

# Smart Project-Based Learning and Artificial Intelligence Literacy in Social Studies Education : A Systematic Review of Conceptual, Pedagogical, and Motivational Outcomes Among Middle School Learners



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## ABSTRACT

AI has gained a lot of relevance in the field of school education, specifically with regard to digital competence, student engagement, and future-ready learning. Meanwhile, project-based learning has become a learner-centered pedagogical strategy which facilitates inquiry, teamwork, and real knowledge building. Although there is an increasing body of research in both fields, the cross-evaluation of artificial intelligence literacy, smart project-based learning and social studies education has not been adequately synthesized, particularly at the middle school level. This review seeks to explore the conceptualization of AI literacy in school education, the role of project-based learning in the context of smart learning in social studies, and the effects of AI-enhanced pedagogy on concept formation and student motivation. The structured method of literature review was chosen based on the major academic databases and a thematic analysis of the chosen works. The review has found five main themes, including AI literacy, project-based learning, AI integration in social studies, its impact on the concept development and motivation, and research gaps. The results suggest that the concept of AI literacy is becoming a multidimensional skill that entails knowledge, critical awareness, ethical awareness, and responsible usage. Another finding of the review is that smart project-based learning represents a valuable paradigm of meaningfully incorporating AI into social studies through facilitating authentic inquiry, concept creation, and engagement of learners. Nevertheless, the literature is still disjointed, and few comprehensive studies are done on the middle school settings. The review finds that AI literacy and smart project-based learning have a great educational potential and can be a valuable basis of analytical and empirical research in social studies education in the future.

**Key words:** Literacy in artificial intelligence; intelligent project-based learning; social studies education; middle school students; student motivation; AI in education; intelligent learning environments.

## 1.INTRODUCTION

The fast-growing digital technologies have immensely changed the way educational activities are conducted,

especially as the use of artificial intelligence (AI) in the learning and teaching classrooms is gradually rising. AI is currently being identified as a potent means of improving instructional delivery, promotes personalized learning, and student engagement. In modern education, the focus on providing students not only with the knowledge in the subject matter but with digital skills, critical thinking skills, and problem-solving skills that would meet the requirements of the twenty-first century is becoming increasingly popular. In this environment, artificial intelligence literacy has become a crucial competency, allowing students to learn to comprehend, analyze, and utilize AI technologies in a responsible manner.

Meanwhile, project-based learning (PBL) has risen to prominence as one of the effective pedagogical strategies that help to facilitate active and student-centered learning. PBL promotes meaningful activities, group work and the ability of learners to apply knowledge to real-life contexts. This methodology is specifically applicable in the subjects like social studies where students have to comprehend intricate ideas concerning the society, culture, geography and human relations. Nevertheless, although both AI and PBL have the potential to improve the learning process, there is still an unequal and underdeveloped integration of the practice in the classroom.

Even though an increasing amount of literature has been conducted regarding artificial intelligence in education and the impact of project-based learning, the two aspects have been studied separately. The latter is often the case with studies on AI in education, whereas research on project-based learning pays more attention to such pedagogical outcomes as engagement and achievement. Limited synthesis of the intersection of these two areas exists, especially within the framework of the creation of AI literacy and subject-specific learning outcomes.

Moreover, in subjects like social studies, students are still subjected to conventional teaching methods which in most cases restrain them in their actions to be active, inquisitive and practical. Although the number of AI tools is becoming more and more accessible, their role in pedagogy is still incomprehensive and lacks a unifying structure. Hence, the existing research needs to be thoroughly reviewed to unify the information, formulate patterns and gaps, and get a better idea of how AI-assisted project-based

learning can be used to support the conceptual knowledge and student motivation.

This review intends to review and synthesize current research on the intersection of artificial intelligence, project-based learning, and social studies education. In particular, the aims of the review are:

- To examine conceptualizations and development of artificial intelligence literacy in school education.
- Purpose: To investigate the issue of project-based learning as a method of technology-enhanced learning.
- To investigate how learning strategies supported by AI can contribute to the acquisition of the concepts of social studies.
- To find out how these strategies affect student motivation and engagement.
- To determine gaps in research and propose the way to conduct research in the future.

