InContext: A mobile application for the improvement of learning strategies at University

InContext: Una aplicación móvil para mejorar las estrategias de aprendizaje en la Universidad

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ABSTRACT

InContext is a custom-designed mobile application for writing assignments intended for university students in journalism and research methodology courses. In these disciplines, it has been observed that there is a need for an educational and technological tool to guide the writing of text using preloaded templates in which students can input text and multimedia material to create articles or write research reports. Besides its ease of use, the app was intended to improve metacognitive thinking. This led to the establishment of six working hypotheses in an exploratory study. For the study, a random sample of students enrolled in the aforementioned courses was selected during the August-December 2019 semester at a private university in Mexico. They took a pre-test using the "Motivated Strategies for Learning Questionnaire" (MSLQ) that had been translated into Spanish and already validated in Mexico. Subsequently, the students used the application and then answered the same questionnaire as a post-test. The study aimed to compare the results of the tests to see whether there was an improvement in cognitive skills. The results showed an increase in four skills: critical thinking, data search, cognitive self-regulation, and regulation of effort. The research results did indicate metacognitive development that would benefit the academic and professional work of future graduates.

RESUMEN

InContext es una aplicación móvil, diseñada a medida, para elaborar trabajos de redacción para estudiantes universitarios de los cursos de periodismo y de metodología de la investigación. En estas disciplinas se observó que había una necesidad de contar con una herramienta educativa y tecnológica que guiara la redacción utilizando plantillas precargadas en las cuales los estudiantes pudieran agregar texto y material multimedia para con ello construir artículos periodísticos o reportes de investigación. Además de la facilidad de uso, se esperaba que la app mejorara el pensamiento metacognitivo, por lo cual se establecieron seis hipótesis de trabajo en un estudio exploratorio. Para la investigación se seleccionó una muestra aleatoria de estudiantes inscritos en los cursos durante el semestre agosto-diciembre 2019 en una universidad privada de México. Los alumnos realizaron un pretest utilizando el cuestionario Motivated Strategies for Learning Questionnaire (MSLQ) traducido al español y ya validado en México; posteriormente utilizaron la aplicación y contestaron el mismo cuestionario a manera de postest, con el objetivo de comparar si había una mejora en las habilidades cognitivas. Los resultados indican que existe un aumento en cuatro habilidades: pensamiento crítico, búsqueda de datos, autorregulación cognitiva y regulación del esfuerzo, pero no lo hubo en organización ni en búsqueda de ayuda. Estos resultados indican un desarrollo metacognitivo que beneficia el trabajo académico y profesional de los futuros egresados.

KEYWORDS | PALABRAS CLAVE

Mobile application, journalism, research methodology, educational innovation, higher education, writing, pedagogical research, didactic proposal.
Aplicación móvil, periodismo, metodología de investigación, innovación educativa, enseñanza superior, redacción, investigación pedagógica, propuesta didáctica.

1. Introduction

Technological advances give university students a wide range of opportunities to develop their skills and apply conceptual knowledge to professional projects. This points to the possibility of using tools to progress in academic projects at their own pace and develop metacognitive skills that prepare them for the work environment. The core professional abilities needed include the ethical use of technology, knowledge of programming, writing on multiple platforms, use of mobile devices as work and communication tools, and audiovisual skills. Indeed, we emphasize that multimedia and digital skills occupy one of the most crucial positions among professional competencies (Lugo-Ortiz, 2016). Berger and Foote (2018) point out that in some educational fields, teaching does not meet the needs of the work environment, which results in companies or academic institutions not having assignments done on time or correctly.

Journalistic practices in the academic environment lead to students developing skills and becoming prepared for the possible challenges of professional life (Deuze, 2018). The same can be said about researchers who are confronting new ways to collect information. This is why academic-program-evaluation agencies, like the Accrediting Council on Education in Journalism and Mass Communications, have established the need to maintain a balance between the classroom and industry as a requirement for a university to obtain international academic accreditation (2019).

