STEAM PROJECT DESIGN IN ARTS EDUCATION: FROM RESEARCH AND EXPERIMENTATION TO CREATIVE OUTCOMES

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Abstract

The integration of the arts with science, technology, engineering, and mathematics increasingly defines the content of modern school education; however, the artistic component in STEAM projects is often reduced to mere decoration of a technical product. This article aims to substantiate the author's model of STEAM project design in arts education, ensuring a consistent transition from an artistic idea – through research, experimentation, and construction – to a tangible, student-created product, and to test it by creating an artist-robot. The study was conducted as a qualitative single-case study within the framework of project-oriented pedagogical research. The methods applied include theoretical analysis and generalization of scientific literature, comparison of practical STEAM project models, participant observation, analysis of project documentation and activity products, a reflective interview with a student, and expert evaluation of the product. A four-stage model – "research – experiment – construction – creative outcome" – with an end-to-end reflective cycle is proposed, in which the artistic idea serves as the initial and system-forming factor.
Furthermore, five models of STEAM project design are systematized according to the leading type of interdisciplinary integration, and evaluation criteria for the STEAM product are developed across five components. Using the example of an artist-robot based on the LEGO Mindstorms EV3 platform, implemented as a plotter, it is demonstrated that the student product integrates creative intent, algorithmic logic, and mechanical execution, with the artistic solution determining the design and software parameters. The scientific novelty lies in substantiating a model in which the artistic concept dictates the technical solution. The proposed model is suitable for implementation in art lessons and extracurricular activities in general secondary education institutions. At the same time, the evaluation criteria can be utilized for formative assessment and student self-assessment. Future research prospects include testing the model on a larger sample and quantitatively measuring creative outcomes.

Keywords: STEAM education, arts education, project-based learning, transdisciplinary approach, artist-robot, empirical study, creative outcomes.

1. Introduction

Problem Statement. The transition from the STEM model to the STEAM model, which incorporates arts alongside science, technology, engineering, and mathematics, redefines the role of arts education in schools. Within this framework, art is viewed not merely as an additional subject, but as a mode of inquiry that fosters figurative thinking, creative problem-solving capacity, and a value-based attitude toward the outcome of one's work. However, practical experience reveals an opposing trend: in many integrated projects, the artistic component is restricted to decorating a technical product or presenting the final result. At the same time, the research and engineering dimensions develop independently. Consequently, students are deprived of the opportunity to experience the full pathway from an artistic concept to its tangible manifestation, and art educators lose the opportunity to demonstrate that a creative idea can proactively determine the technical specifications of an engineering solution.

Analysis of Recent Studies and Publications. In an integrative review of STEAM education research and practices, E. Perignat and J. Katz-Buonincontro established the lack of a standardized definition of STEAM and a wide variety of art integration models – ranging from using artistic tools to explain scientific concepts to the equal combination of disciplines within a problem-based task (Perignat & Katz-Buonincontro, 2019). A bibliometric analysis of 1,116

publications from the Web of Science database conducted by J.-A. Marín-Marín and co-authors demonstrated that research on STEAM education has been ongoing continuously since 2006; however, it has not yet formed a consolidated research trend, with student competencies and teacher professional development remaining the leading topics (Marín-Marín et al., 2021).

A critical stance on contemporary STEAM practices is supported by S. Mejias and co-authors, who argue that the transformative potential of integration is realized only when the cognitive practices of both the arts and STEM disciplines are equally engaged in learning activities, rather than when art serves STEM objectives (Mejias et al., 2021). A similar view is held by M. A. Graham, who considers arts education as a "borderland" zone between disciplines and warns against the instrumental use of art in integrated curricula (Graham, 2021). Thus, two main positions have emerged in the scientific discourse: proponents of the first evaluate STEAM by the gain in scientific and technical outcomes, whereas supporters of the second judge it by the preservation of the intrinsic value of artistic inquiry.