#### A. Review Questions

To attain these goals, the review will be informed by the following questions:

- What does it mean to be literate in artificial intelligence in school education?
- How do project-based learning in technology-supported settings differ and what are the main characteristics and educational advantages of project-based learning?
- Question: What is the impact of the incorporation of AI tools in conceptual social studies learning?
- Question: How AI-based project-based learning influences student motivation and engagement?
- What are the key gaps and shortcomings in the literature?

This review is dedicated to academic works connected with the topic of artificial intelligence in education and project-based learning and their implementation in schools. It mainly looks at the research done on the middle school level where students are at a critical level of acquiring both conceptual and digital skills. The review encompasses empirical research, conceptual literature, systematic reviews, and policy-focused discussions, which discuss AI integration, learning processes, and student outcomes.

It is restricted to peer-reviewed scholarly materials written in English and applicable in the educational environment. Articles which do not directly cover AI-assisted pedagogy, project-based learning, or learning outcomes in students are not covered. With a narrow scope, the review will offer a concise and consistent literature synthesis that is directly in line with the understanding of the educational potential of AI integration with project-based learning.

## 2. THEMATIC LITERATURE REVIEW

### 2.1 AI Literacy

The concept of artificial intelligence literacy has been established as an educational competence instead of a technical skill with more and more basis. In the body of school-based research over the past few years, AI literacy has been typically defined as understanding of the concepts of AI systems, critical interpretation of outputs, ethical awareness, responsible use, and trust of the application of AI to learning. Ng *et al.* [7] reasoned that AI literacy

education is still conceptually disjointed since various studies have focused on teaching technical knowledge, ethical knowledge or practical implementation to different extents. Equally, Feng and Carolus [6] demonstrated that AI literacy in schools has psychological aspects of readiness and learner beliefs and confidence that it needs to be viewed as a wider educational phenomenon as opposed to merely being an operational skill. Chiu *et al.* [22] also differentiated between AI literacy and AI competency by stating that literacy is about what learners know and understand, and competency is how they use these knowledge efficiently in useful and thoughtful ways.

Such multidimensional perspective is strengthened by framework-building studies. OECD and the European Commission [8] introduce AI literacy as a cross-curricular competence that consists of knowledge, skills, and attitudes, which allow learners to comprehend, interact, and engage with AI critically in primary and secondary education. Mills [9] on the other hand describes AI literacy in the context of knowledge, analysis, and practice of AI usage in a safe and effective manner, whereas MacCallum *et al.* [23] introduce the Scaffolded AI Literacy (SAIL) model to demonstrate how AI literacy can be built up in both learners and educators. Combined with these studies, it indicates that AI literacy is not limited to computing courses but is becoming more often considered a subset of overall educational preparedness to modern society.

Increasing interest in developmental appropriateness can be observed in the literature as well. Yang [17] presented the main aspects that should be considered when teaching young children AI, the importance of age-related concepts as well as meaningful experiences. Intelligence based AI literacy in young learners was suggested by Yim, Warschauer and Chan [12], and subsequently reviewed by Yim *et al.* [18] in primary schools, with models of curriculum and assessment more coherent models being needed. Similar results were obtained by Atias [3] who discovered that AI literacy programs in children and youth gain more and more conceptual knowledge and are increasingly coupled with ethical thought and relevance. Hallström *et al.* [13] completed the picture of AI literacy by determining common factors of AI literacy in K-12 education. Taken together, this body of literature indicates that the development of AI literacy among school learners needs to be developmentally suitable, critical and practice-based, as opposed to being just technical.

Meanwhile, the latest reviews indicate that conceptual and methodological inconsistency still persists. Biagini, Zawacki-Richter and Bond [4] have discovered that the AI literacy literature is growing at an alarming rate, but definitions, frames, and pedagogical models are not even. Casal-Otero *et al.* [19] also concluded that K-12 AI literacy studies need further curricular integration outside of a computer science context. It means that although nowadays AI literacy has become a high-priority in education, it does not have enough standardization in terms of school research and practice.

