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TÍTULO: Desarrollo de habilidades de evaluación de la información a través de estrategias de aprendizaje móvil para licenciados en la Universidad Técnica.

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RESUMEN: El documento investiga el desarrollo de habilidades de evaluación de la información como componente de la alfabetización informacional a través de herramientas de aprendizaje móvil. Los datos para el estudio fueron recolectados en la universidad técnica. A los estudiantes del grupo experimental se les ofreció un cuestionario sobre el nivel de información crítica y la evaluación de los recursos de Internet. Después de la sesión sobre la evaluación de la información, los estudiantes de control y grupo experimental realizaron una investigación. La calidad de la investigación se evaluó al final del experimento con un enfoque en la calidad de la información y su impacto en la investigación.

PALABRAS CLAVES: alfabetización informacional, pensamiento crítico, aprendizaje móvil, habilidades, e-learning.

TITLE: Information assessment skills development through the mobile learning strategies for bachelors at technical university.

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ABSTRACT: The document investigates the development of information evaluation skills as a component of information literacy through mobile learning tools. Data for the study were collected at the technical university. Students in the experimental group were offered a questionnaire about the level of critical information and the evaluation of Internet resources. After the session on the evaluation of the information, the control and experimental group students conducted an investigation. The quality of the research was evaluated at the end of the experiment with a focus on the quality of the information and its impact on the research. To obtain the students' comments, we interview them, analyze the results of the research evaluation and conclude that the evaluation of the information is crucial for an educated person and that the mobile learning tool promotes its efficiency.

KEY WORDS: information literacy, critical thinking, mobile learning, skills, e-learning.

INTRODUCTION.

The beginning of the third millennium was marked by the globalization, informatization and virtualization of society. Studying the processes of the educational digitization is a topical and important scientific task of pedagogical research because it promotes understanding of changes in social reality and opens new opportunities for the development of personality and the formation of a competitive employee.

The questions of the development of modern forms, methods and means in education have always been evolving in the field of pedagogical sciences for quite a time due to the current situation on the global labor market. It is obvious that employees' qualifications and competences, which they acquire during the studying at universities, quickly become outdated. Thus, the approaches of lifelong

learning and life-wide learning become more and more significant and relevant to rapidly changing market requirements (Council of the European Union, 2000).

Unfortunately, the traditional education system in Ukraine is experiencing some deficiency with tools and resources to cope with the constantly changing educational demands and the necessity of modern teaching methods integration to satisfy learning needs of students and employers' requirements. With regard to this issue, educators should use innovative teaching methods and forms which take advantages of educational information technologies to provide our students with skills for their future successful career. By the facilitation of innovative and meaningful educational environment, teachers will able to add value to the teaching process and ensure measurable learning outcomes that will meet all education stakeholders' expectations.

As an umbrella term "e-learning" covers such notions as e-teaching, e-education and mobile learning, and describes the learning process with the use of digital media and Internet resources. It worth mentioning that e-learning enriches traditional learning methods but does not replace them. Among the main advantages of e-learning we would like to mention the following:

- Stimulation of students' critical thinking skills development while assessing the validity of information resources.
- Enhances students' communication and cooperation skills.
- Promotes skills of self-directed and self-regulated learning to become a lifelong learner.
- Fosters teachers' and students' digital competence development.

All mentioned skills can be developed through teaching a variety of subjects since critical thinking, communication and cooperation are those soft skills that are not fixed to the specific content but to academic activities such as problem-solving, case studies, projects etc (Lavrysh, 2017). However, in order to train soft skills and critical thinking efficiently it is necessary to provide students with high quality, relevant content and reliable educational resources because the information is a starting point

and by no means the final point of critical thinking. Therefore, it is important to teach students to be information literate and to employ critical thinking to search and assess the quality of information provided online.

The issue of information literacy is rather troublesome for students when they undertake internet research. The most common students' solution is to find a website somehow related to the topic and copy/paste some information because they do not know how to select sources, to be critically engaged with internet content and to consider the value the given information. Developing information literacy fosters the development of research and study skills that are crucial to become independent and critical learners.

Taking into account the mentioned issues, we identified the purpose of our study as to describe perspectives and challenges of mobile assisted learning strategies that can be employed to enhance students' critical thinking and information literacy. The present study was carried out and verified by teachers of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".

DEVELOPMENT.

Theoretical framework.

Today, mobile devices can be an effective learning tool both inside and outside classrooms. As mobile learning capabilities expand, teachers have more and more possibilities to replicate learning outcomes using mobile-assisted learning resources. The rapid development of mobile devices and application software called MobileApp provides unlimited access to digital online authentic learning resources and applications. Wang, Wiesemes, and Gibbons (2012) define mobile learning as learning anywhere, anytime through mobile devices.

