The Artificial Intelligence (AI) detection products, as the tools for measuring the originality of written works: technological and didactical facets

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Abstract: *The work given is a theoretical study with a highlighted application potential, at the center of which is the problem of determining the authenticity of written works in the context of the accessibility of AI-type text generators, which the current generations of pupils, students, and trainees use in various didactic situations, including those of assessment. As part of possible solutions for such situations, the author proposes to teachers the use and implementation of AI detection tools. Starting from the identification and analysis of research dimensions, the author of the current publication comes with application suggestions regarding the selection criteria and, then, the use of AI detection tools for didactic purposes. Those proposed by the author are supported by the description of advantages and limits of AI detection tools potential users.*

1. Introduction

The written works have always had a special place in an educational setting, no matter what type and/or level of didactic complexity it is: whether we approach basic pre-university education (starting with the years of primary school, middle school, and high school) and/or the vocational one, whether we reach university or even postgraduate education. At each of the stated stages, the learner will be challenged to excel in the subjects of study and to demonstrate what they have learned, including by performing written works from the widest spectrum.

Currently, given the accessibility of Artificial Intelligence (AI) tools that are able to generate not only ideas but also some realization of them in more or less successful versions, students often resort to "getting inspired" not only from trivially available sources (online and/or offline), but increasingly they use tools like ChatGPT, Google Gemini, Writesonic, Jasper Chat, etc., the results of which are presented as authentic works, products of the learning process, carried out by the pupils or students to whom the task has been distributed.

Thus, in the digital age, not only the "inspiration" induced by extremes gives rise to the dangers of copying (Burlacu, 2023a) and plagiarism (Burlacu & Irimiciuc, 2017), but already the copying itself ends up being less inspired. By that, we mean the sense of authenticity and progress in a real human creation process here, instead of a situation where the learning proofs and/or results are generated by AI.

In the presence of these new tools, both numerous in typology (Burlacu, 2023b), as well as generating areas of potential solutions to be presented as answers to the problems/tasks distributed by teachers in various educational contexts (Burlacu, 2016b; Burlacu, 2021b), anyone - teacher, assistant, representative of the top administration of educational institutions (Burlacu, 2022e), researcher, civil servant in the field of education and research, involved in the development of educational policies, etc., is on the side of the one who provides services and educational activities at a professional level in accredited institutions, is faced with the problem of objective assessment and grading (Burlacu, 2021a; Burlacu, 2022b) of written works.

The central idea of this article is outlined by the following dilemma: how to check, assess, and mark correctly and objectively a written work

— *without being sure that this is an original one (is it a product of the author's learning activity)?*

— *knowing or having some serious suspicions about its originality in terms of taking over and/or plagiarism of ideas, text, etc., but especially in terms of the direct realization of the work?*

Here we refer to the content of the written work, in a broad sense; this can take the form of either: a complete text of the work; a listing of source code for a computer science problem; a bibliographic list; a set of arguments; the results of the analysis and/or synthesis, etc., presented exclusively by the author of the work, i.e., by the learner.

The purpose of the present scientific foray consists of the research and descriptive analysis of some computer tools to support the teaching staff in unraveling the dilemma of identifying the authenticity of the works written by the students, a fact that would later support the objective realization of the verification, assessment, and grading of these types of learning results, as well as didactic outcomes.

2. Background aspects of the research

2.1 The dimensions of research

Given the stated context, it is necessary to mention that the research problem and, effectively, the solutions proposed to solve it are determined by a series of facts, which constitute the dimensions of the research, as follows: (A.) The typology of written works and/or the form of their presentation; (B.) The

perception of the learner versus the one who teaches on the multitude of aspects related to written works; (C.) The suitability of using written works as a teaching-learning- assessment method; (D.) AI Detection Products; (E.) Technological aspects merged with the didactic context of the application of AI detection products, also presented in the relations of the advantages and limits of this kind of software.

2.2 A brief review of the scientific literature

Due to the complexity of the stated problem, the descriptive analysis of AI tools for determining the authenticity of works written by humans, as well as the dimensions proposed to be addressed in the present article, cover several scientific fields. We note that over time various types of research have been carried out, and these results have been reflected in a series of publications, including that of the undersigned author. We consider it necessary to emphasize the scientific directions tangential to the research theme. These are the followings:

— **The development of program products:** The authors debate the need to develop educational software within a systematic process (Hinostroza et al., 2020) that allow for the design and implementation of the entire spectrum of functionalities (Johnson & Schleyer, 2003): the user interface, the sequence of events, the details of the content to be operated, and the graphic and generic objects of other original media (video and audio scripts) being highlighted (Burlacu, 2016a).

