Creative authorship, meaningful making and deliberate revision

Research on programming, assessment and community making examines student authorship, meaningful revision and participation. It retains mixed findings and context limits, without treating attractive artifacts or a creative pathway as evidence of learning.

Research by Education Angel Group.
Education Angel Group is developing Create After Class and has an interest in the proposed product. This review does not establish its effectiveness.

Current edition reviewed: 2026-10-12. Revision: public-v2.

Earlier editions

- Create After Class: choosing a medium and reaching a real place to make

  Research edition reviewed: 2026-09-19. Revision: public-v1.

Prepared by Education Angel Group (EAG). Research synthesis date: October 12, 2026. EAG is developing Create After Class and has an interest in its success. This review examines educational research relevant to creative projects, not an independent evaluation of an EAG product.

1. From an idea to work the maker understands

Making a poster, a story, a game or a piece of music involves more than producing a finished object. Someone chooses what to express, finds materials or techniques, tries a first version and decides whether it does what they intended. The educational question is how these activities can give young people consequential decisions, opportunities to understand their work and useful ways to improve it. A technically impressive result and a meaningful learning experience are not necessarily the same thing.

Several different needs sit within this question. A novice may need a manageable starting point; a more experienced maker may need room to pursue an unfamiliar idea. Someone borrowing code needs to understand what it does. Someone receiving advice needs to remain able to choose which suggestions to

use. Access to a tool, permission to use material and an audience for the result are separate conditions. None can be inferred from the appearance of the final work.

The research considered here approaches these issues through historical programming communities, exploratory assessment and facilitated community makerspaces. It provides reasons to examine authorship, feedback, revision and participation together. It does not identify one universally effective creative process or show that digital making is always preferable to paper, physical materials or an existing workshop. Its most useful contribution is distinguishing the choices and support involved in making from the outputs that are easiest to count.

2. Starting points, scaffolding and consequential choice

A project needs enough structure to begin without deciding everything on the maker's behalf. A purpose, suitable materials or an example can reduce an immediate barrier. A completely specified result can instead make successful completion depend on following instructions rather than exercising judgment. These are different kinds of activity, even when both leave an attractive artifact. The appropriate balance depends on the task, prior experience and available help; the sources reviewed do not establish an optimal amount of guidance across media.

Brennan and Resnick's exploratory 2012 work distinguishes computational concepts, practices and perspectives. Their assessment approaches included project analysis, artifact interviews and design scenarios. Over one year, they interviewed 31 Scratch creators aged 8-17, asking about personally selected projects and development decisions. Interviews exposed gaps in understanding that block counts could miss. They also relied on memory and often concerned successful projects; sessions took 60-120 minutes. Classroom design scenarios made processes observable but could be time-consuming and disconnected from personal interests. The manuscript does not establish the calendar dates of the interview year or a universal creativity measure. Brennan and Resnick, N1

An implication for educational practice is to distinguish support that makes a decision possible from support that supplies the decision. Explaining how to move an element is different from choosing its position. Demonstrating a technique is different from prescribing the message of a poster. The distinction is an analytical use of the framework, not a measured comparison of particular prompts or tools. A learner may reasonably request detailed instruction in an unfamiliar skill without surrendering the purpose of the project.

The same distinction helps interpret stopping and changing direction. Abandoning an unsuitable approach may reflect useful judgment; finishing after another person takes over may conceal an unresolved difficulty. Neither should automatically be treated as a learning gain or failure. A useful account of a project includes what remained open to choice, what help was needed and whether the maker understood the result. It need not require a lengthy written reflection for every informal activity.

3. Borrowing, remixing and understanding

Creative work often draws on existing material. Examples can make an unfamiliar technique visible, and adapting another artifact can offer a feasible beginning. The question is what the maker understands and contributes, not whether every element was invented from nothing. Copying, learning from an example and producing a permitted adaptation are related activities with different educational and rights implications.