The speed of technological changes and the need for adaptation make it necessary to educate through various devices (Walck et al., 2015) in order to facilitate timely follow-up by academic mentors in education. For example, Martín-Serrano (2019) notes that many activities of daily life have been virtualized; that is, they are carried out through digital means and the use of the Internet. So, now, it is possible to say that the use of technologies is not just prevalent but that they can be harnessed in the educational field without removing human relationships.

Focusing on Mexico and data of the Internet Association (2018), we must point out the high percentage of mobile connections in this country (89%), which demonstrates the priority given to this medium. Therefore, this research paper reports on our work developing and using the mobile application called InContext, which was created for students taking journalism courses and learning research methodology at university level. This application has preloaded templates with input fields to put audiovisual and textual information so that the students have on hand all the data they need to write texts, such as articles, stories, opinion essays, etc., and all according to pre-established learning strategies. This research project was carried out in several stages that involved the design of the application, usability tests, and finally, the use of the application by students to assess whether it promoted the development of metacognitive skills.

2. State of the art

The heutagogic posture embraces the need for flexibility in learning, the use of resources, and the guidance a professor provides to his students, but with an emphasis on the student as the one to design his learning (Hase & Kenyon, 2000). This is a starting point for a student to develop a feeling for critical thinking and the skills to use resources creatively.

The use of technology in courses relates to heutagogy due to the need to promote students' critical analysis and their involvement as citizens, something that can only happen if the way in which people are helped to learn is changed (Hase & Kenyon, 2000). Therefore, the use of mobile applications that promote journalistic work can foster critical thinking, an aspect that Deuze (2018) points to as indispensable in triggering innovative spirit in the university.

Similarly, Ramos et al. (2009) urge educational institutions to introduce the use of mobile devices as a teaching-support strategy, emphasizing that their use does not in itself promote cognitive skills, but that these are developed when there is educational intent behind their introduction. Litwin points out that educational innovations must put actions into play that achieve improvements in teaching practices (Rodríguez & López, 2017). Also, Ajayi et al. (2019) state that the use of a mobile device has been a crucial element in the improvement in the quality of education at the professional level in Nigeria, and their work emphasizes the need for feedback between instructors and students.

Another context in which mobile technology has been useful was demonstrated by Mu and Paparas (2015) when they examined the use of clickers in the classroom to improve interest in economics courses

and reported how students connect to applications like Kahoot to participate in class. Also, Wakefield et al. (2018) associate the use of the electronic tablet to create collaborative learning environments with improvement in student performance and satisfaction. However, they point out that it is necessary to have analyses that consider how professors affect the learning environment, as well as how both professors and students use new technologies. On the other hand, the study by Laskin and Oats (2015) indicates that students at a private university in the United States did not visualize the possibility of using mobile technology in education because their professors had never assigned it.

Pauleen et al. (2015) report that technology facilitates work activities being done anywhere and at any time, but a disadvantage occurs when the work consumes the time for leisure or social interaction. Another disadvantage is mentioned by Carcelén et al. (2019), who note that some students use the mobile phone in the classroom abusively, so they conclude with an emphasis on its responsible use. Despite the disadvantages, most studies highlight that mobile technology is a vital tool for educational work. Castro and Ponce-de-León (2018) point out that teenagers are prone to use instant messaging, for example, for academic matters, although they mainly use this outside of the class.

As for graduate students, Anand et al. (2014) highlight the introduction of mobile technology (iPad) as a useful tool because it allows the management of communications, reading materials, and class notes. University students point to the Internet as necessary in the face of changes in the means of access to information and in the educational dynamics themselves. Students must understand not only the subject but also the tool or the software used in connection with it (Linne, 2014).

The use of technology in research goes beyond database querying or collaboration. It also involves the use of tools to produce results in a more orderly way that leverages available data. In this regard, Codina (2009) predicted that information managers would be everyday resources that would allow us to work more easily. An example of the use of technology and applications in the University is described by Madison (2015) in explaining how communication programs must continuously adjust to rapid technological changes. Marron (2015) adds the option of offering students the opportunity to research and interact in ways that are different from those commonly used by professors. George-Reyes (2018) notes that the future graduate who uses electronic devices and applications will fit the profile demanded by the labor market.

