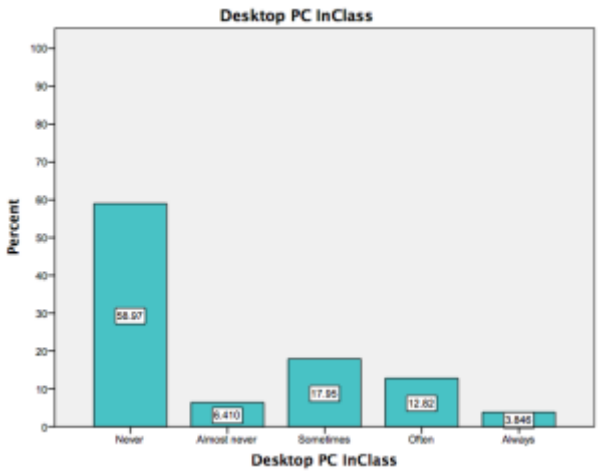
Dimension: Devise Use

In-class sub-dimension

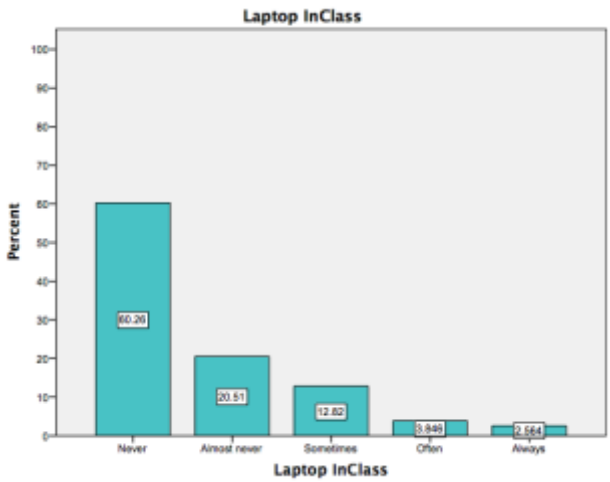
Descriptive Statistics

	N	Min.	Max.	Mean	Std. Deviation	Variance
Desktop PC InClass	78	1	5	1.96	1.284	1.648
Laptop InClass	78	1	5	1.68	1.013	1.026
Tablet InClass	78	1	5	1.47	.833	.694
Smartphone InClass	78	1	5	2.08	1.403	1.968
DigitalBoard InClass	78	1	5	3.23	1.268	1.608
Valid N (listwise)	78					

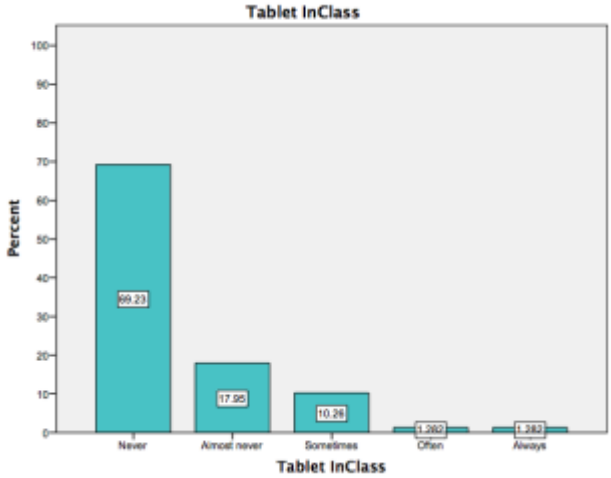
The descriptive statistics table above provides information, based on a Likert scale 1 to 5, on which devices are used by participants within the classroom. As projected, the most popular devices are: digital boards (3.23), Smartphones (2.08), Desktop Computer (1.96), Laptops (1.01) and finally Tablets (0.83). The following graphs show in detail the data collected on each item referred to in class device use:



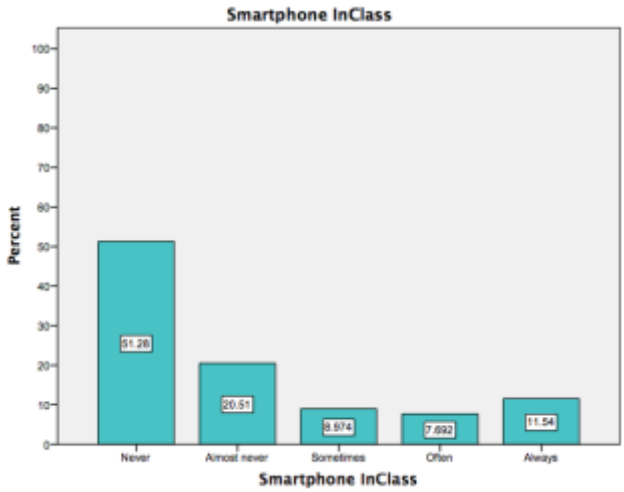
When asked about the use of desktop computers in the class, participants answered the following: never (58.97%), almost never (6.41%), sometimes (17.95%), often (12.82%) and always (3.84%).



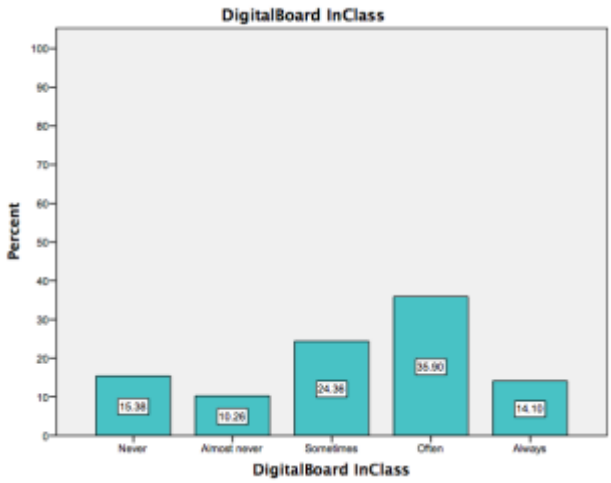
When asked about the use of Laptops in the class, participants answered the following: never (60.26%), almost never (20.51%), sometimes (12.82%), often (3.84%) and always (2.56%).



When asked about the use of tablets in the class, participants answered the following: never (69.23%), almost never (17.95%), sometimes (10.26%), often (1.28%) and always (1.28%).



When asked about the use of smartphones in the class, participants answered the following: never (51.28%), almost never (20.51%), sometimes (8.97%), often (7.69%) and always (11.54%).



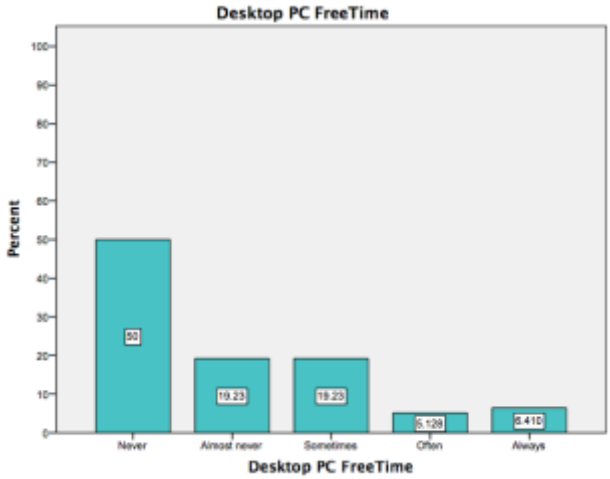
When asked about the use of digital boards in the class, participants answered the following: never (15.38%), almost never (10.26%), sometimes (24.36%), often (35.90%) and always (14.10%).