Empirical studies confirm the effectiveness of STEAM learning for developing creativity and motivation. In a sample of 550 students whose teachers completed a long-term professional development program, C. Conradty and F. X. Bogner proved the positive impact of creativity on learning motivation within a STEAM environment (Conradty & Bogner, 2020). R. Girdzijauskienė (2021) established that teaching science disciplines using art processes enhances students' behavioral, emotional, and cognitive engagement. Ukrainian researchers examine the STEAM approach within specific types of art activities: T. Sovik proposed a seven-stage structure for a STEAM music lesson and reported increased scores on motivational, cognitive, and creative criteria in an experiment with fourth-grade students (Sovik, 2025). I. Shymkova, S. Tsvilyk, and V. Harkushevskyi substantiated STEAM projects for crafting author dolls using digital prototyping (Shymkova et al., 2024). H. Kuzmenko described an educational and creative project in fine arts as a form of combining practical activity with art history knowledge (Kuzmenko, 2021). L. Hrynevych, N. Morze, V. Vember, and M. Boiko defined digital tools and inquiry-based learning as essential components of the educational ecosystem of integrated instruction. A survey of 105 representatives from higher pedagogical education institutions and schools demonstrated that digital tools enhance student motivation and expand their practical experience (Hrynevych et al., 2021). Thus, Ukrainian studies focus primarily on specific art forms and do not offer a generalizable model for translating an artistic concept into a product applicable across various STEAM projects.

A distinct direction comprises research on educational robotics. Having analyzed 147 studies, S. Anwar and co-authors identified creativity and motivation as one of five thematic clusters of verified robotics-driven outcomes (Anwar et al., 2019). I. M. L. Souza and colleagues generalized the experience of utilizing LEGO robotics kits in education (Souza et al., 2018), while N. Morze, O. Strutynska, and M. Umrik examined robotics as a means of early detection of students' technical aptitudes and as a foundation for interdisciplinary projects (Morze et al., 2018). F. Ruiz and co-authors demonstrated that the LEGO Mindstorms construction set enables the introduction of an artistic component into a STEM project through aesthetic design and robot personalization (Ruiz et al., 2019), whereas S. Almpani and D. Alimisis described the combination of dance, music, and engineering in a robotics project for twenty-fifth-grade students executed using the ENGINO kit. The authors emphasize that robotics in such a project simultaneously develops aesthetic perception and engineering thinking (Almpani & Alimisis, 2021). Research by M. U. Bers and co-authors, as well as by A. Gerosa and colleagues, indicates that robot programming contributes to the development of computational thinking provided that the child is highly engaged in a playful and creative task (Bers et al., 2019; Gerosa et al., 2022). Specifically, in an experiment by A. Gerosa and co-authors, a significant increase in computational thinking was recorded only in the group with high task engagement (Gerosa

et al., 2022). In arts education, this implies that a robotics task must be personally meaningful to the student, and that an artistic image can ensure such significance.
The studies closest to the article's topic are those on image-generating robots. The idea of a robot drawing according to a child's program traces back to the "turtle" concept of the Logo programming language, proposed by S. Papert as an "object-to-think-with" that combines geometry, movement, and a graphic trail (Papert, 2020). Modern engineering developments demonstrate artist-robots that reproduce brushstrokes with millimeter precision (Gülzow et al., 2018) or combine non-photorealistic rendering algorithms with manipulator motion planning (Scalera et al., 2019). S. Ali and co-authors established that a social robot demonstrating creative behavior enhances the figural creativity scores of children aged 5–10 (Ali et al., 2021), while Y. Lin and colleagues described human-robot co-creativity in the sketching process (Lin et al., 2020). R. Chamberlain and co-authors found that spectators' bias against computer-generated artworks decreases when they observe the robot in the process of drawing (Chamberlain et al., 2018).

Identification of Previously Unresolved Parts of the General Problem. The analysis of publications demonstrates that the artist-robot is predominantly studied as an engineering or psychological object. In contrast, arts education is viewed as a field that utilizes ready-made technical tools. The following issues remain insufficiently addressed: how to design a STEAM project in which the artistic idea serves as the initial and system-forming factor; what the sequence of transition from research and experimentation to construction and creative outcome should be; and what criteria should be used to evaluate a student product that combines artistic, algorithmic, and engineering components.

The purpose of the article is to substantiate the author's model of STEAM project design in arts education, to ensure the transition from an artistic idea to a tangible student product, and to analyze its implementation through the example of creating an artist-robot on the LEGO Mindstorms EV3 platform.
The research objectives are as follows:

1. to clarify the content of the concept "STEAM project design in arts education";
2. to develop a STEAM project design model and systematize practical models of STEAM projects according to the type of interdisciplinary integration;
3. to analyze the stages of creating an artist-robot in accordance with the proposed model;
4. to determine the evaluation criteria for a STEAM product.