In the case of Tecnológico de Monterrey, this institution envisages a practice-oriented model similar to those in many Anglo-Saxon and South American countries (Schmal & Ruiz-Tagle, 2009). This educational model strengthens the skills of future professionals, incorporating technology supported by electronic devices that support electronic learning. In addition, communication and information technologies are adapting to the growing diversity of students in university classrooms (Martínez et al., 2016).

Technological resources facilitate simpler negotiation between pedagogical elements and assessment by transferring learning control to the student in a custom-guided way that increases their self-efficacy (Hase & Kenyon, 2000). However, it is clear that the use of mobile devices must be supported by a methodology and a theoretical background that consider the elements of content and structure.

Salaverría (cited by Lugo-Ortiz, 2016) points out that an ever-changing environment like the current one is characterized by the abundance of information, the reduction of decision-making time, and the elimination of geographical barriers, all brought about by various multimedia and interactive forms of production. This is why future journalists and social science researchers must use resources critically and responsibly, something professors must lead (Andueza & Pérez-Arozamena, 2014).

3. Materials

The presence of technology and the need for a tool that would facilitate writing, led to the design of the InContext application. This application allows the student to access different formats for text structuring and to collect information inside or outside the classroom. InContext is specialized software, custom-made by professors Lerma and Flores, that comprises several templates with the basic elements needed in journalistic genres and research reports. Using this software, the student enters information in the template fields, attaches the required multimedia material files, and sends them via email, or uploads them to cloud storage. This information is received (in an inbox) by the professor, who checks that all the fields in the

templates are completed and then assigns a grade. Upon adding information to InContext, students can continue writing the text in their style without fearing the omission of any essential points. Also, the student uploads the material to the cloud so that it can be consulted if needed by the professor or himself. This point is very valuable because it teaches the student that every professional must have an archive where they can retrieve data if necessary, and it promotes learning in terms of organization of materials.

Figure 1. InContext Desktop showing sample templates

The tool explores new ways of sending content and promotes more flexible learning as students can progress at their own pace. The format helps them, for example, by placing an asterisk next to mandatory fields such as the title or sources of information. Students enrolled in the Journalism or Research Methodologies classes at university have access to the tool through a personalized registration process. Professors can also use it after registering. Students select the appropriate template for the preparation of their writing assignment according to the genre. There are 16 templates for journalism and four for research studies. In addition, students can append photos, videos, audios, and link text documents. InContext allows for the generation of PDF reports.

4. Methodology

The research was carried out in several stages. The preliminary phase, November-December 2018, aimed to test the usability of the tool and make adjustments to the design of templates. To achieve usability, we applied one exercise using the app and another without it, and we administered a usage satisfaction questionnaire to the 300 students enrolled in the Journalism classes as well as in the Research Methodology courses at Tecnólogico de Monterrey, Monterrey Campus. Based on the results, we developed a quasi-experimental design and applied the tool during the months of October and November 2019. Our sample was taken from all students (226) enrolled in ten different Journalism and Research Methodologies classes in this university at that time.

The participants were both men and women between 18 and 22 years old, who were between the third and ninth semesters of their programs which included Journalism, Communication, International Relations, Psychology, Advertising, Law, and Economics.

The sample for this study consisted of 30 students in journalism courses and 27 in research methodologies. Random selection was made from the enrollment data of the students, and those who were selected were invited to participate voluntarily. Enrollment was the only element of identification, and students were informed of the research objectives and the ethical parameters. The exercise was

divided into two time periods. In the first (October 2019), the students answered (online) the scaled Motivated Strategies and Learning Questionnaire (MSLQ) (Pintrich et al., 1991). In the second time period (November 2019), professors took time from their courses for two activities; namely, the execution of one journalism or research methods exercise, as the case may be, using the application. Subsequently, the students were requested to respond to the questions on the scale as a post-test.

The MSLQ is an important tool to account for the main methods involved in the teaching-learning process of college students; it also provides relevant information to determine their specific skills that are deficient and therefore require training (Burgos-Castillo & Sánchez-Abarca, 2012). The Learning Strategies questionnaire consists of 81 items divided into two parts: the first concerns Motivation to Learn, and the second refers to Learning Strategies. In the case of this research, we only considered the items of the second part because the assumptions established were directly related to the measurement of the impact of learning strategies, regardless of whether there was mediation by technology or not.