Free-time sub-dimension

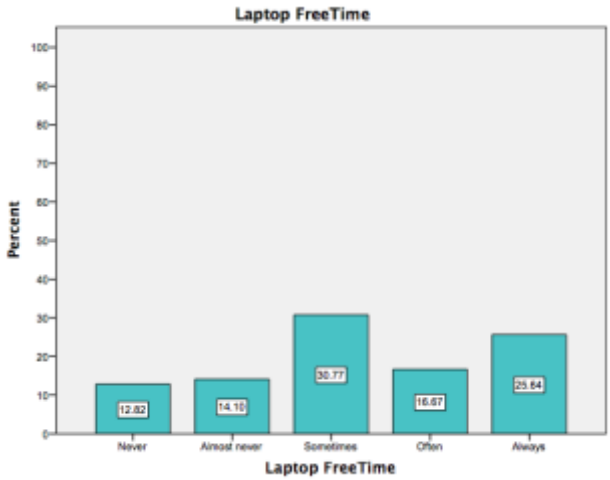
Descriptive Statistics

	N	Min.	Max.	Mean	Std. Deviation	Variance
Desktop PC FreeTime	78	1	5	1.99	1.222	1.493
Laptop FreeTime	78	1	5	3.28	1.338	1.790
Tablet FreeTime	78	1	5	2.77	1.468	2.154
Smartphone FreeTime	78	3	5	4.83	.468	.219
DigitalBoard FreeTime	78	1	2	1.05	.222	.049
Valid N (listwise)	78					

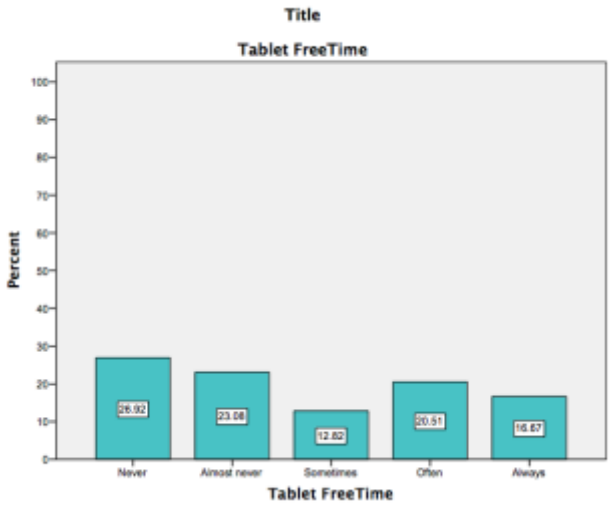
The descriptive statistics table above provides information (Likert scale) on which devices are used by participants in their free-time. As projected, the most popular devices are: Smartphones (4.82), Laptops (3.28), tablets (2.77), desktop computers (1.99) and finally, digital boards (1.05). The following graphs show in detail the data collected on each item referred to students free-time device use:



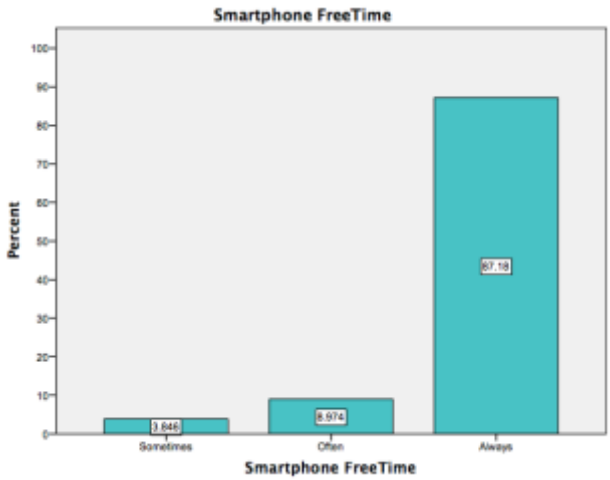
When asked about the use of Desktop computers in their free-time, participants answered the following: never (50%), almost never (19.23%), sometimes (19.23%), often (5.12%) and always (6.41%).