— **Cybersecurity of software products:** Researchers have analyzed various information security issues (Futcher, 2008) in software applications to determine "the need to protect critical assets and the need to build and maintain widespread trust in computing." Being concerned by the aspects of protecting the didactic contents to be evaluated, as well as the products of the learning activities and outcomes of those who learn, this group of authors developed some solutions that reduce the chances of cheating and intellectual theft; the given solutions have been implemented (Balmus & Burlacu, 2010) in a series of proprietary educational software through the application of encryption algorithms.

Another researcher team is marked by the fact that the lack of security features makes all possible vulnerabilities exposed to the public (Lingham et al., 2020). Naturally, the given aspect provides opportunities for attackers to perform dangerous activities, especially for vulnerable systems. Finally (Lingham et al., 2020), the authors come up with a series of suggestions regarding the implementation of security features in the software development process.

— **The educational software development:** Some works insist on an appropriate design of educational software (Burlacu, 2012c; Burlacu, 2013; Burlacu, 2014; Burlacu, 2015b) depending on the curricular area of the discipline for which the program product is developed, learners ages, and grade of the development of digital skills (Burlacu, 2016a) of potential users. All this being supported by the idea of protecting the content to be evaluated for reducing fraudulent behavior in school (Burlacu, 2013) and academic environments (Burlacu, 2021c; Burlacu, 2022c).

— **Artificial Intelligence:** The topic is both current and controversial and arouses the interest of the academic community concerned with conducting surveys that capitalize on the most common methods of using AI with application in SE with the aim of "challenging the current conventional wisdom (i.e., the status quo)" of the technologies (Batarseh et al., 2021). There are enough optimistic opinions regarding AI penetration in education, which are bringing pro arguments for the AI's existence and usefulness in various spheres of life, including in education (Harry, 2023; Burlacu, 2023c), on the opposite side of the given topic.

— **Educational sciences and academic ethics:** The works of the respective authors are oriented towards the promotion and maintenance of the values of honesty, competitiveness, and fairness in educational institutions; these aspects are addressed through the prism of the issues related to the implementation of plagiarism check software (Burlacu & Irimiciuc, 2017), the design and layout of some contents intended for didactic assessment from an anti-fraud perspective (Burlacu, 2021d; Burlacu, 2023a).

— **The didactic docimology:** The docimology has as its object of study the scientific research of problems related to the verification, examination, measurement, and/or grading of the success of learners, students, and candidates who compete to pass various tests, including various tests, exams, contests, etc. The respective docimological analysis is carried out to improve the conditions and methods of didactic evaluation.

In the area of scientific concerns of numerous researchers are topics related to didactic evaluation methods (Burlacu, 2021a; Burlacu, 2022b) in various educational (Burlacu, 2022a) and social contexts (Jurane-Bremane, 2023). Most of the findings confirm the importance of digital assessment in the educational process (Jurane-Bremane, 2023), but these consider it necessary to sensitize the people involved in education (administrators, educators, and researchers) in terms of supporting the digitization of the didactic process (Burlacu, 2021b; Burlacu, 2021c) from the perspective of promoting a culture of honest assessment.

The truth is that, although some articles try chronologically to approach the subject of the present material, given the high degree of innovation of the formulated research problem, the scientific publications that closely analyze the technological and didactic aspects related to AI detection products in verification, assessment, and measurement of the originality of the human-written works do not exist in a similar format to the one accepted to be shown in the current material.

3. The problem-solving context

Since our research is delimited by a set of dimensions, the description of possible solutions will be carried out in correlation with the order established and listed above. In our view, the use of AI detection products for educational purposes should be carried out considering the next facets.

3.1 The typology of written works and/or the form of their presentation

While we are talking about written works, we refer to the entire spectrum of didactic tasks aimed at literary compositions and commentaries, summaries and argumentative texts, essays, analyses and syntheses, case studies, and even the formulation of tasks and/or problems and the description of solutions for those problems.