The exercise for the journalism courses consisted of preparing a draft of a report about a real event. The writing assignment description included approximately 500 words, two photographs with caption, title, and a link to a video produced by the student. On the other hand, the research exercise was based on a public health phenomenon in the real world. It called for the formulation of a research problem, providing two specific objectives, justification, title, and three keywords. InContext was used to perform both exercises. The pre-test and post-test were created using Qualtrics, and they were based on the second section (B) of the MSLQ scale; consisting of 50 items focused on Learning Strategy. The students responded by selecting answers on a seven-point Likert scale from 1 "Not true to me" to 7 "Totally true to me". The values in between were considered and decided by the student. The measurement of six cognitive skills on the MSLQ scale was useful to the study objective, which sought to review whether the use of technology in the classroom resulted in the development of cognitive skills among the students. According to Arellano (2012), these six skills can be defined as follows:

- Critical Thinking: Focuses on the degree to which the student uses prior knowledge in new situations to make critical assessments, solve problems, or make decisions.
- Creation of texts: Allows evaluation of the use of working strategies in writing, such as developing a summary, paraphrasing, analogy creation, among others.
- Meta-cognitive self-regulation: These are the items related to the awareness, knowledge, and control that the student has over his own cognition.
- Effort Regulation: Highlights the ability to control the amount of effort and attention given to distractions or tasks that are difficult or of little interest.
- Organization: Refers to the use of information-organization strategies, such as deciding the themes in a text and structuring them into conceptual diagrams or maps, and selecting the main ideas in a text.
- Search Help: Measures the willingness to ask peers or the professor for help in the face of a problem.

The following hypotheses were determined from the objective of this research study:

- H_1: Using the InContext *app* improves students' critical thinking.
- H_2: Using the InContext app improves the ability to create texts.
- H_3: Using the InContext app improves cognitive self-regulation in the creation of texts.
- H_4: Using the InContext app promotes the regulation of effort and concentration.
- H_5: Using the InContext app improves the organization of bibliographic material for text creation.
- H_6: Using the InContext app promotes the search for help.

5. Analysis and results

Based on the hypotheses indicated above, the questions contemplated on the MSLQ scale were analyzed (Pintrich et al., 1991), for each of the six variables around which the hypotheses revolve: Critical thinking, writing, the ability to self-regulate, the regulation of effort, the organization of materials, and search for help.

Table 1. Descriptive statistics of Journalism students using the app			
	N	Mean	Standard Deviation
Pre-test Critical Thinking	30	5.1667	.92637
Pre-test Creation (Writing)	30	5.2300	.88596
Pre-test Self-regulation	30	4.5767	.73141
Pre-test Regulation of Effort	30	4.3567	.43524
Pre-test Organization	30	4.8667	1.02833
Pre-test Search for Help	30	5.1867	.97264
Post-test Critical Thinking	30	5.2867	.87049
Post-test Creation (Writing)	30	5.2500	.87287
Post-test Self-regulation	30	4.8900	.73030
Post-test Regulation of Effort	30	4.6277	.64340
Post-test Organization	30	4.8500	1.25017
Post-test Search for Help	30	5.3083	.80591
Valid N	30		

Tables 1 and 2 show the data collected from the participating sample of students who used the application, i.e., 30 students taking journalism courses and 27 taking the research methodology courses.

The average of each variable in both the pre-test and the post-test was established, and, subsequently, the data were combined so that one could see the average achieved by the students according to the type of variable. This is displayed in Table 1 for the Journalism students and in Table 2 for the students taking Research Methodologies.