### 2.2 Project Based Learning

The concept of project-based learning (PBL) has been popularly identified as a learner-focused instructional model that encourages inquiry, teamwork, problem-based solutions and realistic practice of learning. Unlike the teacher-

centered methods, PBL demands that students explore, resolve significant questions, solve real or realistic problems and create tangible products. In a massive meta-analysis conducted by Zhang and Ma [10], PBL has a positive influence on academic performance, higher-order thinking, and affective performance, but the magnitude of the effects varies with the quality of implementation, the subject matter, and grade level. This shows that PBL is not only effective as long as it is active, but it orchestrates learning around meaningful tasks and enduring inquiry.

The worth of PBL is particularly apparent in the subject-specific research. Duke et al. [5] discovered that project-based learning enhanced social studies and literacy learning as well as student motivation with professional development guiding supports. Similarly, Pan, Chen and Liu [14] found that a possibility-thinking integrated project-based history course was beneficial in enhancing creativity, motivation of learning and knowledge of history. Previous studies by Ciftci [24] also revealed that project based learning had a positive effect on the attitude of students towards social studies. Collectively, these studies imply that PBL is especially useful in concept-rich courses, where the knowledge is based on interpretation, application, and engagement, as opposed to the knowledge based solely on recollection.

The recent literature also connects PBL to the smart and technology-supported learning environments. According to Biagini et al. [4], technology can only be educationally significant when it is incorporated into a good pedagogy. Astratova et al. [25] also report that the success of PBL is conditioned by the level of the systematic way of overcoming the obstacles to project work. The wider meaning is that technology is not a panacea to deeper learning, instead, pedagogical models like PBL offer the framework within which digital tools can be exploited to explore, collaborate and reflect.

Therefore, the literature repeatedly refers to PBL as a powerful candidate framework of the modern education system due to its correlational relation to the aims of student agency, authentic learning and futuristic skill-building.

### 2.3. Social Studies AIs

The adoption of AI in social studies education is not well-developed in comparison with STEM areas, although social studies is particularly well-adapted to technology-mediated inquiry. The major of social studies demands that students understand interrelated and multifaceted concepts like citizenship, society, geography, culture, governance, and human interaction. Such ideas require situational knowledge, put yourself in their shoes, and critical thinking as opposed to retaining. However, the literature in the field of AI in school education remains computer science and STEM dominated. As Casal-Otero et al. [19] clearly indicated, the process of introducing AI-related learning to other subjects besides computer science requires additional research.

Nonetheless, recent research indicates a high potential of AI-aided social studies learning. Alfarwan et al. [1] discovered that generative AI in K-12 education can aid in the explanation, drafting, feedback, and interaction, as long as the use of AI in the classroom is meaningfully guided. The same authors of Garzón, Baldiris and Gomez [15] also noted that AI in education relates with personalization,

better pedagogy, and motivation and also presents challenges concerning ethics, access, and teacher preparedness. The results would apply to social studies since the topic of interest tends to have many more than one representation, a response based on prompts, comparison of viewpoints, and explanation of a situation.

In their study, at the school systems level, Aravatinos, Koutromanos and Retalis [2] emphasized the infrastructural, teacher preparedness, and access factors in the integration of AI into K-12 education. Chen [16] further clarified that the education reform based on AI needs to be founded on equity, AI literacy and ethics, especially among younger students. These issues are of particular concern in social studies where critical citizenship and responsible participation objectives necessitate a pedagogical mediation of technology.

This can be reinforced by the new literature on generative AI. Lin et al. [20] demonstrated that generative AI in K-12 learning is transforming learning in both formal and informal contexts and Zhang et al. [21] found that generative AI has the potential to enhance academic achievement, cognitive skills, and learning motivation, though, with issues of dependence, misleading information and privacy concerns. Thus, AI in social studies is not to be perceived as a new phenomenon or content-generating tool, instead, inquiry, ethical judgment, and concept development are to be linked to AI in such discipline-sensitive manners.

### 2.4. Concept and Motivation

It is demonstrated in the literature that the approaches to project-based and technology-assisted learning can have a positive effect on the development of the concept and student motivation. Concept learning Duke et al. [5] observed that PBL was better than social studies learning, because it engages students with context-based tasks of importance. Similar results were also found out by Pan et al. [14] who indicated that project-based learning enhanced subject mastery but also improved creativity and motivation. The findings indicate that active participation enables the learners to internalize the complex concepts better than the traditional teaching method since they are expected to practice and apply ideas, examine relations, and make sense of content in context.