2. Methodology

The methodological foundation is built upon the principles of constructionism, according to which knowledge is most fully constructed when learners are engaged in creating an external, tangible product (Papert, 2020), as well as concepts advocating for the equal integration of cognitive practices across the arts and STEM disciplines (Mejias et al., 2021). The study was conducted as a qualitative single-case study within the framework of project-oriented pedagogical research: the model was designed, empirically tested, and refined based on reflective insights. The selection of a single case was based on the project's structural completeness.
The study's experimental base was Balta Lyceum No. 2 of the Balta City Council of Odesa Oblast (Balta, Ukraine). The project was implemented in 2025–2026 during extracurricular activities and art lessons under conditions of interdisciplinary collaboration, guided by art teacher Olena Sholudko and mathematics and robotics teacher Oleksandra Yasniuk.

The participant in the study was a 9th-grade student of the aforementioned lyceum who is passionate about art and robotics (her developed project was also validated and presented on all-Ukrainian educational platforms, notably the Junior Academy of Sciences of Ukraine). The comparative base consisted of four STEAM projects previously conducted by the authors with students of the educational institution and in a museum space.

The following methods were applied: theoretical analysis and generalization of scientific publications – to refine the conceptual apparatus; comparative analysis of practical STEAM project models – for their systematization; participant pedagogical observation – to record the student's actions at each stage; analysis of project documentation (sketches, program versions, trial images) and activity products; a reflective interview – to clarify how the student comprehends the connection between the artistic concept and the technical solution; and expert evaluation of the product based on developed criteria. The study was conducted in compliance with ethical standards: the student's parents provided informed consent for her participation and the use of project materials in a scientific publication; participation was voluntary, and personal data were not disclosed.

Data analysis was carried out in three steps. First, the observation materials, project documentation, and the reflective interview were organized according to the stages of the model. Next, for each stage, the student's actions, the knowledge drawn from various fields, and the decisions made under the influence of the artistic concept were identified. In the final step, the product was evaluated against the criteria presented in Table 2. The reliability of the conclusions was ensured by cross-referencing data from multiple sources: what the student did, what she created, and how she explained her decisions.

3. Results

3.1. Concept Content and Author's STEAM Project Design Model.

Given the divergence of existing interpretations (Perignat & Katz-Buonincontro, 2019; Graham, 2021), this study defines STEAM project design in arts education as teacher-organized student activity in which an artistic idea serves as the initial and system-forming factor, while scientific, technological, engineering, and mathematical knowledge is engaged for its inquiry, experimental validation, and material embodiment in a completed product. Unlike viewing STEAM merely as the sum of subject-discipline knowledge, this definition establishes the progression (from artistic concept to technical solution). It adopts the resulting product as the criterion for project completion.

The author's STEAM project design model comprises four stages (Fig. 1). At the *research stage*, students analyze an artistic image, material, or phenomenon, formulate a project question, and gather the necessary knowledge across various domains. The *experimentation stage* involves testing hypotheses by evaluating materials, techniques, parameters, and methods of action, as well as comparing the resulting variations. At the *construction stage*, students design and fabricate the product – a crafted item, device, exposition, or digital object. The *creative outcome stage* encompasses the finalization of the product, its presentation, practical application, and evaluation. All stages are unified by a reflective cycle: an unsuccessful outcome during experimentation or construction prompts the student to return to a previous stage rather than ending the project.