The key characteristics of mobile learning were introduced by Ogata & Yano (2005): accessibility, immediacy, permanency. This learning strategy focuses on the use of flexible, interactive mobile technologies for learning any subjects and training mostly all skills. In fact, mobile-assisted learning can be seen as the ideal solution for place or time problems for learning (Miangah, Nezarat, 2012, Stavytska, 2017) with unrestricted access to authentic contextualized resources. According to a study conducted by researchers at Cambridge (Kukulska-Hulme, Norris, Donohue, 2015), mobile technologies integration into the learning process encourages students to collaborate and develop autonomous learning skills as well as critical thinking skills since students need to work with Internet sources, identify reliable and valid, find relevant information and demonstrate the product of the learning activity (presentation, project, case study solutions, etc.).

The attributes of mobile learning were defined by Traxler (2009). He classified them as personalized, situated, and authentic. The scholar claimed that as a rule mobile learning is personal and adapts to the needs of learners. By situated learning, Traxler expressed the idea that learning might take place in the relevant context- specific situations. Authenticity was highlighted by the character of real-life experiences involved into the educational tasks and content.

A mobile application, like a computer program designed to work on mobile phones, tablets and other mobile devices.

The term "application" is an abbreviation of the term "software" (Cavu, 2011). Apps are easily accessible through a mobile app distribution platform run by a mobile phone owner with an operating system such as AppleAppStore, GooglePlay, Windows PhoneStore, and more. These programs can be easily, freely and unrestrictedly downloaded by students according to their own interests. It means that students can learn at anytime and anywhere, which promotes mobile learning applications among students. On the other hand, students are offered a variety of options to choose from, but the reality

is that there are too many resources and it is difficult for students to find a program of high quality and efficiency, as they do not know criteria for selecting resources and principles how to employ those resources. However, among the benefits of mobile learning scholars identified the following:

- Easy and fast way of obtaining information.
- Visualization of educational information of different nature.
- Simplification of the students' academic performance monitoring for both sides the teacher and the student.
- Free of time and place instant access to training materials required in the course.
- Archival storage of significant amounts of text and graphic information.

The academic areas of mobile learning application are unlimited. A great number of supporters and practitioners validate the efficiency of the approach in relation to: the enhancement of communication skills and language learning by the use of supportive mobile devices (Brown, Castellano, Hughes, Worth, 2012; Gabarre, Gabarre, 2010), fostering the self-managed learning beyond the classroom (Botero, Questier, Zhu, 2018), collaborative learning (Lin, Liu, Niramitranion, 2008), the use applications for the reflection and assessment (demouy, Eardly, Shrestha, Kukulska, Hulme, 2011), the integration of mobile learning into English for Specific Purposes (Hoven, Palalas, 2011).

Also, mobile-assisted learning allows combining the forms and methods and the nature of teaching: formal and informal; individual and cooperative; blended and face-to-face tutoring sessions. Mobile devices make it easy to do fast research projects using specific applications, as they allow more targeted search. They can also be accessed directly from the users' screen without memorizing URLs, logins, and navigating to specific pages of sites. So, students have the opportunity to create and share multimodal texts; communicate with people anywhere in the world; learn a language outside the class;

conduct self-monitoring and self-reflection of learning outcomes. Learning motivation fostering due to mobile devices is supported by a range of studies (Ciampa, 2013, Baek, Guo, 2019).

A great number of existing researches emphasizes benefits of teaching information literacy skills, connected with critical thinking skills and highlights the necessity of mobile learning strategies integration into the educational process (Kim, Shumaker, 2015). It will help students find information and relate it to the subject knowledge. It makes them go beyond simple checking the necessary site. The Association of College & Research Libraries (Information Literacy Competency Standards for Higher Education (2000) defines the information literacy as the ability to locate, to access, evaluate, and use information that cuts across all disciplines, all learning environments, and all levels of education (Schmidt, Tin, Sanderson, 2018, p.119).

Academic research on the information literacy development discloses the issues of discrepancy between the understanding of information literacy skills importance and possibilities to include it into the curriculum. DaCosta (2010) states "There is an apparent gap between the information literacy skills that faculty want their students to have and those that they actively support and develop" (p. 218).