This process can be reinforced with the help of AI-assisted learning. The systematic review by Farhood et al. [26] revealed that AI-based personalized learning could substantially transform the teaching, learning, and assessment processes as it modulates student needs and facilitates personalized learning. The same case was presented by Park [11] who stated that meaningful educational design is the key to successful GenAI literacy in schools but not exposure to tools. In social studies, where students frequently have problems with abstract and interrelated concepts, AI-assisted project work can thus enhance cognition, as the process of inquiry can be more interactive, responsive, and individualized.

The learning environment design extensively influences motivation as well. It was demonstrated by Zhang and Ma [10] that PBL enhances affective outcomes, whereas.

Pan et al. [14] demonstrated that project-based instruction improves motivation, as well as, learning performance. Both Alfarwan et al. [1] and Zhang et al. [21] state that AI tools have the potential of boosting engagement by being

interactive, providing feedback, and personalized, though, they also caution against the emergence of overreliance in case tasks are not well designed. Therefore, technology is not a motivating factor in itself; authenticity, relevance, participation, and support of the teacher are the key elements to meaningful engagement. On that note, the blending of AI and PBL is important as it bases motivation not on the novelty but on purposeful, collaborative, and visible learning processes.

### 2.5. Research Gaps

Although there is an increasing literature in this field, there are still a number of significant gaps. First, AI literacy, project-based learning, and subject-specific learning outcomes are typically researched separately, but not in combination. The conceptual inconsistency of AI literacy research is pointed out by Ng *et al.* [7], as well as Feng and Carolus [6], and Zhang and Ma [10] discuss the general PBL outcomes, but not AI-supported PBL specifically. This division restricts the knowledge about the formation of AI literacy, the concept learning, and motivation in the actual classroom conditions.

Second, social studies are still underrepresented in AI-in-education studies. The existing literature is dominated by STEM and computing or an overall educational technology, and it has not fully covered the conceptually rich subject areas in the humanities. Duke *et al.* [5], Pan *et al.* [14], and Ciftci [24] present evidence that project-based learning can be effective in the social studies and history courses, however, these studies did not incorporate AI-assisted pedagogy directly. It implies that the particular intersection between AI, project-based learning, and the development of the concept of social studies is still under-researched.

Third, there is still underrepresentation at the middle school level. Numerous studies concentrate either on younger children or general K-12 environments, or on older learners, but only a handful of studies specifically consider middle school students, although this is a critical phase of acquiring digital competence, conceptual knowledge, and motivation. Yim *et al.* [18], Yang [17], and Hallström *et al.* [13] positively demonstrate the importance of developmental considerations in AI literacy education and provide the support of the necessity of stage-sensitive research designs.

Lastly, the gaps in equity, access and implementation are still evident in the literature. Both Chen [16] and Aravantinos *et al.* [2] imply that teacher preparation, infrastructure, and opportunity structures have a strong impact on the beneficiary of AI-assisted learning. These gaps are what make more integrated empirical research that explores AI literacy, concept acquisition and motivation in a single pedagogical study warranted.

framework, particularly using intelligent project-based learning in the social studies education.

## 3. REVIEW PROCEDURE.

### 3.1 Review Design

The article takes a literature review design to critically review the existing literature on artificial intelligence literacy and smart project-based learning and its applicability to social studies teaching in the middle school level. The structured review design is suitable since it enables the researcher to locate, prepare and review pertinent studies in

an articulated and scholarly way. A structured review assists in making sure that the literature selection and interpretation processes are directed by explicit processes, unlike a narrative review that can be more general and less systematic. This method is the most appropriate when it comes to the current research as the sources on AI in education, project-based learning, and student motivation are spread across various disciplines and are in need of a systematic structure to be synthesized.

### 3.2 Databases Searched

The major scholarly databases indexing the high-quality educational and interdisciplinary research were used to identify the relevant literature to use in the review. The databases used were Scopus, Web of Science, ERIC, SpringerLink, ScienceDirect and Google Scholar. The selection of these databases was based on the fact that they offer a wide range of peer-reviewed journal articles, review studies, conceptual papers, and educational research reports on the topics of artificial intelligence, pedagogy as well as school education. The use of various databases assisted in enhancing the thoroughness of the review and minimized the chances of missing out on any studies. With the attraction of literature on these key sources, the review planned to establish an adequate evidence base in terms of breadth and credibility to analyze conceptual, pedagogical, and motivational outcomes related to AI-supported project-based learning.

