

A New Chapter is Being Written About Writing Instruction: Instructional Leadership at K-12 Levels in The Age of Artificial Intelligence (AI)

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Abstract

In this study, in which artificial intelligence applications are examined at the K-12 level, the discussions are multi-dimensional. The use of artificial intelligence applications at the K-12 level, and especially the integrated use of online writing tools into the writing lessons, has led to the occurrence of plagiarism from time to time. In the first place, the fact that artificial intelligence applications create the feeling of being able to think like a human causes student to fully trust this software. What is more, when the subject is approached in terms of educational leadership, teachers' transfer of experience and high level of interaction during teaching and learning decreases. Because artificial intelligence applications individualize the education process and allow students to work more independently from the teacher and from peers. That being said, there are some points that are worth noting here. AI applications should be used as a tool, not an end because when these applications are utilized accountability cannot always be attained. The number of teachers who are already competent in informing and supervising students against malpractices is not sufficient. The fact that teachers are not fully competent in this respect poses a danger to the control and safety of the process. In order for artificial intelligence applications to be exercised effectively at the K-12 level, some software languages and coding skills must be acquired. Lastly, important steps need to be taken towards the future of artificial intelligence applications. Each country should include them in their education systems through their curricula from an early age along with AI applications. In this direction, teacher training programs should also be reviewed. It is of crucial importance to raise the awareness of the society on artificial intelligence, and about ethical rules and morality.

Keywords: Instructional Leadership, Artificial Intelligence (AI), K-12 Levels.

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Introduction

It would be fair to state that yet another period has already begun for humanity with all its challenges and surprises ahead. Each passing day a novel form or version of the existing AI tools emerges, and arguably plentiful others are awaiting to take their own share within the pool consisted of this very accumulated body. Today one can communicate with an AI platform through ‘chatting’, can indeed make an AI medium plan a presentation on a(ny) topic, and conduct research on a subject in a relatively easier fashion again with the accessibility to the said assistants. Most surprisingly, AI is capable of writing well, which used to be a skill that was attributed solely to human beings being a highly refined indicator of cognition and intellect also constituting such a complicated output. As a matter of fact, the aforementioned points are merely a part of what these new agents can accomplish. Without doubt, such incredible progress witnessed in the AI trajectories has a mirror image on educational spheres, to wit, from pre-kindergarten to tertiary level and beyond. Aside from adding onto the rather cliché thoughts like *“Will AI replace educators totally one day?”* through making superficial inferences, it will be both meaningful and purposeful to delve into the diverse dimensions of the (possible) role and place of AI in instruction at K-12 levels that may pave the way for making to-the-point projections about the future. In fact, doing so will also help determine and implement relevant decisions and policies to address the longer-term influence of AI ‘in school’ as well as casting light on several other related areas like teacher education and training.

Aiming to develop writing skills beginning from early ages has been amongst the first set of the agenda items of almost all of the countries in the world. Hemingway once articulated the following: *“There is nothing to writing. All you do is sit down at a typewriter and bleed.”* Years have passed since this quote was noted down and even though writing appears to preserve its eminence as a skill in one’s own language and in other languages learned, as a vital outcome of competence and knowledge, and as a very demanding process, currently an individual can easily; without making much effort, write -or get a piece of writing- provided the command is run accordingly. There is even a piece- a paper recently published focusing on co-authoring with GPT-3 in entitled: ‘AI in Writing Class: Editor, Co-Author, Ghostwriter, or Muse?’ (Kleiman & GPT-3, 2022). On top of all these, quite ironically, this text you are reading may well be written by an AI tool, which mainly attempts to underline the pedagogical, ethical and leadership- bound considerations of the use of AI as part of teaching and learning at K-12 levels. Concerns have been raised long before the ‘birth’ of AI tools with respect to the jeopardy of utilizing digital writing tools which can yield unwanted results like plagiarism issues (Prentice & Kinden, 2018) due to that learners might depend too much on the automated prompts and therefore cannot be good at writing as desired (Kornfeld & Roy, 2021). That being said, the critiques of AI-generated/aided writing is found not-that-quality (yet) considering the inherent limitations of AI in natural language processing in particular towards the pragmatic and contextual components deployed (Vinall & Hellmich, 2021). That said, not referring to these tools by no means may bear risks too, to