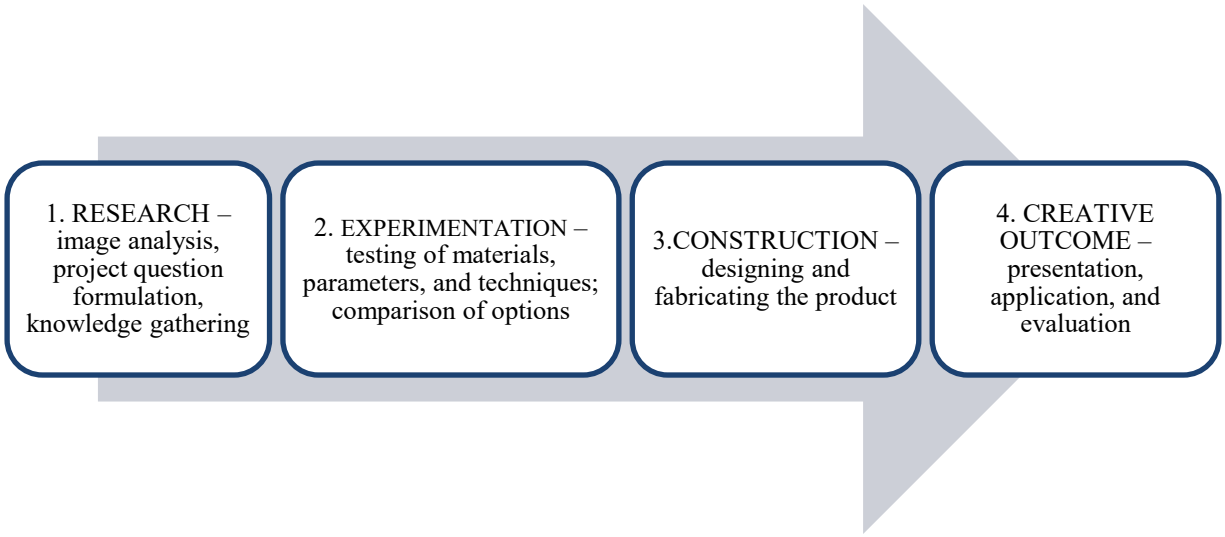


Figure 1. Author's model of STEAM project design in arts education

3.2. Practical Models of STEAM Projects.

A comparative analysis of projects implemented by the author identified five models of STEAM project design based on the leading type of interdisciplinary integration (Table 1). The models differ in which domain of knowledge supports the artistic idea and the experiment; however, in each model, the project culminates in a tangible material product.

Table 1. Practical Models of STEAM Project Design in Arts Education by Integration Type

Integration Model / Type	**Leading Domain**	**Character of Experiment**	**Tangible Final Product**
1. Aesthetic-Technological ("ART FOOD LAB: The Taste of Creativity")	Arts + Technology + Design	Exploration of composition, color, and form in food materials	Creative food art products / culinary art objects
2. Ethnocultural ("ETHNO-FUTURE LAB: Design Code of Ukrainian Spring", museum space)	Arts + Ethnology + Design	Reimagining ornaments, symbols, and colors in modern design	Original design product based on ethnocultural traditions
3. Research and Natural Science ("Magic of Color Around Us")	Arts + Natural Sciences	Observation and empirical investigation of color phenomena	Original color composition / artwork
4. Polysensory ("The Art of Coffee")	Arts + Chemistry + History + Music + Technology	Influence of coffee solution concentration on color saturation; synthesis of color, texture, and aroma	Sensory exposition: coffee paintings, bean artworks, aromatic soap, digital presentation
5. Engineering-Algorithmic ("Artist-Robot")	Arts + Mathematics + Computer Science + Engineering	Image simplification; movement and line parameters	LEGO EV3 plotter robot that draws portraits

This systematization demonstrates a gradual progression in the complexity of integration: advancing from combining art with material processing technology (Model 1), through ethnocultural exploration (Model 2), natural science experimentation (Model 3), and a polysensory environment (Model 4), to an engineering-algorithmic model (Model 5), wherein the student creates not only an artwork but also the technical means for its execution. The fifth model fully encompasses all STEAM components and is therefore selected for detailed analysis.

A brief characterization of the first four models is as follows. In the "ART FOOD LAB" project, the artistic idea was transformed into a concrete product: students selected composition, color, and form while taking into account the properties of food materials, thereby integrating art with technology and design. The "ETHNO-FUTURE LAB: Design Code of Ukrainian Spring" project, conducted within a museum space, was built on the investigation of Ukrainian ornaments, symbols, and colors and their reinterpretation in modern design, culminating in the creation of an original artistic product. The integrated lesson "Magic of Color Around Us: We See, Feel, and Explore" combined observation, color research, and experimentation with natural science concepts. The most extensive project in terms of content was "The Art of Coffee," in which coffee simultaneously served as a scientific object of study, an artistic medium, a source of aroma, and a cultural phenomenon. Students painted with instant coffee solutions of varying concentrations – determining how concentration influences color saturation – created artworks from coffee beans, manufactured aromatic soap, and analyzed the imagery of coffee in J. S. Bach's *Coffee Cantata* as well as in contemporary music, with digital documentation culminating in a sensory exposition. A common feature across all models is experimentation as an indispensable phase between concept and product; it is precisely this experimentation that transforms an artistic task into research activity, aligning with the conclusions of Girdzijauskienė (2021) regarding the enhancement of students' cognitive engagement through arts-based learning processes.