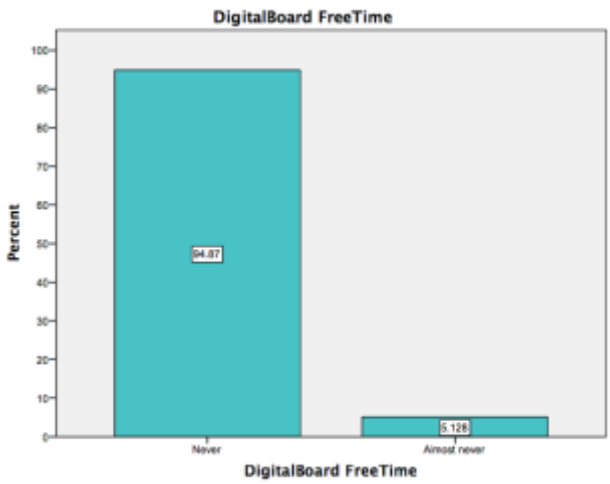
When asked about the use of laptops in their free-time, participants answered the following: never (12.82%), almost never (14.10%), sometimes (30.77%), often (16.167%) and always (25,64%).



When asked about the use of tablets in their free-time, participants answered the following: never (26.92%), almost never (23.08%), sometimes (12.82%), often (20.51%) and always (16.67%).



When asked about the use of smartphones in their free-time, participants answered the following: never (0%), almost never (0%), sometimes (3.84%), often (8.97%) and always (87.18%).



When asked about the use of digital boards in their free-time, participants answered the following: never (94.87%), almost never (5.12%), sometimes (0%), often (0%) and always (0%).

Annex V: Research data and SPSS procedure results

Reliability results of the Digital Scenarios Questionnaire (DSQ)

Reliability Statistics

Cronbach's Alpha	N of Items
.812	46

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
FACEBOOK FreeTime	95.36	221.480	.237	.810
TWITTER FreeTime	94.14	216.356	.273	.810
INSTAGRAM FreeTime	92.87	215.464	.350	.806
SNAPCHAT FreeTime	93.24	211.667	.344	.807
IM FreeTime	92.14	226.876	.337	.810
VINE FreeTime	95.56	225.002	.192	.811
PERISCOPE FreeTime	95.55	224.666	.193	.811
Web Page FreeTime	95.90	230.821	-.003	.813
Virtual Environments FreeTime	95.69	225.411	.307	.809
Videogames FreeTime	94.23	235.504	-.149	.826
Blog FreeTime	95.26	224.583	.179	.811
Info consultation pages FreeTime	93.82	216.045	.445	.803
FACEBOOK Study	95.85	224.496	.300	.809
TWITTER Study	95.78	223.264	.429	.807
INSTAGRAM Study	95.47	218.253	.362	.806
SNAPCHAT Study	95.23	217.401	.312	.807
IM study	93.60	211.723	.458	.802
VINE Study	95.97	229.792	.159	.812
PERISCOPE Study	95.96	230.323	.098	.812
Web page Study	95.86	227.032	.206	.811
Blog Study	94.91	213.797	.365	.805
Virtual Environments Study	95.37	217.457	.407	.805
Videogames Study	95.85	228.573	.095	.812
Info consultation pages Study	93.01	215.208	.462	.803
FACEBOOK projects and work	95.88	225.402	.265	.809
TWITTER projects and work	95.79	221.360	.472	.806
INSTAGRAM projects and work	95.71	216.808	.503	.803
SNAPCHAT projects and work	95.68	220.558	.321	.807
IM projects and work	93.82	215.162	.319	.807
VINE projects and work	95.99	230.350	.166	.812
PERISCOPE projects and work	96.00	230.935	.000	.813
Web page projects and work	95.69	220.527	.372	.806
Blog projects and work	94.72	213.088	.397	.804