exemplify, this would mean missing out the opportunity of catching up with the latest advances or with the Zeitgeist or not keeping up with the ‘modern world’, especially taking into account the fact that these media actually have the great potential to back up any writing endeavor, so long as they are employed in a responsible and appropriate manner (Burkhard, 2022). To this end, it is hoped that AI tools which are particularly geared for educational territories will be made useful and usable products by the manufacturers via acting on the feedback provided by the immediate shareholders, namely, researchers, learners, and teachers so that more features of beneficial sort can be installed in them (Godwin-Jones, 2022). In light of all these this paper intends to shed more light to the use of AI in the instruction of writing at K-12 levels by first reviewing the bulk of literature in this regard to determine the salient aspects of the matter and later by commenting on some key issues such as improving technological, pedagogical, and content knowledge (TPACK) of instructors, fostering technological, digital, and AI leadership along with facilitating instructional leadership, the ethics of resorting to AI in writing in and outside classroom, the idea of integrating an AI track into the available program. In this direction answers to these research questions are sought:

1. How are the salient discussions centered on AI in writing instruction at K-12 levels in the line of literature?
2. What are the prominent points to consider in the usage of AI by instructors and students toward education at K-12 levels?
3. What can the reflections in the field observed so far point to about the future of AI in writing instruction at K-12 levels e.g., from taking measures in the classroom to policymaking?

Background

Writing, as a skill, is indeed a process that continues to develop from earlier ages, that is, from the pre-school period when one starts to receive education until the end of their lives. This skill develops by blending with the experiences gained and emerges as an outward form of individuals’ creativity (Öztürk, 2023). Writing skill is also closely related to reading skill. Because individuals with greater lexical capacity are able to express their thoughts in diverse ways. Looking closely at the course of life, high school years are arguably the years throughout which persons develop very rapidly both physically and mentally. In these years, the transition from concrete to abstract concepts accelerates, and the brain adapts to the ways of deeper learning as opposed to rote learning (Hinton, 2018). Therefore, special attention should be paid to developing writing skills in high school. High school is also a critical transition period during which academic and social preparations are made before university and several basic skills are acquired. Today, with the help of information technologies, young people can write codes, prepare programs and develop digital applications (Manske & Wagner, 2020). These activities have become a part of the common practice at the high school level. Information technologies surprise us more each day and expand our boundaries of thinking. To this end, it is observed that especially in recent years, with the widespread use of artificial intelligence technologies, students' writing skills have

developed to a great extent. These technologies, oftentimes entitled online writing tools, support writers of all levels and assist them in accessing the related resources and unleash their creativity. Online authoring tools can handle many operations easily and relatively quickly today. Whilst doing these operations, they perform in a much shorter time than a human. These online writing tools, often supported by algorithms and artificial intelligence applications, have become so much influential in developing creativity and writing skills. Here are some of the things online authoring tools can do:

- To detect grammatical syntactic problems and act as a spelling checker,
- To translate a prepared text into different languages,
- To insert scientific citations to a written report,
- To summarize a lengthy article and divide it into parts,
- To expand a short article and create new sections,
- To monitor the plagiarism of prepared documents, papers, or theses/dissertations,
- To correct an article within the frame of academic conventions,
- To write codes on any subject or to detect errors in a prepared code set,
- To solve problems with mathematical operations.