3.3. Model Implementation: Creating an Artist-Robot. *Research Stage.*

The initial artistic idea stemmed from a student's desire to build a device that could draw portraits of animated film characters. The artistic research encompassed an analysis of the graphic language of the selected images: the role of the contour, form generalization, and the relationship between detail and the integrity of the overall silhouette. The technical research focused on determining the operating principles of a plotter – a device that generates graphic images by controlling the movement of a writing instrument across a plane. The student identified that any line drawing can be described as a sequence of points within a Cartesian coordinate system; consequently, the drawing process can be represented as movement along two coordinate axes. At this stage, the artistic task – to convey a recognizable image through line work – dictated the technical requirement for the robot: ensuring precise and smooth marker displacement.

Experiment Stage. Work on the image was carried out based on a pre-prepared digital sketch. The software program decomposes the graphic file into individual line segments, which the robot reproduces sequentially. Consequently, the experiment was twofold. The *artistic experiment* involved identifying a degree of image simplification in which the character remained recognizable while the number of segments was feasible to execute. The *technical experiment* encompassed test runs at varying motor speeds and marker-pressing forces, as well as comparisons of line quality across sample sheets. The student directly observed how changes in mathematical parameters affected the line's expressiveness, aligning with Seymour Papert's concept of the robot's graphic trace as material for thinking (Papert, 2020).

Construction Stage. The artist-robot was constructed and programmed on the LEGO Mindstorms EV3 platform (Education edition). The model was implemented in a plotter format: the structure consists of EV3 motors, sensors, and structural LEGO elements that ensure precise movements along two coordinate axes. Control is exercised through graphical programming tools, enabling specification of an algorithm to sequentially execute marker movements according to the digital sketch. The algorithm includes a segment-processing loop in which the coordinates of the starting and ending points, marker lifting or lowering, and axial movements are determined for each segment. Thus, at this stage, the student applied knowledge from mathematics (coordinates, proportions, scaling), computer science (algorithms, loops, variables), and technology/engineering (mechanical transmission, structural stability). The capabilities of the LEGO Mindstorms platform for integrating an artistic component into a technical project have also been documented in international literature (Ruiz et al., 2019; Souza et al., 2018).

The interdisciplinary integration content within the "Artist-Robot" project is summarized in Table 3. Its analysis demonstrates that each STEAM component fulfilled its own distinct task within the project, while art functioned not merely as final decorative styling, but as both the initiating and controlling factor: the artistic image established the technical requirements at the outset and served as the benchmark of quality upon completion.

Table 3. Interdisciplinary Integration Content in the "Artist-Robot" Project

STEAM Component	**Project Content**	**Model Stage**
S – Science	Motion, trajectory, marker pressing force	Research, Experiment
T – Technology	LEGO Mindstorms EV3 platform, graphical programming, digital sketch preparation	Experiment, Construction
E – Engineering	Two-axis plotter mechanism, motors, sensors, structural stability	Construction
A – Arts	Character/image selection, line and contour work, form generalization, portrait recognizability	All stages
M – Mathematics	Cartesian coordinate system, line segments, proportions, scaling	Research, Construction

Creative Outcome Stage. The completed artist-robot reproduces portraits of animated characters on paper, materializing a digital image within physical space. The product has practical utility in the educational process: it is used in art, mathematics, and computer science lessons to demonstrate the interrelationships among a graphic image, a coordinate system, and an algorithm. Product analysis made it possible to delineate three core components whose interaction the student observed throughout the modeling process: *human creative concept* (choice of image, composition, stylistics), *algorithmic logic* (software code determining the sequence and parameters of movement), and *mechanical execution* (motor operation, structural precision, kinematics of the system). During the reflective interview, the student emphasized that it was precisely the choice of the artistic image that dictated how detailed the program needed to be and how precise the physical structure required to be.