Along with the ascent to another level of studies, the requirements for written works, naturally, become more and more complex and abstracted, but the types of written works continue to expand, absolutely naturally, from simple to compound according to the characteristics of the discipline of study and/or the field of professionalization, reaching not only individual and/or group projects, laboratory works and/or generalization works at the end of a theme/ module/ discipline, but also culminating projects (Burlacu, 2022a; Burlacu, 2022b) such as some types of tasks in baccalaureate exams (national academic qualification that students can obtain after their secondary education (lycée) in France, Romania, Republic of Moldova), Capstone Projects (Burlacu, 2022a; Burlacu, 2022b), such as the final year theses, bachelor's or master's degree theses, etc.

3.2 The perception of the learner versus the one who teaches on aspects related to written works

The problems that arise in this context are multiple. The main idea is that their classification is also diverse, but the perception of the same didactic circumstances, when the potential of written works is capitalized, differs for the teaching staff and the learner.

If the teaching staff works to satisfy the curricular requirements as best as possible (creative, varied in terms of thematic and/or approach, task formulation and/or typology of presentation forms, and then assessment) the curricular rigors of the study discipline, the pupil/student/trainee is concerned in the ideal version: how to respond to the requirements drawn up by the teaching staff in the most successful way as is possible, where this "success" has more interpretations in the perception of each learner.

If we go for the ideal option, to carry out the task as successfully as possible, the student will tend to study, research, lecture, reflect, analyze, plan, and design the structure, and only then present everything in written form, taking into account the work presentation requirements given and/or accepted by the teaching staff. In a broad sense, the expected results can be accepted in any format justified by the specifics of the task, disseminated by the teaching staff, but also by the study discipline, which, in turn, has its own particular tools.

The exigencies for the final submission of a written work (partially or fully) may relate to its technical editing through office tools such as MS Office, Libre Office, Latex, etc.; either its full or partial holographic presentation, either in

printed or digital poster format, or in multimedia format (audio, video, graphic, presentation, etc.); either with inclusions of schematic representations, formulas, and/or code sequences, as appropriate. Certainly, the results of the papers can be requested to be brought by the students both in a single format, in such cases, the format being stipulated, and in a mixed or blended format.

If we are to consider the cases of less ideal perceptions of the meaning of the word "successful" concerning obligation and quality when performing the task distributed by the teacher, the learner may misinterpret it to the detriment of the quality and honesty of its performance. Here we can collide with "success", which for the learner means: fast or as fast as possible; not very qualitative; which solves the problem statement in an approximate or apparent way or does not solve it at all; with personal involvement in a regime as economical as possible, to the point of nothing; the student would achieve his desired goal "if the solution can be taken fully or partially ready-made", etc. Unfortunately, the last two forms of "succeed" can be found more and more recently.

3.3 The appropriateness of using written work as a teaching-learning-assessment method

Each scientific field, even educational institutions and/or teaching staff, should have its own requirements for the performance, exposition, and presentation of written works, and here we are not only referring to the formal elements such as the style requirements for the written work, those to be technically redacted, and/or the mandatory inclusion of some compartments, etc.

Given the fact that this research does not aim to focus on particular didactics, except through the prism of their belonging to general didactics, these will not emphasize the aspects that are within the scope of particular didactics in a narrow sense. Thus, we will refer only to the scientific style of presenting ideas in written works, valid for education at all levels of study. Naturally, the scientific or academic style should be aligned with the scientific field and the typology of the written work. Thus, in linguistics and literature, there will be a style and form; for the written works made for the technical and engineering fields, in addition to writing and presenting ideas using specific terms and language for the scientific field.

For example, the writing and presentation of the source code of the program products and/or the functionalities will be valued in the fields of programming and ICT; the schematic representations and diagrams that illustrate and substantially clarify the ideas presented in the written text are very appreciated in the fields of systems engineering; the color palettes, the sheet music, dictionaries of literary terms, etc. may be implemented as appropriate in the various literary and artistic fields, depending on the specificity of the given field.

Because the reflection of technical aspects in the written papers is also part of the scientific style specific to the field and/or scientific discipline, under the idea

of aligning the written papers to the rigors of the scientific field which these are part, in general, we will refer to:

i. The clarity of a clear, logical, and coherent formulation of ideas by using a vocabulary corresponding to the specifics and level of study of the discipline.

ii. The suitability of the use of the most appropriate linguistic means (words, meanings, forms, and structures) in the expression of ideas is aimed at concordance between the author's intention, the exposed content, and the chosen expression.

iii. The precision of the rigorous use of linguistic means for the clear, logical, and concise expression of the contents of ideas that should be concentrated around central ideas and/or the background of ideas of the subject addressed.

iv. The correctness of respecting the norms of expression in the organization of communication; this is valid for both oral and written speech.

v. The purity of the use of certain linguistic means consecrated using the literary language and admitted by the norms of the literary language, specific to the field of study.