As can be seen, online writing tools are advancing incredibly and can act like humans on numerous subjects. This causes artificial intelligence-based applications to attract more and more attention and to be used actively on a daily basis toward various aims. As a matter of fact, these tools are invaluable resources for producing high-quality work. However, at this juncture, it is deemed necessary to take severe measures such as determining the intended use of applications, the ethical boundaries, employing the active service of educational leadership, and avoiding plagiarism. This is because although these writing tools provide convenience and creativity, they should not be fully depended on. After all, human creativity and thinking skills are still complex thanks to thousands of years of experience. Even though artificial intelligence algorithms, which are prepared using millions of data at present, seem to be exhibiting similar capabilities, they cannot fulfil all the required tasks. For this reason, artificial intelligence tools need to be in a position that supports humans, not doing all the job. Online writing tools should aid individuals in their traditional writing activities, should make alternative means of writing possible and should be included in the writing process in a balanced manner. In fact, artificial intelligence has started to be frequently employed in writing activities in recent years. In this regard, opportunities have been created to further improve students' writing skills.

Artificial intelligence tools have become much preferred in offering spell checking, in editing grammar, in generating innovative ideas and creative applications along with towards writing original articles. This has become the topic of studies in the literature. Research accumulated in the literature suggest that artificial intelligence tools in general contribute positively to the writing process. Thet and Htay (2021), for instance, examined the academic writing processes of university students in their studies. As a result of the research, it was stated that the students produced better quality papers using

artificial intelligence applications and acted more independently when preparing academic work. In their study, Chen and Wei (2021) underlined that students' use of artificial intelligence applications improves their writing quality, and they can organize their opinions better. However, not all studies in the literature are pointing out to the positive effects of artificial intelligence applications. Some studies underpin that artificial intelligence applications can bring about problems. Through their research, Krajcik and Kim (2020) pinpoint that artificial intelligence applications have both negative and positive aspects. It has also been stressed that students may tend to rely too much on artificial intelligence applications, though the quality of their writing improves. This shows that students do not spend effort on their writing skills and that they may be faced with plagiarism. That said, online writing tools integrated with artificial intelligence enhance students' writing quality and give them the habit of working autonomously. At this point, educational leadership comes into play, in particular instructional leadership to eschew the potential negative results via ensuring the required supervision and back up.

AI Literature at the K-12 Level

Opting for artificial intelligence-based applications in daily life has led to the emergence of new trends. These trends are felt intensely in educational and societal arenas. The presence of a young and dynamic population, specifically at K-12 education levels, and the high learning capacity of individuals at this age add onto the importance of research on artificial intelligence applications in this direction. Scholars italicize that artificial intelligence applications should be included in education systems at a very young age (Heintz, 2021). To this end, nowadays, many countries of the world are trying to integrate artificial intelligence applications into educational environments at the K-12 level (Touretzky et al., 2019). These endeavor of integration appear in different forms at the K-12 level. For example, while it is used in the process of data-driven design in some countries (Chittora & Baynes, 2020; Vartiainen et al., 2020), in some others it is deployed in areas such as virtual reality, robotic coding and engineering processes (Narahara & Kobayashi, 2018). Nevertheless, steps of concrete sort have not yet been taken regarding the inclusion of artificial intelligence applications in the curricula (Lee et al., 2020). Preparing laws and regulations on this and aligning the education curriculum will definitely be a positive initiative. If studies on artificial intelligence applications are scrutinized, one will witness that the concept was first articulated in 1956 (Casal-Otero et al., 2023). This branch of Science or discipline is formed by combining a number of areas like Mathematics, Computer Sciences, Logic, Philosophy and Neuroscience. Yet it would be fair to say that the development of the field has a longer chronicle; after the industrial revolution, individuals began to think and behave in a mechanized way, and this transformation brought a bunch of conveniences. They benefited from time, cost and labor and learned to have their jobs done quickly thanks to machines (Ayyıldız & Yılmaz, 2023). Today, thanks to the developing information technologies, there has been an effort to make machines look like humans. Machines can actually think like humans, make decisions like humans and internalize justice like humans (Russell & Norvig, 2021).