The role of the art teacher evolved dynamically across the model stages. At the *Research Stage*, the teacher assisted in formulating the artistic objective and guided the analysis of the image's graphic language. At the *Experiment Stage*, the teacher posed prompting questions that encouraged the student to compare alternatives and conclude, rather than offering ready-made solutions. At the *Construction Stage*, the teacher acted as a consultant. Finally, at the *Creative*

Outcome Stage, the teacher organized the product presentation and facilitated a discussion in which the student explained the robot's operating principles to her classmates. This distribution of roles aligns with the creativity support strategies described by S. Ali et al.: reflective questioning, offering ideas and challenges, and positive reinforcement (Ali et al., 2021).
The artist-robot also possesses intrinsic value as a didactic tool for other students. Demonstrating its operation makes it possible to visualize the process of decomposing an image into a sequence of elementary actions – thus rendering visible an algorithm that typically remains hidden. Students observe how a holistic portrait emerges from individual lines and can compare this process with their own method of executing a line drawing: proceeding from the general contour to details. Such a comparison aligns with Seymour Papert's notion that a child internalizes an abstract concept more effectively when able to "project" it onto their own physical movement and action (Papert, 2020). For younger students, the robot serves as a playful introduction to the concept of an algorithm, consistent with Marina Umaschi Bers and colleagues' approach to programming as a space for play (Bers et al., 2019). In contrast, for older students, it serves as an object of analysis of the relationship among geometry, software programming, and artistic outcome.

3.4. Evaluation Criteria for a STEAM Product.

To assess a student product integrating diverse knowledge domains, an evaluation system comprising five components was developed (Table 2). The criteria align with the stages of the framework, making them applicable to both summative assessment and ongoing student self-assessment.

Table 2. Evaluation Criteria for a STEAM Product in Arts Education

Component	Criterion	Indicators
Artistic and Expressive	Expressiveness and integrity of the image	Originality of concept; compositional coherence; recognizability of the image
Research and Experimental	Substantiation of decisions	Formulated project question; comparison of alternatives; conclusions drawn from experimentation
Engineering and Structural	Product functionality	Structural stability and precision; alignment with the concept
Algorithmic	Procedural logic	Algorithm correctness; appropriate parameters; ability to debug/correct errors
Reflective and Presentational	Awareness of interconnections	Explanation of the link between artistic and technical solutions; presentation quality

An evaluation of the artist-robot based on these criteria demonstrates that the product aligns with all five components: the *artistic and expressive component* is evidenced in the recognizability of the characters; the *research and experimental component* is evidenced in identifying the optimal image simplification; the *engineering and structural component* is evidenced in the functionality of the two-axis design; the *algorithmic component* is evidenced in the program for step-by-step segment reproduction; and the *reflective and presentational component* is evidenced in the student's ability to explain the relationship between artistic choices and technical parameters.

4. Discussion

The obtained results are consistent with the perspectives of Mejias et al. (2021) and Graham (2021) regarding the equal status of artistic and scientific-technical cognition: in the case of the artist-robot, the artistic decision does not merely decorate the technical device but determines its parameters. In this respect, the proposed model differs from the approach of Ruiz et al. (2019), in which the artistic component is introduced into a STEM project through the robot's aesthetic styling. In our case, what is artistic is not the device's external appearance but its core function – generating an image.

The results complement engineering studies on artist-robots (Gülzow et al., 2018; Scalera et al., 2019): while in those works the robot serves as a tool for professional artistic practice, in the educational context, the primary value lies in the very process of its creation by the student. The principle of converting an image into a set of trajectories – which, in professional systems, is implemented through complex algorithms – becomes an accessible subject of inquiry in a school project. This aligns with the constructionist thesis regarding the educational value of creating a tangible product (Papert, 2020).

The conclusion by Ali et al. (2021) that a robot can stimulate children's imaginative creativity takes on a different dimension in our study: creativity manifests not in interacting with a pre-existing robot, but in designing one. Concurrently, data from Chamberlain et al. (2018) concerning changes in viewers' attitudes toward machine-generated artworks during the observation of the drawing process provide grounds for considering the demonstration of the artist-robot as a means for discussing issues of authorship, creative intent, and the role of the human in technology-mediated art with students.