Although for many categories of students, writing papers is a real challenge, the periodic distribution of this kind of task is as important as solving exercises and/or problems, doing laboratory work, etc.

Unfortunately, not all students are equally diligent about such assignments. For this reason, teachers are increasingly faced with various actions of academic fraud, such as cheating, copying, or pretending that the work is "written" in part or in full with the use of external sources, including technological tools such as the forms of generative AI (ChatGPT, Claude, Gemini, etc.), which belong to the learner who puts their name in the "work" header. In this vein, the antidote to using generative AI would be AI detection products for identifying text provenance.

Thus, as part of the verification, before grading, the written works submitted by the learners should be scanned to detect the contribution of AI, AI+human, and humans, and for AI models, some AI detection products determine the AI model that generated the content.

3.4 AI detection products

AI detection tools are software solutions designed to identify written texts employing so-called AI generators. This category includes several products, some of which we will analyze further. It is important to mention that these types of software solutions are based on certain algorithms as well as linguistic models designed to process input data to generate texts as output data.

The text content generation operations are based on language models such as GPT (Generative Pre-trained Transformer) and PaLM from Google. These language models have been trained on large amounts of textual data from the global web through techniques such as deep learning and/or neural networks. If we

were to touch on certain aspects that would differentiate AI detection products from one another in general, as well as at first glance, we consider the following worthy of consideration as criteria:

(1.) The model that was the basis of the system's development;

(2.) The product access and exploitation policy (see Table 1), or of a set of product functionalities. In this vein, as a rule, we are talking about the owners' vision regarding the regime in which those interested in the use or procurement of the product, natural and/or legal persons, can implement the respective solution; there is always a pricing policy and/or subscriptions that differ from one to another by the number of offered facilities and also by the ability to put into exercise the product, in the sense of how many MB or GB of textual information can be checked in a limited time, etc.;

(3.) To which category of texts and/or activities is the product oriented;

(4.) What set of languages does the product work with (see Table 1);

(5.) The fields of implementation of the respective solutions, etc.

Table 1. AI Detection Products: overview

No.	The product details	The offered features		The usage policies	
	Product name & Link	*Languages*	*Additional tools*	Left: Free (+ / -)	
	Manufacturer & Product Type			Right: Subscription (+ / -)	
1.	*ZeroGPT* *https://www.zerogpt.com/*				
	Edward Tian; The Streamlit Company (provides additional server resources).	*EN* *FR* *ESP*	− API possible to integrate into other apps; − Paraphrasing; − Spelling and stylistic check; − Automatic translation; − Generator of bibliographic lists (in styles: APA, MLA; CHICAGO); − AI Detector; − Email response generator; − Word counter.	+ -	+ -
2.	*Scribbr* *https://www.scribbr.com/ai-detector*				

	Co-Founders: Koen Driessen & CEO Bas Swaen Currently belongs to the company Course Hero, Redwood City, California, USA.	*EN*	– Proofreading & Editing (EN; FR; DE; ESP & others 5 languages); – Plagiarism Checker (20+ languages); – Citation Tools; – AI Writing; – AI Detector; – Paraphrasing Tool; – Grammar Checker; – Summarizer; – Knowledge Base.	+ -	+ -
3.	*Quillbot* *https://quillbot.com/ai-content-detector*				
	Co-Founders: Rohan Gupta; Anil Jason; Dave Silin. Currently belongs to the company Course Hero, Redwood City, California, USA.	*EN* *FR* *DE* *ESP*	– Paraphraser (support around of 28 languages, including RO); – Grammar Checker; – Plagiarism Checker; – AI Detector; – Summarizer; – Citation Generator; – Translator; – QuillBot Flow.	+ -	+ -
4.	*CopyLeaks* *https://copyleaks.com/ai-content-detector*				
	Co-Founders: Alon Yamin, Yehonatan Bitton. They met during their service in the Israeli Defense Forces. Now the company operates from New York.	*38 languages including: RO; RU; UA; CH; Hebrew Hindi, etc.*	– Paraphraser (support around of 28 languages, including RO); – Grammar Checker; – Plagiarism Checker; – AI Detector; – Summarizer; – Citation Generator; – Translator; – QuillBot Flow.	+ -	+ -