The introduction of artificial intelligence applications to educational environments dates back to the 1970s. In these years, people began to perform learning/teaching and educational management activities, albeit partially, through machines, computers, and software (Kandlhofer et al., 2016). Nonetheless, when it comes to acknowledging and utilizing artificial intelligence, as is the case with other areas, it is eminent to own artificial intelligence literacy skills. Thence, acquiring three different skills is a prerequisite. First off, it is essential to possess extensive experience in artificial intelligence and to be exposed to plenty of information. Adequate learning of technological, pedagogical, and content knowledge in artificial intelligence is also critical. The more experience and knowledge gained, the more understanding there will be in artificial intelligence. This owing to that artificial intelligence applications are, in a sense, creativity applications. Practicum pertaining to creativity also necessitates having broader knowledge and a solid experience background (Ayyıldız & Yılmaz, 2021). The second skill is having the knowledge of the logic, that is to say, the underlining philosophy of artificial intelligence. Logic and philosophy constitute the basis of artificial intelligence since it operates as a result of a series of logical inquiries. Establishing cause-effect relationships well will ensure that logical outputs are produced. Therefore, it is crucial to learn to think like a machine and predict the limits of what machines can do. Finally, it is vital to establish a link between artificial intelligence and everyday life. It should be questioned well how artificial intelligence produces solutions when faced with real-world problems (Miao et al., 2021). In this case, paradoxically, to think like a human, to focus on social problems will become significant. As for the studies on artificial intelligence literacy of students at the K-12 level, it may be uttered that these skills are put into practice in primary and secondary education. Moreover, it is indicated that measures should be taken on ethical and safety issues in developing and gaining artificial intelligence literacy (Wong et al., 2020).

More studies seem to cluster under the title of artificial intelligence applications for a variety of educational levels, and mostly at the K-12 level (Kandlhofer & Steinbauer, 2021) in recent years (Kong et al., 2021). Although not fully covered in the curriculum, guidelines have begun to be prepared for using artificial intelligence applications in some places (Yue et al., 2021). Notwithstanding, writing skills taught with artificial intelligence applications are not yet officially included in the K-12 curricula. Field experts put forth that studies should be carried out on this subject and that the applications should be subjected to an intensive education process at the K-12 level (Casal-Otero et al., 2023; Touretzky et al., 2019). Studies also put forward that artificial intelligence applications are seen as a threat at the K-12 level. These studies find artificial intelligence applications dangerous for students and teachers (Micheuz, 2020). Some studies, on the other hand, claim that artificial intelligence applications have not yet been adequately addressed in terms of solid reasoning and making the right decision like a teacher, and more work should be done in this respect (Nisheva-Pavlova, 2021). When using artificial intelligence applications at the K-12 level, students should not be left alone with these applications, and it is recommended that they use these with teachers holding strong educational leadership abilities. This is paramount in creating the relationship between technology and pedagogical knowledge (Zhai et al.,

2021). One of the studies conducted on including artificial intelligence applications in the writing skills and education process at the K-12 level belongs to Guan et al. (2020) which discussed the artificial intelligence applications made in recent years from different perspectives. Ng et al. (2022) analyzed the tools and pedagogical approaches made use of in the teaching artificial intelligence. Some of the studies at the K-12 level have investigated how and at what level artificial intelligence education should be received (Long & Magerko, 2020). These studies tried to spot the gaps in artificial intelligence literacy and artificial intelligence applications at the K-12 level. Yue et al. (2022) enquired into the pedagogical components of artificial intelligence applications. According to this research, curriculum studies planned to be developed on artificial intelligence should change from product-centered models to process-centered models. In other words, not only product-oriented but also process-oriented improvements should be made.

AI Studies on Teacher Training

For artificial intelligence applications to be successfully implemented at the K-12 level, first of all, it is imperative to explore teacher competencies. A fair number of studies in the literature point out that teachers have a compelling place in the development of artificial intelligence literacy and hence students' competence in this field (Bai & Yang, 2019; Lin et al., 2022; Xia & Zheng, 2020). Teachers themselves have to master artificial intelligence applications and transfer this knowledge to students at the K-12 level (Itmazi & Khlaif, 2022). Teachers who cannot keep up with the requirements of the technology age we live in will experience difficulties in gaining an understanding of artificial intelligence as these practices are no longer a matter of choice, they have already become an indispensable part of our lives.