### 3.3. Search Keywords

The literature search was based on the combinations of the carefully selected keywords which were connected with the main themes of the review. Such keywords were: artificial intelligence literacy, AI in education, project based learning, smart learning, social studies education, middle school students, student motivation, and generative AI in classrooms. These terms were searched separately and combined with Boolean operators like AND and OR, to get the relevant studies in different perspectives. As an illustration, queries like artificially intelligent literacy AND middle school students, AI in education AND project-based learning, and social studies education AND student motivation proved helpful in finding the articles that are at the intersection of the themes of the reviews. The keywords chosen were aimed at having both broad discussions and more narrow studies being included in the search so that the objectives of the review would be met.

### 3.4. Inclusion Criteria

The review used specific inclusion criteria to make the reviews relevant and of academic quality. To begin with, peer-reviewed journal articles and academic works were only taken into consideration. Second, the research was limited to studies published in English so as to ensure uniformity in analysis and interpretation. Third, the review was narrowed down to school education specifically in middle school setting where possible. Fourth, the literature chosen had to indicate a clear applicability to one or more of the main themes of the review: artificial intelligence, project-based learning, social studies education, concept acquisition, or student motivation. Both the conceptual and empirical studies have been incorporated in case they add value to the relationship between these constructs. The following set of

criteria assisted with maintaining the focus of the review to high-quality and relevancy academic literature.

### 3.5. Exclusion Criteria

In conjunction with the inclusion criteria, there were also a number of exclusion criteria that ensured that the review was accurate. The non-academic sources like blogs, news articles, opinion articles, commercial websites and informal internet materials were not included. Unrelated studies were also filtered out such as those that were about higher education or training in a corporation or an informal learning setting unless they presented the conceptual insight that was of very high relevance. Moreover, the papers that did not have obvious connection to AI-integrated pedagogy, project-based learning, social studies learning, concept development or student motivation have not been taken into account. Redundant records detected in the databases were eliminated and those studies that did not have adequate methodological or conceptual clarity were also excluded in the end review pool. The exclusion criteria were needed to make sure that the analysis was conducted on coherent and academically sound as well as contextually relevant literature.

### 3.6. Method of Analysis

A thematic analysis approach was used in the analysis of the selected studies. The literature that was included after search and screening process was carefully read and sorted into recurring concepts, findings and pedagogical patterns. The thematic analysis was suitable in the case of this review as it enables the researcher to transcend mere description and be able to observe overarching patterns, relationships and debates throughout the literature. The studies in the current review were summarized into key themes: artificial intelligence literacy, project-based learning and smart learning environments, integration of AI in the teaching of social studies, and impact on concept development and motivation.

In this way, the review investigated the ways in which various authors conceptualized AI literacy and framed project-based learning as a pedagogical approach and analyzed how the teaching process based on AI support can affect conceptual and motivational outcomes. Thematic analysis has also enabled similarities and differences to be drawn within the studies, unexplored areas to be identified and gaps in the existing body of knowledge to be made. Thus, this approach gave a systematic and consistent foundation to the synthesis of the literature and conclusions that will be applicable in the further research and practice in the educational process.

## 4. SYNTHESIS AND DISCUSSION

### 4.1 Conceptual Insights

The literature reviewed offers a number of valuable conceptual ideas on the connection between artificial intelligence and project-based learning, as well as the school education. To start with, it has always been evident that AI literacy is no longer viewed as mere familiarity with technology. Rather, it is being more and more conceptualized as a multidimensional construct comprising of conceptual knowledge, critical analysis, moral sensitivity, and responsible application of AI tools. This suggests that AI

literacy ought to be regarded as a more general educational competence, as opposed to a more technical skill.

Second, there is a body of literature that project-based learning provides a solid pedagogical basis of nurturing such competence. PBL requires inquiry, authentic tasks, and active participation, thus, providing an opportunity to use AI in a meaningful and not in a mechanical way. The overlapping of the ideas of AI literacy and smart project-based learning is thus important: AI is the technological component that facilitates learning, whereas project-based learning consists of the pedagogical framework in which students are able to engage creatively and constructively.