3.5 The merge of the technological aspects with the AI detection products application didactic context

Currently, there are already an impressive number of AI detection products that compete for the attention of users, both individually and in corporate formats,

on the software market. In choosing an AI detection product, ML and AI professionals, developers, and testers of this kind of product recommend that potential users draw attention to criteria such as:

—   The aspects related to the degree of ease of use of the product;

—   The tool's accuracy in successfully detecting AI-generated content. The best products of this kind are considered to detect AI content with a confidence rate of at least 75%. In total accordance with the given aspect is the concept of false positive, which signifies an erroneous identification of a human-written text as an AI-generated text. For example, the developers of the Turnitin system state that in the case of their product, the false positive rate of the documents analyzed by them is incorrectly identified in a proportion of less than 1% for documents with the presence of at least 20% of AI-generated text. Thus, Turnitin's rate of false positives at the sentence level is about 4%. The same source (Chechitelli, 2023) states that "there is a 4% probability that a given sentence highlighted" as being written by AI is written by a human. This fact is thus detected more often in the case of documents containing a mixture of human and AI-written content, while in 54% of cases such textual content is identified as AI-generated texts. Information regarding the false positive detection rate of other AI Detection Products is not published by other developers.

—   The aspect of interpretability. This is correlated with the accuracy factor of the product. The more types of textual content the product can identify, the more competitive it is. Ideally, AI detection products detect all types of AI-generated (GPT, Gemini, Llama, Claude, Falcon, etc.), human, and mixed (AI + human) text.

—   The endowment has additional functionalities. Here we refer to any set of options that the product is accompanied by: summarizing, generating or drafting bibliographic references, automatic translation, etc.

—   Product scalability refers to the product's ability to detect AI-generated content relative to its limits, such as volume to analyze and accuracy.

Among the AI detection products with a good reputation, we could note the products in Table 1, which mostly meet the criteria listed above, i.e.:

—   Having an intuitive interface, are relatively easy to use even for a user with modest digital skills, as well as both free and paid versions of the products presented by the developers;

—   Show high accuracy in detecting AI-generated text; some products, Scribbr and ZeroGPT, can identify and display the contribution rate of ChatGPT models, Gemini, Human, AI, AI + Human, etc., in the analysis of the given text;

—   They have a series of functionalities that can be exploited not only in education but also in fields such as expertise in several fields such as journalism, mass media, multimedia, marketing, promotion, advertising, writing the bibliography, writing citations in the scientific text, posting on social networks, etc.

— The free versions usually have a lower level of scalability than the paid ones, but if we analyze the set of facilities that the free versions of the products listed in Table 2 come with, they are much more numerous and diverse compared to other competing products.

In our opinion, the evaluation of learning products and results is at the heart of the teaching process. Because of this reason, this process should be carried out not only for the measuring of the learning results and/or the grading, but also to:

— It stimulates the student's learning, the given notion attests tangents with the concept of assessment for learning (Hansen, 2024).

— It regulates and reconceptualizes the methods and forms of teaching didactic content, currently being considered a necessity dictated by the dynamics of various educational contexts. The educational concept is called as the rebuilding of didactic strategies (Setiawan & Sarı, 2019).

— It personalizes the didactic process and makes it more accessible for students with various levels of development of initial prerequisites, for those with medium or poor training (Horga, 2012).

— It promotes the appropriate behavior in an honest and competitive environment;

— It expands the self-assurance capacity of the learners, but also of the teachers.

The respective AI detection products have a series of additional facilities that could be exploited in various educational contexts.

This includes:

i. Additional services, such as essay editing services, editing services, translation, etc.

ii. The ability to work with various styles of expression, such as Standard & Fluency; Natural & Formal; Academic & Simple; Creative & Expand; Shorten & Custom; etc.

iii. Some products offer extensions compatible with Chrome, Word, and macOS.

Fraud, cheating, copying, plagiarism, and intellectual theft are blatant violations of school, academic, and research ethics and conduct. The greater the danger of these uploads, the fewer measures are taken to prevent and/or detect such actions. The indifference of the teaching staff and/or the administration of educational institutions in the long-term leads to the desensitization of society to the given problem, a fact that puts us at risk of never solving it.