A considerable number of studies demonstrate that teachers do not have sufficient technological and pedagogical knowledge about artificial intelligence (Wei, 2021; Yılmaz et al., 2020). In fact, many process components must be considered when designing the curriculum on artificial intelligence applications to be adopted toward developing writing skills at the K-12 level. With the help of in-service training, teachers need to renew themselves and acquire new skills (Lindner & Berges, 2020). The preparation of professional development practices within the scope of the TPACK (Technological, Pedagogical and Content Knowledge) model for teachers has been recommended in the literature toward this aim (Gutiérrez & Henriques, 2020; Wei et al., 2020). In addition to the steps to be taken by the central government on deepening the understanding of artificial intelligence, teachers' opinions should also be sought. After all, the people who are in the kitchen of the business and interact directly with the students are the teachers. There are some studies based on teacher opinions as well. Accordingly, the use and learning of artificial intelligence (Holstein et al., 2019), teachers' technology competencies (Cheung et al., 2018) and artificial intelligence literacy at the K-12 level are among the subjects studies concentrate on. These days, curriculum design and educational content creation for teachers other subjects of great interest.

Using AI as an Education and Training Tool

In order for artificial intelligence applications to be successfully used as teaching materials in the education processes, it is pivotal to produce some smart devices and to create appropriate software languages for these applications. These should be recruited intensively in secondary school and above. This due to the fact that an intensive training period is required in order to learn software language and be familiar with artificial intelligence applications. Contradictorily, many application tools currently produced are designed for machine learning rather than human learning. Wan et al. (2020) conducted a study on this subject. In the study, it was discovered that block-based programming languages were chosen to be used for artificial intelligence tools. In another study, it was revealed that traditional programming languages and machine learning activities were combined, and an easier programming language could be created (Reyes et al., 2020). Artificial intelligence applications are applications that call for intense attention and long-term focus. By contrast, it is known that children's focus time is short, and they are quickly distracted. Accordingly, the studies on this subject unearth that some applications are combined with games to make this process more enjoyable. In this way, children can both use applications without getting bored and have fun (Kahn et al., 2018). One of these applications is the Scratch application. In this application, children can code, use software languages and create fun designs. At the same time, the Scratch application can be used by students at the K-12 level. These applications, which students of all levels can easily use, can be included in the curriculum and used as teaching tools. There are many digital environments related to using artificial intelligence as a teaching tool. Especially after the COVID-19 pandemic, the skills of students, teachers and families towards digital applications have increased considerably, and their technology literacy skills have improved at a certain level. Therefore, environments where simulation can be used are very effective in developing artificial intelligence applications (Verner et al., 2021). These applications assure that the results of the activities are instantly obtained. Thus, students can instantly see the results of coding, software and online writing activities and can see their deficiencies by receiving instant feedback. In recent years, the intensive use of autonomous systems has increased the interest in artificial intelligence applications. From this point of view, students participate in robotic festivals, exhibit the tools they use with their own software, and prefer artificial intelligence applications as teaching tools.

The Role of AI in the K-12 Education

The use of artificial intelligence in education has a multidisciplinary being allowing for the development of instructional designs and helping students to learn individually (Holmes et al., 2019). Artificial intelligence technologies are advancing at a rapid pace. This has brought with it new opportunities, novel fields of application, creation of alternative skills, and additionally some challenges (Abbas et al., 2020). Considered at the K-12 level, artificial intelligence applications and writing skills have now turned into individual learning rather than group learning. As a matter of fact, students realize their inclination in individual learning has caused both the roles of educators and the educational process

