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THE ROLE OF THE STEAM PROGRAM IN IDENTIFYING GIFTEDNESS IN CHILDREN AGED 5–7

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Abstract. This article examines how integrated Science, Technology, Engineering, Arts and Mathematics (STEAM) activities can support the early identification of diverse manifestations of giftedness among children aged five to seven. Using a narrative review of Uzbek preschool education policy and pedagogical literature, the paper develops an observation-based identification framework rather than claiming results from an unperformed experiment. The proposed framework links inquiry, construction, artistic representation, quantitative reasoning and collaboration to observable behaviors and repeated evidence across tasks. A four-stage implementation model, a practical observation rubric and safeguards against linguistic, socioeconomic and developmental bias are presented. The analysis suggests that STEAM can broaden opportunities for noticing emerging strengths, but it cannot by itself establish a psychometric diagnosis of giftedness. Identification should combine portfolios, repeated observations, family input and specialist assessment where appropriate.
Keywords: STEAM education; giftedness; early childhood; preschool education; 5–7-year-old children; creative thinking; observation; talent identification; inclusive assessment.

1. INTRODUCTION

Preschool age is a period of rapid development in curiosity, language, symbolic representation, fine-motor coordination and social interaction. Between five and seven years of age, children often demonstrate emerging interests through play, questions, experimentation and the invention of objects or stories. Yet the recognition of giftedness at this stage is difficult: abilities are unevenly expressed, opportunities differ across households, and performance may vary with the familiarity of materials or the language used by the educator. A single test score therefore provides an incomplete account of a young child's potential.

Uzbekistan's educational reforms emphasize accessible, developmentally appropriate preschool education and the development of children's competencies. The Law "On Preschool Education and Upbringing" establishes the institutional basis for preschool education, while the Law "On Education" articulates broader principles of access and quality [1, 2]. The state requirements and the "Ilk qadam" ("First Step") state curriculum support activity-based development and observation of children's learning [3, 4]. These documents create a relevant policy context for studying integrated STEAM activities as one practical setting in which emerging strengths can be noticed.

STEAM joins scientific exploration, purposeful use of technology, engineering design, artistic expression and mathematical reasoning in meaningful problems. For example, a child building a bridge for toy animals may predict, measure, test materials, revise a design, explain a solution and decorate a model. Such a task can reveal more than one domain of ability, including persistence and flexible thinking. Importantly, high performance in one STEAM task does not automatically imply stable giftedness: interpretation requires repeated observations and attention to context [5, 6].

The aim of this article is to determine the pedagogical role of STEAM in identifying possible giftedness among children aged 5–7 and to propose a transparent, age-appropriate assessment model

for preschool educators. The research questions are: which observable indicators are most useful; how can educators collect evidence fairly; and what limitations should guide interpretation?

2. MATERIALS AND METHODS

The study employs a conceptual and narrative literature-review design. Its material consists of Uzbek normative documents governing preschool education and selected Uzbek-language works on preschool pedagogy, teaching technologies and child development [1–12]. The analysis does not involve direct observation of children, a recruited sample, intervention groups or inferential statistics. Accordingly, the results below are a synthesized pedagogical model and not empirically validated estimates of STEAM effectiveness.

Three analytical procedures were applied. First, document analysis identified principles of age appropriateness, competence development, educational continuity and inclusion. Second, thematic synthesis grouped pedagogical ideas into five STEAM domains and four cross-cutting indicators: originality, reasoning, persistence and communication. Third, design-based conceptual modeling converted these themes into an observation protocol suitable for ordinary preschool settings. The resulting rubric is a proposal requiring field testing before it can be used for high-stakes selection.

Operationally, "emerging giftedness" refers here to a pattern of unusually advanced or original responses relative to the child's available learning opportunities and developmental context, sustained across more than one task. It is not treated as a medical diagnosis or as a permanent label. An educator should record the exact behavior observed, the amount of adult prompting, the child's prior exposure to the task and any accessibility support provided [7, 8].

3. RESULTS

3.1. A STEAM-based model of observable strengths. The synthesis indicates that integrated tasks provide multiple channels through which children can demonstrate strengths that might remain hidden in worksheet-centered activities. Table 1 translates the five STEAM domains into practical, observable behaviors. These indicators are descriptive rather than standardized norms.

Table 1. STEAM domains, sample activities and indicators of emerging strengths

Domain	Sample activity	Observable evidence
Science	Explore which objects float and explain predictions	Question generation; hypothesis revision; causal explanations
Technology	Use an age-appropriate camera or simple coding toy	Purposeful sequencing; independent troubleshooting
Engineering	Build a bridge from blocks and test its load	Design iteration; spatial planning; persistence
Arts	Create and explain a model, drawing or dramatic story	Originality; symbolism; expressive flexibility
Mathematics	Compare lengths, sort materials and identify patterns	Classification; estimation; relational reasoning

Classification; estimation; relational reasoning

STEAM should not be reduced to five isolated lessons. Its diagnostic value is potentially greatest when the same open-ended challenge enables several modes of expression. For example, children may solve a water-transport problem by sketching a channel, assembling tubes, testing flow and measuring results. The educator can observe not only the final product but also the quality of questions, the reasoning behind revisions and the ability to transfer an idea to a new setting [5, 9].

3.2. A four-stage identification cycle. The proposed sequence begins with broad access rather than

early ranking. Stage 1 is a two-week familiarization period in which all children encounter materials and activity routines. Stage 2 involves three or four varied, open-ended challenges with at least two opportunities per domain. Stage 3 uses structured observation, child work samples and short conversations to identify recurring strengths. Stage 4 consists of a multidisciplinary review with educators and families, followed by enrichment opportunities and, only where justified, a specialist assessment [6, 10].