Although, currently, AI detection products and anti-plagiarism systems are not the only ways to verify the compliance of written works with general

deontological norms, the use of these products and technologies is recommended as an indicator of improper academic behavior.

4. Conclusions

Motto: „If you copy then it is not self-expression.”
(Michael Schenker:
the guitarist, ex-Scorpions, and ex-UFO member;
the founder of Michael Schenker Group)

If the learner resorts to the use of AI tools for the performance of written works, the results presented, not being partially or even entirely of the alleged author, end up compromising: the didactic process itself, the essence of learning that pursues the objective of forming and developing skills for the learner and to prepare him/her for other levels of studies and, in the final phase, for integration and competition on the labor market.

Having already given the said technological context equipped with AI, we consider it appropriate that teaching staff, qualified institutions, and educational systems take into account these risks and be prepared to coexist with these technological tools as far as possible, using didactic, ethical, and professional reasoning to turn them into allies, valuing their ability to detect possible abuses of AI use at the expense of true and quality learning and education.

REFERENCES

Balmuş, N. & Burlacu, N. (2010) Tehnologii de criptare a informaţiei utilizate în software-le educaţionale pentru testarea computerizată a cunoştinţelor. *In: Culegerea lucrărilor Conferinţei Internaţionale "Telecomunicaţii, Electronică şi Informatică", 20-23 Mai 2010, Chişinău, Moldova.* Vol. II, pp. 425-428.

Batarseh, F., Mohod, R., Kumar, A. & Bui, J. (2021) *The application of artificial intelligence in software engineering: a review challenging conventional wisdom.* doi:10.48550/arXiv.2108.01591 [Accessed 19th July 2024].

Burlacu, N. (2013) Produsele educaţionale "DicEl" şi "RecitalMaster": aspecte de elaborare şi implementare pentru studierea limbii române în şcoala naţională. In: *Materiale din a XI-ua Conferinţă Naţională de Învăţământ Virtual „VIRTUAL LEARNING – VIRTUAL REALITY. Tehnologii Moderne în Educaţie şi Cercetare. MODELS & METHODOLOGIES, TECHNOLOGIES, SOFTWARE SOLUTIONS", 25-26 October 2013, Bucureşti, România.* Editura Universităţii din Bucureşti. pp. 237-243.

Burlacu, N. (2014) Dimensiuni informaţional-tehnologice şi psihopedagogice ale softwarelor educaţionale. *Univers Pedagogic.* 4(44), 33-41.

Burlacu, N. (2016a) *Aspecte metodologice ale elaborării şi implementării software-lor educaţionale: perspective de formare a competenţelor transversale digitale.* Chişinău, Tipografia UPS "Ion Creangă".

Burlacu, N. (2016b) Învăţarea centrată pe student în formarea profesională la specialităţile de Informatică și Tehnologii Informaționale. *Revista de Ştiinţe Socioumane.* 1(32), 45-52.

Burlacu, N. (2021a) Aspects of assessment of students' activity in the seminar classes: problems and solutions. *Journal of Social Sciences.* IV(4), 63-74.

Burlacu, N. (2021b) Didactic transformations of the distance educational process in universities in engineering in (post) pandemic times. In: *The Processing of the 17th International Scientific Conference eLearning and Software for Education Bucharest, 22-23 April 2021, Bucharest, România.* Publisher: Adl Romania. Volume 1. pp. 352-361. doi:10.12753/2066-026X-21-045.

Burlacu, N. (2021c) Digitalization of university courses in the focus of educational management. In: *The 16th Interational Conference on Virtual Learning, 20 November 2021, Bucharest, România.* Bucharest University Publishing House. Vol.16, pp. 23-32.

Burlacu, N. (2021d) Elemente de dezvoltare și management ale unui curs plasat pe Moodle. In: Burlacu N., Ababii V., Ciorbă Dm. etc. *Soluţii pentru studii online în învăţământul universitar ingineresc. Ghid de bune practici: Din experienţa cadrelor didactice FCIM.* Chişinău, Editura "MS Logo" SRL, pp. 32-43.

Burlacu, N. (2021e) Evaluarea pe Moodle: de la idee la aplicare. În: Burlacu N., Ababii V., Ciorbă Dm. etc., *Soluţii pentru studii online în învăţământul universitar ingineresc. Ghid de bune practici: Din experienţa cadrelor didactice FCIM.* Chişinău, Editura "MS Logo" SRL, 70-85. 104 p. ISBN 978-9975-3481-6-4.