to change (Baker & Smith, 2019; Oflaz, 2023) if not transform. Students are to be considered at the center of the traditional K-12 education system where teachers are in the position of guides. That being said, with the latest developments in the field of education system prepared with artificial intelligence applications, many tasks of the teachers who are in the position of the guide can indeed be performed by artificial intelligence applications (Chatterjee & Bhattacharjee, 2020). Addedly, so many parts of the modus operandi that is pertinent to the teaching and learning of writing skills such as doing homework, project preparations, and alike can now be done easily and quickly by artificial intelligence tools. This may sound fantastic at first, but things are not so good when approached from a different angle. The roles of teachers and students have altered, and machines that decide according to specified (still restricted) algorithms have become a part of the process. At this point, uniquely human values such as empathy, compassion and initiative, are gradually being removed from the overall system, and new mindsets and mentalities have been introduced.

Some researchers have classified the role of artificial intelligence applications in the education system. To cite an example, Zawacki-Richter et al. (2019) studied artificial intelligence applications in four different pillars. These areas are profiling, assessment and evaluation, adaptive systems, and personalized learning environments. On the other hand, Hwang et al. (2020) categorized artificial intelligence applications for trainers and learners. Chen and Wei (2021) dwelled upon the applications of artificial intelligence in the education system in terms of more technical issues such as the evaluation of students and the school, the evaluation of homework and exams, and the evaluation of the individual teaching process. In addition to these studies, Baker and Smith (2019) divided the role of artificial intelligence in education into three groups. These groups were named as applications for students, applications for trainers and applications for the system itself. As can be understood, there is no standard classification for artificial intelligence applications at present. Furthermore, their role in education has not been clearly defined. This hints at that there is a lot to do in spheres of education that pertains to AI.

Using AI at K-12 Levels

A lot of countries of the globe are making many investments using technology infrastructure for K-12 education. Some of these investments are related to using artificial intelligence applications in the education process. One of the countries where artificial intelligence applications usually find a place on the agenda is the United States of America. The USA is conducting comprehensive studies on the active use of artificial intelligence in schools (Heintz, 2021). Curriculum and guidelines are being prepared to ensure the cooperation between student-teacher-national developers in this regard (Chiu, 2021). Similarly, it is known that the Massachusetts Institute of Technology (MIT) in the USA has prepared a curriculum on artificial intelligence. Despite such intensive curriculum work in the USA, no system has hitherto been actively used in schools. In China, in another corner of the world, more radical steps have been taken in this respect. As a matter of fact, the Chinese government has developed a curriculum for artificial intelligence applications and has made it compulsory for use at the secondary

school level (Xiao & Song, 2021). Likewise, on account of the intense engineering practices in Germany, pilot applications for artificial intelligence teaching in education programs have been initiated (Micheuz, 2020). In Singapore, programs have been put into practice to increase the awareness of artificial intelligence on the part of students at the K-12 level.

In light of all these, one can express that the fact that teachers and students do not have sufficient knowledge about artificial intelligence may cause these practices to be disrupted occasionally (Heintz, 2021). As in many countries of the world, the Canadian government has attempted to address this issue. In this context, the philosophical and conceptual foundations of AI have been taught to students at the K-12 level through practical applications and courses.