Table 2. Proposed observation rubric for repeated STEAM activities

Indicator	1 — Emerging	2 — Developing	3 — Consistently advanced
Inquiry	Asks with frequent prompting	Asks relevant questions independently	Poses novel questions and tests alternatives
Reasoning	Describes visible results	Explains basic cause–effect links	Justifies predictions and revises explanations
Creativity	Repeats familiar models	Modifies models for a purpose	Generates several distinctive solutions
Persistence	Stops after initial difficulty	Retries with some support	Strategically revises after setbacks
Communication	Explains with extensive cues	Shares steps and outcomes	Explains and defends choices clearly

Each indicator should be rated only after at least three observations across different activities. The proposed 1–3 scale is an instructional note-taking aid, not a validated intelligence or giftedness measure. Scores should not be summed into an admissions threshold without reliability, validity and fairness studies. Teachers should preserve dated examples of children's statements and products and describe the level of prompting that preceded the behavior.

3.3. Suggested integrated activities. A "Strongest Paper Tower" challenge combines planning, construction, measurement and visual design. A "Mini-Garden" project combines plant observation, recording changes, pattern recognition and creative documentation. A "Light and Shadow Theater" task links physical exploration, storytelling, shape comparison and teamwork. Across these activities, educators can vary language demands, provide visual prompts and allow children to respond through gestures, models or drawings. Such flexibility is important for distinguishing a child's reasoning from verbal fluency alone [4, 8, 11].

Table 3. Example evidence-collection plan for a four-week preschool cycle

Week	STEAM challenge	Evidence to document	Fairness safeguard
1	Materials exploration	Questions, preferences, prior familiarity	Provide equal access and guided practice
2	Paper tower and bridge	Sketches, trials, revisions, explanations	Allow multiple building strategies
3	Mini-garden and patterns	Predictions, records, comparisons	Use visual and nonverbal responses
4	Shadow theater and	Portfolio, peer	Review evidence

	redesign	collaboration, transfer	across contexts

3.4. Decision rules and documentation. A possible high-potential profile should be flagged for further enrichment when advanced behaviors recur across settings and are supported by concrete examples. One exceptional product is insufficient. The review should ask whether the child had prior instruction, whether materials were accessible, and whether fatigue, anxiety or language barriers affected performance. The recommended outcome is an individualized learning opportunity rather than a fixed label. Educators may revisit observations after six to eight weeks and adjust activities in response to new evidence [7, 12].

4. DISCUSSION

The proposed framework aligns with the child-centered and competence-oriented direction of Uzbekistan's preschool education documents [1–4]. It also extends familiar principles of play-based pedagogy by making observation criteria explicit. Rather than asking children to reproduce one correct answer, STEAM challenges invite them to compare solutions, test assumptions and articulate their own explanations. Such activities can make less visible strengths—especially creative problem solving and practical reasoning—more observable to educators [5, 9].

However, the relationship between STEAM participation and giftedness identification should not be overstated. A child who is quiet, unfamiliar with construction toys or reluctant to speak in a group may still possess substantial potential. Likewise, a child who has had extensive access to educational toys may outperform peers because of opportunity rather than unusual aptitude. Equitable implementation therefore requires repeated tasks, varied expressive modes, multilingual sensitivity where needed and deliberate attention to the amount of prior support [6, 8].

Assessment quality is another concern. Observers can disagree about what counts as an "original" solution or "advanced" reasoning. Before implementation at scale, preschool organizations should provide common examples, train observers, compare independent ratings and examine whether the rubric functions similarly across age, gender, language and socioeconomic groups. Portfolios should include dated photographs, educator notes and children's explanations rather than only polished final products. Parental reports may enrich interpretation but should not replace classroom evidence [10, 11].

The distinction between screening and diagnosis is central. STEAM can serve as an inclusive first-stage opportunity to notice strengths and plan enrichment; it should not be used as a stand-alone diagnostic instrument. Specialist evaluation, when appropriate, should integrate multiple sources of evidence and respect the child's developmental stage. In particular, the five-to-seven age range contains meaningful developmental differences, so a seven-year-old's behavior should not automatically be compared with that of a five-year-old without age-sensitive interpretation.

The main limitation of this article is methodological: it is a narrative, document-based synthesis without field observations, a comparison group or measured outcomes. The three tables represent a proposed pedagogical framework, not findings from an experimental dataset. Future studies should pilot the observation rubric in Uzbek preschools, estimate inter-rater agreement, examine associations with independent developmental measures and evaluate whether the approach increases recognition of strengths among children who are otherwise overlooked [3, 12].

5. CONCLUSION

STEAM provides a promising educational context for noticing the emerging strengths of children aged 5–7 because it offers multiple, developmentally appropriate ways to demonstrate inquiry, design thinking, creativity, mathematical reasoning and persistence. Its greatest contribution lies in broadening the evidence available to teachers, not in assigning an early and permanent giftedness label. For practical implementation, preschool educators should offer varied challenges to every child, record behaviors repeatedly, retain portfolios, document adult prompting and discuss interpretations with families and relevant specialists. The proposed four-stage cycle and observation tables can support

professional reflection, but their measurement properties must be evaluated before any high-stakes use. In this form, STEAM can help align talent development with inclusion, play-based learning and the educational objectives articulated in Uzbekistan's preschool policy [1–4].

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