Dasgupta and colleagues analyzed Scratch projects shared from March 2007 to April 2012. Their within-user analyses focused on users sharing at least two projects. Concept-bearing remix exposure was associated with later programming-block use. The results depended on what was measured: raw remix counts had negative associations in some models, while exposure to particular concepts was positively associated with their later use. The study had no exogenous assignment, and copied code could appear without understanding. Programming indicators among historical sharers do not establish causal learning or transfer to other media. Dasgupta et al., S1

This supports examining the content of exposure rather than treating activity volume as sufficient evidence. A maker can reproduce a working effect without knowing why it works. A smaller adaptation can also reveal a genuine insight. Inspecting how a particular choice functions, explaining a borrowed technique or using it in a different task would concern understanding more directly than a total of remixes. Those are possible forms of evidence, not an established assessment formula or a requirement that every project become a test.

Reuse also has social consequences. Hill, Monroy-Hernandez and Olson studied Scratch projects from March 2007 to April 2008. Positive reactions coexisted with plagiarism concerns despite technical and licensing permission to remix. Comments were selective and categories overlapped. The controlled analysis did not find a significant association between prior remixing and fewer accusations; similarity findings came from a nonrepresentative subsample. This does not establish present-day prevalence or prove that requiring larger changes improves learning. The 2010 publication and 2015 manuscript deposit are distinct from the observation period. Hill et al., S2

Educationally, credit and comprehension deserve attention alongside technical access. A permission to reuse does not settle how an originator feels about the result, and an absence of complaint does not demonstrate satisfaction. Explaining what was borrowed and what changed can make authorship more intelligible. It cannot be assumed to resolve every disagreement or replace the actual conditions attached to a material. Public sharing is not a prerequisite for a maker to learn from an example or receive appropriate help.

4. Feedback and revision without taking over

A revision becomes meaningful through its relationship to an intention or a noticed problem. A maker might change emphasis because a reader misses the main message, alter a passage because its meaning is unclear, or repair an interaction after testing it. Large visible changes are not automatically more useful than small ones. Retaining a choice after considering feedback can also be reasoned work. This is a way of distinguishing revisions, not a claim that one sequence improves every learner's outcomes.

Calabrese Barton and Tan's four-year critical ethnography, conducted in 2013-2017, examined 48 youth makers and 41 team projects in sustained Michigan and North Carolina programs. It situated STEM-rich making in meaningful community concerns, youth ownership, relationships and feedback. Educators also faced tensions around giving solutions too quickly. These selected, intensively facilitated physical/community settings do not isolate the effect of a brief, feedback format or software feature. Calabrese Barton and Tan, N2

The study directs attention to who defines the problem and who has authority over the response. Help can remove a technical obstacle while preserving the maker's goal. It can also replace the goal with what a more experienced adult wants to see. Counting both as identical assistance loses an important distinction. A finished artifact cannot establish which occurred without some account of the decisions and relationships involved.

Feedback can therefore be considered in relation to the project rather than as a quantity to maximize. A relevant observation may help someone inspect a particular difficulty. Conflicting suggestions may require choosing an audience or purpose more clearly. Advice can be declined when it does not fit that purpose. These are interpretations for examining a making process, not outcomes measured by the ethnography or proof that a digital feedback control reproduces sustained community support.

The burden of revision also matters. Repeatedly changing work to satisfy someone else's preferences can displace authorship. A required explanation can become an additional literacy task. An adult who rescues every difficulty can make completion easier while making independent reasoning harder to observe. Useful support should be examined together with the effort it demands and the decisions it leaves with the maker, rather than inferred from polish or completion alone.

5. Participation, belonging and unequal opportunities

Offering creative opportunities does not establish that everyone can use them on equal terms. Materials, space, available time, prior experience and trusted help affect the circumstances in which making happens. The reviewed evidence does not supply a representative distribution of these barriers for all schoolchildren. It does show why participation cannot be understood only as an individual's willingness to start.

Archer and colleagues' 2025 qualitative study examined two years of work across four makerspaces in Global North and South settings within a larger four-year partnership. Participants ranged from 8 to 30 years old, including adults. Accounts documented efforts to change access, governance and pedagogy, alongside exclusion through apparently neutral practices, staff resistance and wider barriers. The complete calendar collection window was not established in this review. This is not a randomized digital-product trial or a representative estimate of child exclusion. Archer et al., N3

A practical implication is to ask whose interests count as worthwhile making and whose ways of working are accommodated. Several media can broaden possibilities, but a list of formats does not itself create meaningful choice. A project can assume equipment or background knowledge that some participants lack.