Ethical Issues of AI in K-12 Education

The use of artificial intelligence in education has undoubtedly disclosed many conveniences (Becker et al., 2018). This means many new opportunities for both students and teachers as the two major stakeholders of instruction. It is of utmost importance to note that artificial intelligence applications can affect the performance of students and teachers, their gaining experience and, most importantly, their thinking. This situation may lead to personal data to be shared with the third parties, to students' becoming unsociable, and even anti-social, and to the violation of ethical rules (Jalal et al., 2021). It is also worthy of noting that artificial intelligence applications have just started to be a part of the education at K-12 level, and there is no systematic use. The absence of any limitations in artificial intelligence applications, where individual use is heavily preferred, the lack of legal rules, and the scarcity of national and international regulations and laws for these applications cause these applications to be ethically questioned (Holmes et al., 2021). Today, you can write poems using artificial intelligence applications in any language or have a term project prepared on any subject. This breadth of use poses no threat on the parties when ethical concerns are catered to (Ouyang et al., 2022). However, these practices can pose a danger in determining real academic success, in creating original studies and in making a fair evaluation of performance. Youngsters at the K-12 level who are in adolescence are ready to develop entrepreneurship qualities with a high learning capacity and perseverance, but they may choose easier ways when performing operations that require long-term focus or long-term work. Here, artificial intelligence applications can be seen as an opportunity not to be missed for them. It is worthwhile to recall how AI operates to better contemplate at this point. Artificial intelligence applications consist of two processes. In the first process, the system accepts all kinds of data as input, processes each incoming data, and takes it into the data pool. In the second process, questions are answered using the existing data pool and various algorithms. All kinds of positive and negative data are collected during these processes, personal data can be violated, and this data can be shared with the third parties (Borenstein & Howard, 2021). At the same time, artificial intelligence applications do not always get informed consent. This results in the emergence of privacy violations, biased data creation, and statistical apophenia (Sacharidis et al., 2020). On top of these, using artificial intelligence

applications at the K-12 level can negatively impact the ideal balance within the rapport between students and teachers. Because teachers are responsible for the coordination of the educational process. Teachers have a key role where students join in the processes to develop knowledge and skills. However, since artificial intelligence applications individualize the education process and cause students to be less dependent on the expertise or wisdom of their teacher, teachers' leadership may be affected negatively (Slade & Prinsloo, 2013). There is another aspect through which artificial intelligence applications affect students and teachers via ethical means at the K-12 level. This is a concept that is to do with accountability and inclusivity. All kinds of educational activities at the K-12 level are evaluated with a specific application process and concrete products are obtained as a result. This is often done through written exams. However, it was unknown whether an assignment given online e.g., as was the case with the during the emergency online teaching environment of the COVID-19 pandemic, was actually a work of students or that of artificial intelligence applications. At the same time, ethical problems may arise toward accountability since students are not always required to present 'their' work. Rather than the advantages offered by artificial intelligence applications, one of the hottest topics at the moment is unethical behavior (Wang & Cheng, 2021). Artificial intelligence detectors have been used to be able to figure out if a piece of work is created solely through AI. Arguably, one of the most interesting of these is that of the OpenAI (ChatGPT), a groundbreaking company in artificial intelligence, which is again a detector to see whether the content was produced with or without artificial intelligence.

Conclusion and Discussion

In this study, in which artificial intelligence applications are examined at the K-12 level, the discussions are multi-dimensional. Primarily, it has been supported by many studies that writing skills have shown a positive development with artificial intelligence applications (Chen & Wei, 2021; Thet & Htay, 2021). The use of artificial intelligence applications by the students helped them to produce higher-quality products in a shorter time. However, over time, this situation caused students to have excessive confidence in this software and to turn to it directly without making any individual effort (Krajcik & Kim, 2020; Sevgi et al., 2023). The use of artificial intelligence applications at the K-12 level, and especially the integrated use of online writing tools into the writing lessons, has led to the occurrence of plagiarism from time to time. In the first place, the fact that artificial intelligence applications create the feeling of being able to think like a human causes student to fully trust this software. What is more, when the subject is approached in terms of educational leadership, teachers' transfer of experience and high level of interaction during teaching and learning decreases. Because artificial intelligence applications individualize the education process and allow students to work more independently from the teacher and from peers.

Despite the negative aspects of artificial intelligence applications, many countries have started projects to include these applications in their curricula, and even in countries such as China, it has

become mandatory to use these applications in lessons starting from secondary school (Xiao & Song, 2021). Many researchers stress out the use of artificial intelligence applications at the K-12 level. That being said, there are some points that are worth noting here. Firstly, artificial intelligence applications should be used as a tool, not an end because when these applications are utilized accountability cannot always be attained. At the same time, situations with legal sanctions may occur on a number of issues, such as ethical problems, data breaches, plagiarism and sharing personal data (Sacharidis et al., 2020).