However, much effort has been applied to change this situation and nowadays educators in collaboration with librarians provide projects for students to enhance the information literacy because "To be successful and independent learners for life, students must graduate with the ability to successfully navigate electronic environments. They must understand and use both the information and technology related to their fields of study" (Schmidt, Tin, Sanderson, 2018, p.121). The Canadian researchers carried out the pilot project on creation of a web-platform with lessons on information literacy. The results of the projects evidence that the information literacy is not a separate skill which students can develop on their own and at the moment of need, but continuous systematic process that should be included into the curriculum.

The key idea of the experiment (Schmidt, Tin, Sanderson, 2018) is "As the volume of information expands and becomes more available, technology changes and improves and methods of research change, it is important to become aware of the increasing complexity of skills to use information effectively in all aspects of our lives" (p. 133). By our study we would like to support the idea as in Ukrainian universities there is a huge gap between teachers wish to see students' information literate, students' possibilities to gain this competence and real opportunities which universities can supply.

Methods.

In order to verify the results of the suggested problematic issues, our study followed the sequential mixed methods framework (Creswel, 2015) as a complex approach to our practice-based investigation. Since our study is aimed at finding practical ways and solutions how to integrate mobile learning into the process of information literacy developing, we validated all our results in practice while teaching students. We regard our research as a mixed due to some features: it combines the collection and analysis of both quantitative (close-ended) and qualitative (open-ended) data collection tools to provide in-depth study of the efficacy of mobile learning; these tools description is incorporated into the research design through analyzing, observation, merging and comparing; it supports qualitative data with quantitative results.

Quantitative data were collected via questionnaires about students' challenges and skills level prior to the experiment and qualitative tools were acquired through semi-structured individual interviews after the experiment. The study was carried out according to the scheme: quantitative data collection and analysis follow up with qualitative data collection and analysis resulted in interpretation.

Data collection tools.

With a view of collecting the information about the students' challenges, we asked students to choose the most confusing issues while performing a web research from the list:

- Identifying the keywords for the search.
- Differentiating peer-reviewed journals and non-reviewed journals.
- Evaluating information source.
- Popular vs scholarly resources.
- Types of articles and how to use them.

Students could choose some answers.

The second questionnaire was about the initial level of information assessment literacy. We adapted and used survey tools developed by Lisa Beutelspacher Department of Information Science at Heinrich Heine University, Düsseldorf, Germany (Beutelspacher, Henkel, Schlögl, 2015).

The main advantages of the assessing tool are its objectivity, relevance to students' perception of their skills and knowledge level and referring to different points of information literacy. Most of the questions we did not change as they are closely connected with the objectives of the research and common students' problems on information assessment, a few questions were omitted or transformed to our educational environment context. We have selected those questions that dealt with critical assessment concerning the quality of sources and information:

1. Which search engines do you know?

- Google.
- Yahoo.
- Bing.
- Other.
- I don't know any search engines.

2. What is the main feature of a website indicating its quality?

- Representation.

- Images.
- Language.
- Authors.
- Amount of advertising.
- Types of articles.
- Audience.
- All mentioned above.

3. When researching a topic that you don't know anything about, where would be the best place to start looking? [One answer].

- In a journal.
- In an encyclopedia or dictionary.
- In a library catalog.
- On a website.
- I don't know.

4. Which statement is true? [One answer].

- In an internet research you should check as many web pages as possible.
- You should only use a single search engine.
- You should compare different websites.
- You should only look for information that supports your personal viewpoint.
- I don't know.

5. You must write a comparative paper about recent innovations in engineering in Ukraine and the USA. Which words will you use in your web research? [One answer].

- Ukraine, USA, innovations.
- Ukraine, USA, engineers.

- Ukraine, engineering.
- USA, innovations.
- I don’t know.

6. Current scientific studies are first published in: [Any number of answers].

- Books.
- Encyclopedia entries.
- Articles in scientific journals.
- Conference papers.
- Manufacturers websites.
- I don’t know.

7. How can you tell whether a Wikipedia article is high quality? [Any number of answers].

- I check whether the article has bibliographical references.
- I check the comments on the article’s discussion pages.
- I check whether the article has a lot of pictures.
- I check how long the article is.
- I don’t know.

8. A summary of a scientific article is found: [One answer].

- In the abstract.
- In the bibliography.
- In the conclusion.
- In the introduction.
- I don’t know.

9. What does it mean when an article has passed peer review? [One answer].

- The article has been checked and corrected by friends and colleagues of the author.

- The article has been checked by experts and changes have been suggested.

- The article has been edited by the publisher.

- I don’t know.

10. How do you sort your search results when looking for articles that have attracted the most attention in the scientific community? [One answer].

- By citation frequency.

- By author.

- By date of publication.

- By the length of the articles.

-By the sources it is displayed

- I don’t know.