Third, the literature emphasizes the role of context of subjects, and this is particularly in the field of education of social studies. Social studies are a field that needs interpretation, situational comprehension, and formation of concepts, thus a good field to explore how AI-based inquiry can enhance in depth learning. Comprehensively, the conceptual literature indicates that AI, pedagogy, and subject learning are not distinct fields that can be considered to be independent entities, but interrelated aspects of modern education.

### 4.2 Pedagogical Implications

In terms of pedagogy, the literature shows that the value of AI in education is not as much related to the presence of technology as to its incorporation in the learning design. AI tools seem to be most useful with guided, inquiry-based and authentic learning setting as opposed to being applied alone. It implies that teachers are instrumental in the process of designing AI-aided learning to ensure that students can learn within a framework of analysis, reflection, and application instead of just depending on the generated results.

Another assumption in the literature is that smart project-based learning can act as a powerful instructional design since it is a combination of active learning and digital support. Students can use AI tools to generate, receive feedback, explain, and solve problems through projects in a manner that is still related to learning goals. This instructional framework promotes cooperation, critical thinking and authentic interaction. Such approach can find its use in the social studies education where abstract and interconnected ideas tend to cause learning problems and students, instead of memorizing the information, ought to be able to interpret and apply it to real-life situations.

The other pedagogical implication is the significance of readiness of teachers. Research has shown time and again that the success of AI implementation hinges on the mindfulness of teachers to employ AI in a responsible manner, construct meaningful activities, and stay focused on learning and not on novelty. Thus, even in the technological learning environment, pedagogy is at the center stage.

### 4.3 Motivational Outcomes

According to the literature, AI-based and project-based learning methods can have a positive impact on the motivation of the students in case they are designed properly. The motivation seems to be enhanced in the case where the students are given a sense of autonomy, participation, relevancy, and visible learning outcomes. Project-based learning helps to achieve this by enabling the learners to work on real-life activities, cooperate with the fellow students, and be responsible in their work. AI tools can also

enhance this process by transforming the learning process into a more interactive, immediate, and responsive process. Nonetheless, the incentive effect of AI is not a given. The literature is clear that technology in itself does not support engagement. Although AI can be initially appealing due to the novelty, the meaningful and sustained motivation will be possible based on whether students find tasks meaningful, relevant, and something they can do. This is why AI + project-based pedagogy is important. It enables motivation to be based not only on mere application of the technology, but it is based on the experience of the actual solution of problems, the development of products and engagement in an active learning process.

More particularly in the context of middle school learning this should be considered as the interest, social interaction, and perceived usefulness often determine how students engage themselves during this stage of their learning. The literature hence indicates that intelligent project-based learning could offer a powerful avenue towards facilitating academic involvement as well as motivation growth.

#### 4.4 Gaps in the Research in the Existing Literature

Although the literature in this area has increased, there are still a number of significant gaps. A significant gap is that AI literacy, project-based learning, subject-specific learning outcomes are usually examined independently but not in a combination manner. Numerous studies consider AI literacy as a single phenomenon, i.e., in terms of awareness, technical knowledge, or ethical aspects. Other researchers concentrate on the project-based learning and its impact on academic performance or even motivation without taking into account the role of AI-assisted tools. This dichotomy restricts the knowledge of the interaction of these areas in practice in actual classes.

A second discontinuity relates to context of the subject. Most studies in the AI-in-education field are also heavily focused on STEM, computer science, or technology-focused settings and much less on social studies and other topics on the humanities. This leaves a knowledge gap in the understanding of the functioning of AI-assisted pedagogy in conceptually rich, but less technical subjects.

The third gap is the middle school level that is yet to be represented in the literature. As middle school students are at the crucial point of mastering the conceptual knowledge and digital competence, there is a need to conduct more specialized research in the field. Moreover, differences in definitions, assessment instruments and models complicate the process of comparison across studies and diminish the clarity of the field.