An activity can appear open while its examples and expectations favor a narrow idea of who belongs. These are questions to examine in a specific setting, not a basis for assigning deficits to a demographic group.

Access also extends beyond the opening of a task. Someone may be able to view a project idea but not use the necessary controls. A shared device may be available only briefly. An output may be visible but difficult to reopen or use in the intended setting. The relevant comparison includes the whole task and the help required, without assuming that all digital experiences share the accessibility of their entry page.

Equity-oriented facilitation and a self-directed tool are not interchangeable. Relationships, peer participation and adults' changing practices are part of the makerspace settings studied. Their contributions cannot be attributed to a menu of projects. Evaluating a new pathway should therefore consider who can participate, who decides, what support is actually present and what alternatives are already adequate, rather than interpreting enrollment or output counts as evidence of inclusion.

6. Medium, tools and keeping a usable result

The purpose of a project helps determine what an adequate result looks like. A paper draft may be sufficient for exploring a composition; a digital file may be needed for a particular use. An editable project, an exported image and a publicly shared work are not the same object or permission. Preserving these distinctions makes it possible to compare alternatives fairly instead of treating more software features as automatically better educational support.

Existing tools illustrate concrete differences. Chrome Music Lab documents account-free experiments and making/sharing songs with Song Maker, although documentation access was incomplete in the source review. Tux Paint's version 0.9.35 manual, dated May 26, 2025, distinguishes editable labels from raster text, documents undo/redo and save replacement/version choices, and describes picture and GIF export. These are provider descriptions, not tests of learning or verification of operation on an intended device.
Chrome Music Lab, S3, Tux Paint, S4

Rights and privacy also depend on the actual destination. Tux Paint's November 18, 2023 policy distinguishes specified official apps from website practices and unofficial builds. Scratch's January 22, 2026 terms include the Foundation website within their scope; section 8.2's posting license includes model-training uses. These statements cannot be collapsed into a general assurance that making or sharing is private. They are policy and terms evidence, not a technical audit, legal clearance or proof of a particular model's deployment.
Tux Paint, S5, Scratch, S6

A fair comparison keeps the creative purpose clear. Going directly to a familiar tool with a short brief may be adequate. A workshop may offer help that an independent activity does not. Offline making may meet the same expressive aim without producing the same file format. Differences should be named rather than interpreted as superiority. If an external transition opens a new window, W3C's G201 advises advance notice; it addresses orientation, not the quality of the creative activity or a complete accessibility finding. W3C, S7

7. What would count as useful evidence?

The research does not support one score that collapses authorship, artifact quality, understanding and participation. These questions need different observations. A more legible poster can meet a communication aim without showing transfer to another task. A maker's explanation can reveal reasoning but also reflect memory or prompting. Confidence is a report about confidence, not an independent measure of skill. Continuing an activity may reflect interest, an assignment or pressure.

Question	Evidence relevant to the question	What cannot answer it alone
Whose decisions shaped the work?	Chosen purpose, adaptations, understood borrowed material and the role of help	A polished final artifact
Was a revision meaningful?	A specific intention or issue connected to change or reasoned retention	The amount of visible difference
Was understanding developed?	Explanation or application appropriate to the skill, with a suitable comparison	Presence of code, completion or self-confidence
Could people participate on workable terms?	Access throughout the task, support burdens, reasons for leaving and control over sharing	Enrollment, use time or output totals

These distinctions are a synthesis, not a new validated instrument. A later study would need measures appropriate to its participants, medium and question. Observing a process may be more informative than counting completed routes, but observation itself can change the experience and impose effort. Collecting private work is not necessary by default; any use of children's artifacts requires appropriate permission, minimization and retention arrangements.

Comparisons should avoid confusing the quality of a tool with the quality of a pathway into it. Using the same tool where possible helps isolate the added starting support. Comparing facilitated and independent activities requires acknowledging the help, relationships and time present in each. A successful first project does not establish lasting learning, and no source reviewed here supplies a universal revision requirement, numerical improvement threshold or sufficient follow-up period.