Virtual Environments projects and work	95.14	215.266	.379	.805
Videogames projects and work	95.94	227.983	.250	.811
Info consultation pages projects and work	92.35	224.905	.264	.809
Desktop PC In Class	95.04	219.258	.264	.809
Laptop In Class	95.32	227.078	.093	.814
Tablet In Class	95.53	225.447	.192	.811
Smartphone In Class	94.92	213.423	.379	.805
Digital Board In Class	93.77	217.556	.315	.807
Desktop PC Free Time	95.01	225.571	.105	.814
Laptop Free Time	93.72	217.322	.300	.808
Tablet Free Time	94.23	214.024	.344	.806
Smartphone Free Time	92.17	225.491	.372	.809
Digital Board Free Time	95.95	229.867	.151	.812

Spearman's Rho. Non parametric Correlation.

Correlations

			Mean_Total	Acquisition	Codification	Recovery	Aid
Spearman's rho	Mean_Total	Correlation Coefficient	1,000	,179	,175	,157	,253*
		Sig. (2-tailed)	.	,117	,125	,170	,025
		N	78	78	78	78	78
	Acquisition	Correlation Coefficient	,179	1,000	,668**	,512**	,547**
		Sig. (2-tailed)	,117	.	,000	,000	,000
		N	78	78	78	78	78
	Codification	Correlation Coefficient	,175	,668**	1,000	,672**	,581**
		Sig. (2-tailed)	,125	,000	.	,000	,000
		N	78	78	78	78	78
	Recovery	Correlation Coefficient	,157	,512**	,672**	1,000	,745**
		Sig. (2-tailed)	,170	,000	,000	.	,000
		N	78	78	78	78	78
	Aid	Correlation Coefficient	,253*	,547**	,581**	,745**	1,000
		Sig. (2-tailed)	,025	,000	,000	,000	.
		N	78	78	78	78	78

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Mann-Whitney U Test. N-Par Tests. Non parametric test.

Test Statistics[a]

	Acquisition	Codification	Recovery	Aid
Mann-Whitney U	577,500	602,000	446,500	496,000
Wilcoxon W	1243,500	1268,000	1112,500	1162,000
Z	-1,792	-1,546	-3,108	-2,611
Asymp. Sig. (2-tailed)	,073	,122	,002	,009

a. Grouping Variable: Sex

Kruskal-Wallis Test. N-Par Test with one-way ANOVA and Posthoc tests

Ranks

	Age	N	Mean Rank
Acquisition	14-15 years	33	38,70
	16-17 years	42	40,95
	>17 years	3	28,00
	Total	78	
Codification	14-15 years	33	37,41
	16-17 years	42	43,38
	>17 years	3	8,17
	Total	78	
Recovery	14-15 years	33	38,27
	16-17 years	42	42,49
	>17 years	3	11,17
	Total	78	
Aid	14-15 years	33	37,41
	16-17 years	42	42,88
	>17 years	3	15,17
	Total	78	

Test Statistics [a,b]

	Acquisition	Codification	Recovery	Aid
Chi-Square	,990	7,272	5,540	4,692
df	2	2	2	2
Asymp. Sig.	,610	,026	,063	,096

a. Kruskal Wallis Test

b. Grouping Variable: Age

Test of Homogeneity of Variances

Codification

Levene Statistic	df1	df2	Sig.
.624	2	75	.539

Multiple Comparisons

Dependent Variable: Codification

Tukey HSD

(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
14-15 años	16-17 años	-6.613	6.087	.525	-21.17	7.94
	>17 años	38.697*	15.778	.043	.97	76.42
16-17 años	14-15 años	6.613	6.087	.525	-7.94	21.17
	>17 años	45.310*	15.637	.014	7.92	82.70
>17 años	14-15 años	-38.697*	15.778	.043	-76.42	-.97
	16-17 años	-45.310*	15.637	.014	-82.70	-7.92

*. The mean difference is significant at the 0.05 level.