All in all, there are points to consider in using artificial intelligence at the K-12 level. To begin with, student-teacher interaction should not decrease in the use of artificial intelligence and these applications should be embraced carefully as a support tool in the education process. A curriculum as part of a system that is internationally valid and reliable has not yet been designated. Although many countries have attempted to integrate AI into their education systems, no progress of meaningful sort has been made yet. Also, there is no legal limitation on the conditions under which students will use artificial intelligence applications, how long and at what level they will use these. The number of teachers who are already competent in informing and supervising students against malpractices is not sufficient. That is because these applications require the blending of dissimilar skills pertaining to technology, information, and digital literacy. The fact that teachers are not fully competent in this respect poses a danger to the control and safety of the process. At this point, it should be made sure that teachers are artificial intelligence literate through in-service trainings (Holstein et al., 2019) as well as through pre-service education. In order for artificial intelligence applications to be exercised effectively at the K-12 level, some software languages and coding skills must be acquired. In some countries, games and software applications have already been combined, and the education process has been made fun in order for students not to get bored and learn software languages efficiently (Kahn et al., 2018).

Lastly, important steps need to be taken towards the future of artificial intelligence applications. At first, so as to ensure the supervision and control of these applications, software such as the artificial intelligence control detector developed by OpenAI should be created and disseminated (Sevgi & Yılmaz, 2023). Each country should include them in their education systems through their curricula from an early age along with AI applications. Because software, coding and artificial intelligence applications are new-generation technologies that will be encountered frequently in the coming years and will stay with us for many years (Verner et al., 2021). It should not be forgotten that artificial intelligence applications can be used in a desired way thanks to competent teachers at every step of the education process. In this direction, teacher training programs should also be reviewed. It is of crucial importance to raise the awareness of the society on artificial intelligence, and about ethical rules and morality. These can be accomplished by using artificial intelligence as a tool, not as a goal. At the moment, it is strategic to start studies on the content of artificial intelligence applications, training curriculum, legal uses, sanctions, protection of personal data and respect for privacy. These initiatives must be protected by laws and regulations of countries and eventually at the international level. Because,

unless the source of the provided data is known, any information produced will remain as information based on interpretation and with low validity.

Policy Implications

Artificial intelligence applications have attracted great interest at all levels of education since the first day they were introduced. Especially the rapid development of information technologies, easy access to the internet, smart phones and smart applications, and people's interest in technology have made the popularity of these platforms widespread. Recently the development of artificial intelligence applications has gained considerable speed particularly with the introduction of ChatGPT. So many different artificial intelligence applications have hitherto been implemented in a variety of fields. These are undoubtedly more frequently used in the trajectories of the field of education along with the spheres of training environments. It is then no surprising that students, teachers and educational policy makers closely follow artificial intelligence applications. However, a series of laws or implementation regulations of inclusive sort have not yet been fully prepared for artificial intelligence applications. Plentiful countries have initiated various studies to control and limit the use of artificial intelligence by the immediate stakeholders and beyond. This has made it compulsory to better determine the purposes of the potential and current usages of artificial intelligence applications, legal sanction limits, ethical uses as well as the positive and negative aspects in the education and training processes. On light of the findings of this research, we hold the belief that we have inspired the researchers and policy makers to dwell upon educational policies for the use of artificial intelligence, in particular at the K-12 level, to contemplate the ways to resort to artificial intelligence applications in the teacher training processes, to think about the limits pertaining to ethical uses and lastly to come up with pathways through which artificial intelligence can be referred to in education in a purposeful and meaningful manner.

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In this study, ethics committee permission was not obtained since literature and document review was performed. However, ethical rules were meticulously followed at every stage of the research.

Credit Author Statement

First Author: Conceptualization, Methodology, Investigation, Writing - Original Draft, Writing - Review & Editing, Project Administration.

Second Author: Methodology, Software, Validation, Data Collection, Formal Analysis, Visualization, Writing - Review & Editing.

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