Burlacu, N. (2022a) Capstone Project: From Theory to Practice. In: *The Processing of the 17th International Conference on Virtual Learning, 25-26 November 2022, Bucharest, România.* Vol. 17, pp. 63-75.

Burlacu, N. (2022b) Multilaritatea procesului de evaluare a studenţilor în condiţiile studiilor hibrid și/sau online [Multidimensionality of the student assessment process in the conditions of hybrid and/or online learning]. *Revista ştiinţifică - Studia Universitatis Moldaviae. Stiinte ale educatiei.* 5(155), 87-95.

Burlacu, N. (2022c) Procesul didactic digitalizat: viziuni și perspective privind managementul educaţional. *Akademos, Revistă de ştiinţă, inovare, cultură şi artă.* 1(64), 86-93.

Burlacu, N. (2023a) Antifraud protection in learning outcomes assessment: from didactic requirements to technological solutions. *In: The Processing of the 18th International Conference on Virtual Learning, 26–27 October 2023, Bucharest, Romania.* Vol. 18, pp. 43-56.

Burlacu, N. (2023b) Potenţialul transformator al Inteligenţei Artificiale asupra educaţiei secolului XXI. In: *Materialele Conferinţei Naţionale de Învăţământ*

Virtual, CNIV 2023, 26–27 Octombrie 2023, Bucureşti, România. Editura ICI. Vol. 21, pp. 27-38.

Burlacu, N. & Irimiciuc, S. D. (2017) Produsele software de detectare a plagiatului: analiză din perspectiva principiilor interdisciplinarităţii. *In: Materiale din a XV-cea Conferinţă Naţională de Învăţământ Virtual „VIRTUAL LEARNING – VIRTUAL REALITY. Tehnologii Moderne în Educaţie şi Cercetare. MODELS & METHODOLOGIES, TECHNOLOGIES, SOFTWARE SOLUTIONS", 28 Octombrie 2017, Bucureşti, România.* Editura Universităţii din Bucureşti, pp. 69-76.

Cardenas, L. S. H., Castano, L., Guzman, C. C. & Alvarez, J. P. N. (2022) Personalised learning model for academic leveling and improvement in higher education. *Australasian Journal of Educational Technology.* 38(2), 70-82.

Chechitelli, A. (2023) Understanding false positives within our AI writing detection capabilities. *Turnitin.* https://www.turnitin.com/blog/understanding-false-positives-within-our-ai-writing-detection-capabilities [Accessed 27th September 2024].

Futcher, L. (2008) Guidelines for secure software development. In: *ACM International Conference Proceeding Series.* pp. 56-65.

Hansen, C. (2024) *Assessment for Learning: a summary of concepts, tactics and strategies.* doi:10.13140/RG.2.2.28213.28640.

Harry, A. (2023) Role of AI in Education. *Interdiciplinary Journal and Hummanity (INJURITY).* 2, 260-268. doi:10.58631/injurity.v2i3.52.

Hernandez Cardenas, L., Castano, L., Guzman, C. & Nigenda, J. (2022) Personalised learning model for academic leveling and improvement in higher education. *Australasian Journal of Educational Technology.* 72-84. doi:10.14742/ajet.7084.

Hinostroza, J., Rehbein, L., Mellar, H. & Preston, C. (2000) Developing Educational Software: a professional tool perspective. *Education and Information Technologies.* 5, 103-117. doi:10.1023/A:1009699417462.

Horga, I. (2012) The Personalisation of Learning–Between Reality and Desideratum in the Romanian Education System. In *Personalisation of Education in Contexts.* 175-189, Brill.

Johnson, L. & Schleyer, T. (2003) Developing High-Quality Educational Software. *Journal of dental education.* 67, 1209-20. doi:10.1002/j.0022-0337.2003.67.11.tb03712.x.

Lingham, A., Kin, N., Jing, C., Loong, C. & Tuz Zahra, F. (2020) *Implementation of Security Features in Software Development Phases.* https://www.researchgate.net/publication/347880901_Implementation_of_Security_Features_in_Software_Development_Phases [Accessed 11 July 2024].

Setiawan, W. & Sarı, T. (2019) The effectiveness of cognitive conflict on the concept of differential. *Journal of Physics: Conference Series.* 1157. 042069. 10.1088/1742-6596/1157/4/042069. [Accessed 27 September 2024].