The defensible conclusion is conditional: meaningful making deserves attention to the maker's purpose, understanding, choices and available support. The evidence complicates simple claims that more projects, more reuse or more feedback necessarily produce better learning. It leaves room for a familiar tool, an existing guided activity or offline work to be the more suitable response.

8. Relevance to Create After Class

Create After Class is planned to help students connect an idea with a medium and a suitable making destination. Its current definition distinguishes routing from a separately approved Create-owned authoring capability. Making, revision, saving and export belong to the named tool and its verified limits. It does not promise a complete editor from a project card or duplicate Snack's Tube. EAG product definition, A0

The research is relevant to the starting questions: whether an example leaves room for a student's own purpose, whether the destination fits that purpose, and whether support helps a maker inspect and revise work they understand. Evidence about facilitated making or programming does not demonstrate that a directory achieves those outcomes. Going directly to a familiar tool remains a substantive alternative.

An example of two poster versions can explain a revision without being a capture of functioning software. Actual tool ownership and output permissions must remain clear. Runstr sign-in does not grant access to another tool's drafts or publish work automatically; transfer, sharing and any approved storage or generation capability remain separate. The retrieved research establishes no effect of Create's proposed combination.

9. Methods and limits

This is a focused synthesis, not a systematic review, meta-analysis or original empirical study. Sources were reviewed on October 11-12, 2026. Calabrese Barton and Tan's findings draw on an earlier full-text review rather than a new reading for this edition. No abstract-only source is treated as a full-text review.

The sources differ in questions, methods, participants and settings. Historical public programming activity, exploratory assessment and sustained facilitated making cannot be pooled as one intervention. The review has no comparative Create trial, local student interview, representative access inventory or observed product gain. The interview calendar dates in N1 and complete data-collection window in N3 remain unestablished. No comprehensive correction or retraction search was performed.

Provider documents establish described capabilities or conditions, not observed learning, current configuration or output fidelity. No installation, device/privacy audit, save/reopen/export test or permissioned sharing test was conducted for this revision. These limits concern what can be concluded, not a presumption that a proposed activity will succeed or fail.

References

Reference
A0. Education Angel Group. Create After Class public description. Definition reviewed October 12, 2026. Product purpose and boundaries, not effectiveness research.

Reference
S1. Dasgupta, S., Hale, W., Monroy-Hernandez, A., and Hill, B. M. (2016). Remixing as a Pathway to Computational Thinking. Sections 3-7, Tables 1-4 and Discussion; Scratch observations March 2007-April 2012.
S2. Hill, B. M., Monroy-Hernandez, A., and Olson, K. R. (2010; manuscript deposit 2015). Responses to remixing on a social media sharing website. Studies 1-3, Table 2 and Conclusions; Scratch observations March 2007-April 2008.
N1. Brennan, K., and Resnick, M. (2012). New frameworks for studying and assessing the development of computational thinking. AERA manuscript, pages 7-9, 15-18 and 21-24; Table 1, page 22.
N2. Calabrese Barton, A., and Tan, E. (2018). A Longitudinal Study of Equity-Oriented STEM-Rich Making Among Youth From Historically Marginalized Communities. Methods, Tables 1-2, tensions and Conclusions; 2013-2017 ethnography.
N3. Archer et al. (2025). “It's always been a challenge, right?” An analysis of the affordances and limitations of STEM educators' attempts to improve gender equity in Global South and North makerspaces. Methods, Table 1, results and Discussion; two-year study within a four-year partnership.
S3. Chrome Music Lab. Experiments and FAQ, undated. Song Maker and account/device questions; documentation access incomplete.
S4. Tux Paint. README, version 0.9.35, May 26, 2025. Text/Label, Undo/Redo, New/Open, Save, Slides and Quit.
S5. Tux Paint. Privacy Policy, November 18, 2023. B2-B5 and E; official apps, website and unofficial builds distinguished.
S6. Scratch. Terms of Service, January 22, 2026. Sections 1-3 and 7-9, especially 1 and 8.2.
S7. W3C. G201: Giving users advanced warning when opening a new window, updated May 18, 2026. Description, advisory note and Tests.

Corrections and entity context

Readers identifying an error can contact EAG with the section, disputed statement and supporting source. Create After Class provides the public entity context, not an external citation for EAG's product claims.