Table 2. Descriptive statistics of Research Methodology students using the app			
	N	Mean	Standard Deviation
Pre-test Critical thinking	27	4.8519	1.26806
Pre-test Creation	27	4.9000	1.13781
Pre-test Self-regulation	27	4.5667	.91652
Pre-test Regulation of effort	27	4.2481	.83775
Pre-test Organization	27	4.5630	1.13006
Pre-test Search for Help	27	5.4852	1.05565
Post-test Critical thinking	27	5.2963	1.07613
Post-test Creation	27	5.3370	.87008
Post-test Self-regulation	27	4.8815	.86471
Post-test Regulation of effort	27	4.5370	.78356
Post-test Organization	27	5.0648	1.38431
Post-test Search for help	27	5.4722	1.09046
Valid N	27		

For the hypotheses tests, the subjects of Journalism (n-30) and Research Methodologies (n-27) were separated, and the significance of each of the six variables was analyzed, considering the pre-test and the post-test so that it could be determined whether there was improvement due to the use of the application.

Table 3. Results of using the app for the Journalism subject Wilcoxon Signed Ranks Test						
	Post-test Pre-test Critical Thinking	Post-test Pre-test Creation	Post-test Pre-test Self-regulation	Post-test Pre-test Regulation of Effort	Post-test Pre-test Organization	Post-test Pre-test Search for help
Z	-.714^c	-.013^c	-2.474^c	-1.515^c	-.752^d	-.741^c
Asymp. Sig. (2-tailed)	.475	.989	.013	.130	.452	.459

Table 3 shows that in the case of the Journalism students, it is only possible to accept the third hypothesis, which points to the improvement in cognitive self-regulation in writing texts when using the app.

Table 4 shows the results for the Research Methodology students, and it was detected that the data are statistically significant in accepting the first three hypotheses concerning improvement in critical thinking, creation, and self-regulation when using the app.

Table 4. Results of using the app for the Research Methodologies subject Wilcoxon Signed Ranks Test						
	Post-test Pre-test, Critical Thinking	Post-test Pre-test Creation	Post-test Pre-test Self-regulation	Post-test Pre-test Regulation of effort	Post-test Pre-test Organization	Post-test Pre-test Search for help
Z	-2.354[c]	-2.612[c]	-2.533[c]	-1.576[c]	-1.652[c]	-.470[d]
Asymp. Sig. (2-tailed)	.019	.009	.011	.115	.098	.638

Table 5 shows the hypotheses tests considering the entire sample (n-57). These results indicate that there is statistically significant evidence to accept the first four hypotheses.

Table 5. Results of using the app in both subjects Wilcoxon Signed Ranks Test						
	Post-test Pre-test Critical thinking	Post-test Pre-test Creation	Post-test Pre-test Self-regulation	Post-test Pre-test Regulation of effort	Post-test Pre-test Organization	Post-test Pre-test Search for help
Z	-2.192[c]	-1.811[c]	-3.497[c]	-2.270[c]	-.995[c]	-.245[c]
Asymp. Sig. (2-tailed)	.028	.070	.000	.023	.320	.807

These results show that when the two samples are combined, there is a positive effect on four variables: critical thinking, text-creation strategies, metacognitive self-regulation, and stress regulation. These are relevant to learning and the cognitive skills that a university student develops because the results imply that the student can apply knowledge in new situations and make decisions; he or she can also take control over their acquisition of knowledge and have the ability to focus on tasks. On the other hand, it was not possible to find statistically significant data with respect to organization or the search for help.

It should be noted that the only variable with statistically significant values in the samples tested separately and jointly is metacognitive self-regulation, which may indicate that the application is more useful for improving control, knowledge acquisition, and awareness than the student's own cognition. In this way, we can point out that, for the Journalism students, one can accept the H_3 hypothesis: The use of the InContext app improves cognitive self-regulation in the creation of texts.

For students in the Research Methodologies course sample, the first three hypotheses are accepted:

- H_1: There is a significant difference in the means in the critical thinking of students between the pre-test and the post-test.
- H_2: There is a significant difference in the means in the ability to write texts between the pre-test and the post-test.
- H_3: There is a significant difference in the means in the improvement of cognitive self-regulation in the creation of texts between the pre-test and the post-test.

When the two samples are combined, the first three hypotheses are accepted, as well as the fourth one:

- H_4: There is a significant difference in the means in the regulation of effort between the pre-test and the post-test.