After the short session on information literacy in order to get a feedback, we interviewed students individually about the topics, necessity and efficacy of such sessions, and also repeated some questions from the initial test on information literacy level.

Participants.

Our study enrolled 47 students from 2 academic groups of the second course of study at the department of Mechanical Engineering as they begin their training on performing scientific research. The control group included 22 students and an experimental group comprised 25 students. After the explanation of the objective and strategies of the study, students chose the group for participation according to their personal wish.

In case students did not want to continue participation, they could change group freely without any academic consequences. Students of both groups were suggested to perform a small in depended

internet research on “Goals of Sustainable Development in Ukraine” and prepare the presentation in English demonstrating the results.

Since we are teachers of English for Specific Purposes, we decided to conduct the experiment in English and suggested students all educational materials and questionnaires in English. Students are taught English for Specific Purposes (ESP) by integration of some of mobile-assisted learning strategies (Kahoot, Quizlet, Google classroom etc); so, they use mobile devices freely in classes.

The study lasted 2 months only at ESP, students had 1 class of English (90 minutes) per week, totally 8 classes: 3 classes on information literacy assisted with mobile learning tools for the experimental group and 5 classes to complete the research for both control and experimental group. The students from the control group (n=22) were given the assignment and focused on its language, content and presentation quality, but students from the experimental group (n=25) were suggested three classes on information assessment skills prior to the preparing the research and presentation. Classes were focused on five key topics mentioned by students and we combined lectures with mobile learning tools to engage students into the learning process. For the research assessment, we developed an assessment rubric that consisted of two parts: presentation (content, layout, language used) and sources quality.

All the students were asked for their permission to be in the study and to audio-record the interview. The interviewees’ identities were anonymized. The questions of the interviews and questionnaire were connected with mobile-assisted environment and skills enhanced by this strategy.

Students of both groups did not perform any academic pre-tests, only 2 questionnaires for the experimental group before the training and a semi-conducted interview at the end of the experiment for both groups.

Credibility.

To validate the results and reliability of the study, we applied different types if data collection tools: a questionnaire and an interview. Our choice of methodology framework is based on the relevant scientific sources analysis to ensure the relevance of chosen tools. The accuracy of the interviews was checked with the participants. The findings were cross-referenced.

Results and Discussion.

It is worth mentioning that the way and nature of information has considerably changed over the last decades and information literacy can be enhanced by means of mobile learning as well.

Information literacy implies using critical thinking and procedures for identifying reliable sources and information, analyzing information, and employing the results for personal lifelong development (Mandusic, Blaskovic, 2013). Thus, the primary objective was to teach students information literacy employing critical thinking skills and to assess the credibility, reliability, and authenticity of information. To identify students' challenges regarding the information assessment we asked them to complete the questionnaire and the results are shown in table 1.

Table 1. Response percent on challenges.

	Challenges you might encounter	**Response Percent**
1	Finding key words how to search	53%
2	Differentiating peer-reviewed journals and non-reviewed journals	77%
3	Evaluating information source	83%
4	Popular vs scholarly resources	80%
5	Types of articles and how to use them	64%

Regarding the results of the second questionnaire on the information literacy and assessment, we observed that most students (96%) apply to the internet resource for searching the scientific information and only 4% of students prefer visiting libraries to find the reliable scientific source as

they do not trust the information provided in the Internet. While the internet research, 54% students use one searching engine and find that source which is easily accessible and understandable for them in terms of the language and content; 37% students check all pages suggested and choose one website according to the criteria of the most popular visited. Only 8 % of students compare websites and choose according to time relevance.

Answering the 5th question 89% of students gave the right answer because the topic for the search was complete and understandable. 92% of students believe that the most credible and reliable sources are different types of Wikis and manufacturers websites as students consider that books and encyclopedias are outdated and contain much extra information. “Wikipedia articles provide all necessary information in a clear way with rich reliable references” – commented students the 6th and 7th question: 43% chose references as a criterion, 37% pay attention to comments and 20% of students use Wikis only as an additional source. The 8th question did not present a difficulty, 94% answered correctly. On the contrary, the 9th question caused much discussion, because we often employ peer assessment during our classes, so 84% of students thought that the peer review was the same process. Answers to the 10th question varied greatly: 75% of students chose the date as the main criteria, 20% - the source and 5% the author. Nobody chose the citation frequency or the length of the article.