#### 4.5 Implications to Future empirical Studies

The literature reviewed provides an explicit indication of the necessity of further empirical research that encompasses AI literacy, concept learning, and motivation in one educational system. A significant implication is that the future studies need to go beyond the study of the constructs individually and explore the development of the constructs in realistic classroom models. This would more accurately give insight into the way AI-supported pedagogy works in practice.

Subject-sensitive empirical research, in particular in the field of social studies education, is also in high demand. Because the majority of the current literature is based on the STEM contexts, future research needs to experiment whether AI-

based project-based learning can lead to such similar or even more effective results in the subjects that demand interpretation, contextual reasoning, and conceptual knowledge.

Moreover, it is necessary to strengthen the evidence base with bigger and more heterogeneous samples, extended interventions, and more precise measurement instruments in the future. Teacher preparation, access to AI tools, and school context are also aspects that researchers should consider as they can contribute to a significant change in outcomes. In general, the literature implies that future empirical research must not only aim at testing the effectiveness of AI-supported project-based learning, but also elaborating on the circumstances under which it is most educational.

### 5. EXPECTED CONTRIBUTION / SCHOLARLY CONTRIBUTION

This review is likely to have a significant scholarly impact by uniting the disjointed literature of artificial intelligence literacy, smart project-based learning and social studies education in a single combined scholarly discourse. Even as these areas have been increasingly covered separately, there were fewer studies that have been able to collectively synthesize these areas in terms of middle school learners. In this way, the review offers a better idea of the intersection of AI-supported and project-based approaches in the area of school education.

Another value of the review is that it helped to elucidate the theoretical basis of AI-based teaching. The review assists in clarifying the reasons why AI literacy, inquiry-based pedagogy, and authentic project work are not independent areas but complementary to each other through the synthesis of conceptual and empirical literature. This reinforces the theoretical foundation of developing instructional interventions that integrate the use of technological tools with the instructional approach that emphasizes the student.

The review has also a contribution in terms of determining both the pedagogical opportunities as well as challenges. It suggests the possibility of AI-aided project-based learning to support concept development, engagement, and future-readiness and also notes the issues surrounding access, the preparedness of teachers, the critical use of AI, and the disproportional integration of AI in classrooms. Moreover, the review also demonstrates the main gaps in the research such as the lack of integrated studies that would be concerned with AI literacy, the notion of social studies acquisition, and motivation among middle school students.

Last but not least, the review gives an excellent scholarly rationale of the proposed doctoral level of analysis and empirical research in the future. It creates the necessity to further explore the effectiveness of smart project-based learning as an instruction methodology in social studies teaching by mapping the current knowledge base and illustrating what has not been studied in-depth.

### 6. CONCLUSION

The aim of conducting this review was to review and synthesize the literature available on the intersection of artificial intelligence literacy, smart project-based learning, and social studies education with a specific focus on middle

school learners. The aim of the review was to elucidate the conceptualization of AI literacy in school pedagogy, the role of project-based learning as a pedagogical framework in technology-supported learning, and the connection between these two concepts and concept development and student motivation. The review sought to offer a coherent scholarly insight into a field, which is still conceptually and pedagogically disjointed by synthesizing studies in these overlapping areas.

There were a few key themes of the review. First, AI literacy is becoming more widely accepted as a multidimensional learning skill that encompasses theoretical knowledge, ethical consciousness, critical thinking, and the responsible use of AI. Second, project-based learning remains an upheld method of student-focused learning that fosters inquiry, teamwork, authentic learning, and critical thinking. Third, the potential of AI-assisted learning in social studies is under-researched, although this topic has a good potential of inquiry-based and concept-oriented learning. Lastly, the literature indicates that concept acquisition and learning motivation can be enhanced in case the AI tools are incorporated into the meaning-making project-based activities.

The review also shows the significance of incorporating the AI literacy and smart project-based learning since the two seem to be complementary to each other. AI offers technology assistance in exploration, feedback, and generating ideas, whereas project-based learning offers the pedagogical framework to make this technology educatively significant. Collectively, they provide more interactive, relevant and future oriented learning model.

Concurrently, the review demonstrates that additional analytical and empirical research is required. The current literature is small in size, divided in scope and frequently divided by field or methodology. This is why the next step in research should focus on AI literacy, concept acquisition in social studies and student motivation in integrated interventions in schools in order to present greater evidence on educational practice and reform.

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