6. Discussion and conclusions

The results are relevant based on the hypotheses raised because they consider the possibility of developing cognitive skills when using InContext. This implies that the application presents a practical utility for the student and professor while promoting cognitive self-regulation. This is as Schena (2018) points out: The skills defined as the most important (for the professional future of communication) are the ability to understand and interpret complex environments, using critical thinking, and having the ability to present the results of research projects properly.

The use of a technological innovation such as the InContext app strengthens the domain of the format and also assists in the collection of the textual and audiovisual data that are generated with other tools and devices. This enables the researcher to concentrate on content and analysis and leave the elements of formatting to the utility of the tool (Lazo et al., 2018).

In the case of journalism students (López-García et al., 2019), training should be directed toward the creation of deep content and the management of technological tools that incorporate mobility, interactivity, and documentation. Solar and Diaz (2019), in their research on teaching strategies, show that many professors use memory-based exercises as their main strategy, which result in the students having poor

reading comprehension. In addition, their study affirms that students "learn by doing," and technological innovations can foster other strategies necessary for the professional environment.

The use of technology as a work tool for learning is essential because, as Roses and Humanes (2014) point out, journalism professors develop a wide variety of activities: They stimulate the critical thinking of students, carry out scientific research, publish, facilitate internships in companies, and share their knowledge.

Additionally, one must consider that students are capable of quickly adopting new technologies, and they have the ability to find other applications on their own to enrich their academic exercises. Therefore, it is important that professors promote a more intensive use of technology in the classes, because, in the end, the world of work demands the combination of old and current practices (García-Santamaría & Barranquero, 2014). These new practices can favor digital newspapers that need to attract and retain readers (Marcos-Recio et al., 2018).

It is important to highlight the relevance of *intending* to use technology to develop learning strategies, defined by Gargallo (2009) as the organized, conscious, and intentional activities of the learner to achieve a particular learning objective. Thus, the student can acquire useful metacognitive skills not only in his academic life but also in professional life (Alvarez et al., 2018).

Several limitations were found in this research, and one of them relates to the attendance of students in their courses. Given that the application of the pre-test took place in October, while the activity with the application and the post-test took place in November, many students who had responded to the questionnaire the first time were not present in their classes in the second part of the work. A high level of absenteeism made it impossible to compare the data of a large number of students. Also, the students could not always concentrate because, in some courses, they had exams or assignments that directed attention to those activities instead of responding to the questionnaire.

A positive aspect was that the participating students felt confident that this study did not involve risks, and the exercise with the app even caused interest in them, so they decided to continue working on the subject.

The use of educational innovations encourages new stimuli and can induce the student to be the architect and protagonist of his own training process. As Ramos et al. (2010) point out, the use of mobile devices for learning can generate a collaborative and innovative environment in which students feel motivated to work and learn even while unaware. This requires deploying educational strategies that use technology to develop cognitive skills such as critical thinking.

The proposal for the creation and use of this application stands out because it is a new form of content delivery that also allows for the incorporation of audiovisual tools. From the templates of the app, one can create a lot of texts because the student looks for the best angle to accommodate the information, thereby developing creativity. Although it is not simple to introduce changes at the curriculum level in universities, it is crucial to become adaptable to technology (Manfredi-Sánchez et al., 2019).

The relevance of this proposal is that the studies carried out so far on the use of technologies in education focus on technological tools such as databases, distance education, peer collaboration, or development of global competencies like writing or using point-in-time technology tools such as cameras and video cameras. However, little has been researched about the use of specific mobile applications that present a guiding structure for writing and data management aspects of research methodologies.

Up to now, public universities in Mexico have focused their attention on the acquisition of fixed equipment and collective use throughout electronic classrooms and computer centers or laboratories, neglecting another important source of technological resources, namely, mobile devices. There is no general institutional policy that promotes the strategic use of such devices or gadgets for educational purposes in Mexico (Batista-Herrera, 2009). It remains for future research to involve a higher number of students in a comparative study with control and experimental groups. In the future, researchers or professors who wish to make use of this application will be able to strengthen learning mechanisms among their students.

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