The initial findings evidenced the lack of knowledge and low level of a critical approach to the information assessment. The results of the final interview with students from the experimental group were more positive and comparing the results of research from both groups, teachers as well as participants, were convinced by the difference in the quality of material presented by experimental and control groups. Both groups tried to find reliable sources and credible information but the control group spent more time searching for the information, could not find infographics or evidence-based data and about 35% of their references were not reliable. Whereas students for the experimental group demonstrated strong evidences with reliable data and sources for a shorter period of time and less

efforts. During the interview, students confessed that before the training classes they used superficial criteria to the web sites and information quality, students simply copied the question and pasted it in the search box. Then they chose 3-5 top sites from the list without analyzing its credibility or information assessment. All respondents agreed that the experiment was useful and productive and they would like to expand their knowledge on information literacy in future.

Considering our strategies, activities and mobile learning tools applied during the experiment we suggest a short overview of the most useful and interesting for students.

To develop analyzing skills, we suggested student to choose such apps as Google Keep, Evernote or Seesaw that help integrate data from mobile devices and review the information. All of them deal with data visualization, identifying patterns and key ideas, editing, annotating, searching for critical evidence, keeping notes, and evaluating information. These tools provide opportunities for students to create digital portfolios of their work including comments, teachers' editing, partners' ideas. Teachers create meaningful multimedia content for students with a variety of tasks in the form of video, texts, links, tables or images. It is easier for teachers to follow up the students' process of thinking as a teacher can see students' submissions and check the understanding of the task. In other words, it provides evidence of learning step by step visible for teachers so we could monitor and direct students in case of losing their way in the space of online information.

For identification of key words, we explained the general theoretical rules and suggested such mobile apps as Google Trends, Keywords Everywhere and Keyword Shitter. The characteristics of popular and scholarly articles as well as peer-reviewed journals were explained by the examples given in the resources of EBSCO company which creates and hosts scientific databases. They worked out the algorithm how to find necessary articles. We disclosed key characteristics of articles that students should evaluate while searching the articles: content, author, audience, language, graphics, layout and organization, accountability, references and paging.

The issue of web sites credibility was solved by using the resources from libraries with the information on criteria and critical questions while assessing the site and information quality. We applied to the resources developed by specialists Linda M. Oslo Library and well-known Purdue College Online writing lab (OWL).

A valuable resource with a variety of activities on information literacy is “All about explorers”. Here teachers can find activities about how to teach students to compare websites, understand the key similarities and differences between a subscription database and a subject directory, to read URL, to find correct and accurate information. We summarized some activities that might benefit the development of information literacy and assessment.

Table 2. Information assessment activities.

Objective	**Strategy**	**Activity**
To propose map-oriented model for the identification of keywords.	Collaborative learning	Student creates and revises concept maps while searching for the topic using Mindomo, MindMeister or MindMup.
To present the background of information assessment skills as a part of information literacy.	Collaborative learning	Students in group collect the information from different resources: Libraries, Writing Labs or specialized sites and present their findings.
To teach how to assess the information quality by using critical questions.	Individual learning	Students are given criteria for the site and information assessment: authority, accuracy, objectivity, coverage, appearance. Students should think of questions how to verify the quality. We suggested www.exploratree.org.uk site that provides a free online thinking guides to structure the thinking process.
To understand the key differences between popular and scholar articles.	Situated Learning.	Students are given articles of different quality according to their subject knowledge and by using the EBSCO articles database find and prove what is a scholar or popular article.
To assess the benefits of the peer review approach.	Peer-assessment.	Students are engaged into the developing criteria for the assessment and asses each other.

Among the benefits of using mobile learning tools, we should mention the possibility of individualization of the learning process and adjusting it to students' preferences and needs. That is why we tried to suggest students more than one app or platform to complete the task as it supports students with different background, learning style, interests and financial capabilities to own some types of devices.

CONCLUSIONS.

Developing information literacy is a crucial skill for university graduates as it helps them to feel confident and competent in their subject knowledge while performing the internet search. We identified some reasons to teach students the information literacy: to prepare them for professional word overloaded with digital information; to find and communicate the information in different modes; to make learning more relevant and engaging by changing the way students acquire knowledge.

As a conclusion we would like to outline some recommendations for the successful mobile learning process design:

1. Expected outcomes of mobile learning activity should be stated clearly and understandable for students so they would know what to do.
2. The feedback should be immediate and constructive.
3. Activity should engage students' interest, learning style and motivation by integrating different types of data presentation.
4. The choice of resources, time for an activity and level of difficulty should be flexible so that learning could be personalized and students could study at their pace and style.

Therefore, teaching information literacy is important not only to educate students, but to expand learning beyond the classroom. Our study offers some practical ideas how to develop some components of information literacy and to put mobile learning strategies into practice. However, the further exploration how to achieve complete digital literacy is needed.

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