The question of authorship regarding an artwork created by a robot warrants separate discussion. In the artist-robot case study, the human remains the author of the image, composition, and stylistics. In contrast, the robot serves as an instrument that materializes creative intent. This division of roles differs from professional systems in which the robot independently makes certain decisions regarding brushstrokes or trajectories (Gülzow et al., 2018; Scalera et al., 2019). In arts education, this distinction is fundamental: it enables discussions with students about where technical execution ends, and creative choice begins, and why the artistic value of a work is bound to intent rather than to mere fidelity of reproduction. The findings of Chamberlain et al. (2018) indicate that observing the drawing process alters the viewer's evaluation of the artwork; therefore, demonstrating the robot's operation is best combined with a narrative in which the student explains their original concept and technical solutions.

Compared to Ukrainian studies on the STEAM approach in music education (Sovik, 2025) and design-technological training (Shymkova et al., 2024), the proposed model serves a broader purpose: it outlines a shared logic for transitioning from concept to product applicable across diverse artistic domains, as corroborated by the systematization of the five practical models. The limitations of this study stem from its qualitative design and single-case analysis, which preclude generalizing the conclusions to the broader population. Additionally, the student's high intrinsic motivation, given their prior interest in robotics, may have amplified the observed outcomes.

The practical implications of this study pertain directly to the planning of STEAM projects by art teachers. It is advisable to initiate a project with an artistic task formulated so that it inherently requires knowledge from other disciplines. Experimentation should be planned as a distinct phase that incorporates the systematic recording of alternatives and conclusions, as this stage ensures the transition from an initial concept to a substantiated solution. STEAM project models can be structured as a sequence with a gradual increase in integrative complexity –

advancing from aesthetic-technological to engineering-algorithmic – thereby accommodating students' age levels and prior preparation.
The integration of the artist-robot into an art lesson can be structured following a framework close to the seven-stage STEAM lesson model proposed by T. Sovik (2025): motivation through demonstrating the device in operation, problem statement (how to convert an artistic image into a sequence of lines), collaborative problem-solving in groups, creation of original simplified sketches for robotic reproduction, testing and verification of results, followed by discussion and reflection. The digital component of the lesson (sketch preparation, photo and video documentation of the process) aligns with the role defined by L. Hrynevych et al. regarding digital tools in enhancing student motivation and expanding practical experience (Hrynevych et al., 2021). Such a lesson structure does not require every student to construct an individual robot; a single device created within a project context is sufficient to enable the entire class to engage through the stages of research, experimentation, and creative outcome.

5. Conclusions

1. **STEAM-projecting in arts education** has been refined as a student-centered activity in which the artistic idea serves as the initiating and system-forming factor. At the same time, knowledge from the natural sciences, technology, engineering, and mathematics is integrated to support research, experimental validation, and the tangible materialization of a completed product.
2. **A four-stage model of STEAM-projecting** ("research – experiment – construction – creative outcome") with an embedded cross-cutting reflective cycle has been developed. Additionally, five practical STEAM project models have been systematized by their primary integration type: *aesthetic-technological*, *ethnocultural*, *research-natural science*, *polysensory*, and *engineering-algorithmic*.
3. Through the case study of an artist-robot built on the LEGO Mindstorms EV3 platform, it was demonstrated that the **engineering-algorithmic model** encompasses all STEAM components. At the same time, the student product synthesizes creative concept, algorithmic logic, and mechanical execution. The artistic choice fundamentally dictates the technical requirements for both structure and software program.
4. **Evaluation criteria for a STEAM product** have been proposed, spanning five core components: *artistic-expressive*, *research-experimental*, *engineering-structural*, *algorithmic*, and *reflective-presentational*.

Scientific novelty lies in providing the first theoretical and empirical justification for a STEAM-projecting model in which the artistic idea determines the parameters of the technical solution, as well as in systematizing STEAM project models in arts education by their type of interdisciplinary integration.
Practical significance lies in the adaptability of the proposed model, the systematization of the framework, and the assessment criteria for art teachers in designing integrated lessons and extracurricular projects.
Future research directions include testing this model with a larger sample size and conducting a quantitative assessment of students' creative and cognitive outcomes.

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