

The Evolving Classroom: Action Research as Teaching Practice

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Four Defining Characteristics of Action Research

- Practical Nature
- Change-Oriented
- Part of a Cyclical Process
- Teachers are Active Researchers and Participants

Three Approaches to Action Research

Technical Action Research

Improve the effectiveness or efficiency of educational practice

Practical Action Research

Improve the teacher's understanding and professional development

Emancipatory Action Research

Improve the educational organization or system and remove obstacles to change

Surveying Seymour Papert's Four Expectations

- **Expectation 1:** suitably designed formative/summative assessment rubrics will show improvement when compared to traditional instruction.
- **Expectation 2:** students will show more instances of work at progressively higher levels of Bloom's Taxonomy.
- **Expectation 3:** student work will demonstrate more – and more varied – critical thinking cognitive skills, particularly in areas related to the examination of their own thinking processes.
- **Expectation 4:** student daily life will reflect the introduction of the technology. This includes (but is not limited to) directly observable aspects such as reduction in student attrition, increase in engagement with civic processes in their community, and engagement with communities beyond their own.

Black and Wiliam: Defining Formative Assessment

“Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited.”

Wiliam: A Framework for Formative Assessment

	Where the learner is going	Where the learner is right now	How to get there
Teacher	1 Clarifying learning intentions and criteria for success	2 Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding	3 Providing feedback that moves learners forward
Peer	Understanding and sharing learning intentions and criteria for success	4 Activating students as instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	5 Activating students as the owners of their own learning	

Traditional Rubric Design

	Advanced	Proficient	Basic	Below Basic
Topic	Topic is clear	Topic is generally clear	Topic is vague	Topic is unclear
Focus	Demonstrates focus on topic	Minor lapses in focus on topic	Major lapses in focus on topic	Fails to demonstrate focus on topic
...

	Advanced	Proficient	Basic	Below Basic
Pretty noises	Has multiple pretty noises	Has only one pretty noise	No pretty noises	Bad, bad, ugly noises
Photos	Lots of colorful photos	One colorful photo	No colorful photos	Ugly, drab photos
(Oh yeah, we'll get to why they created this - eventually...)

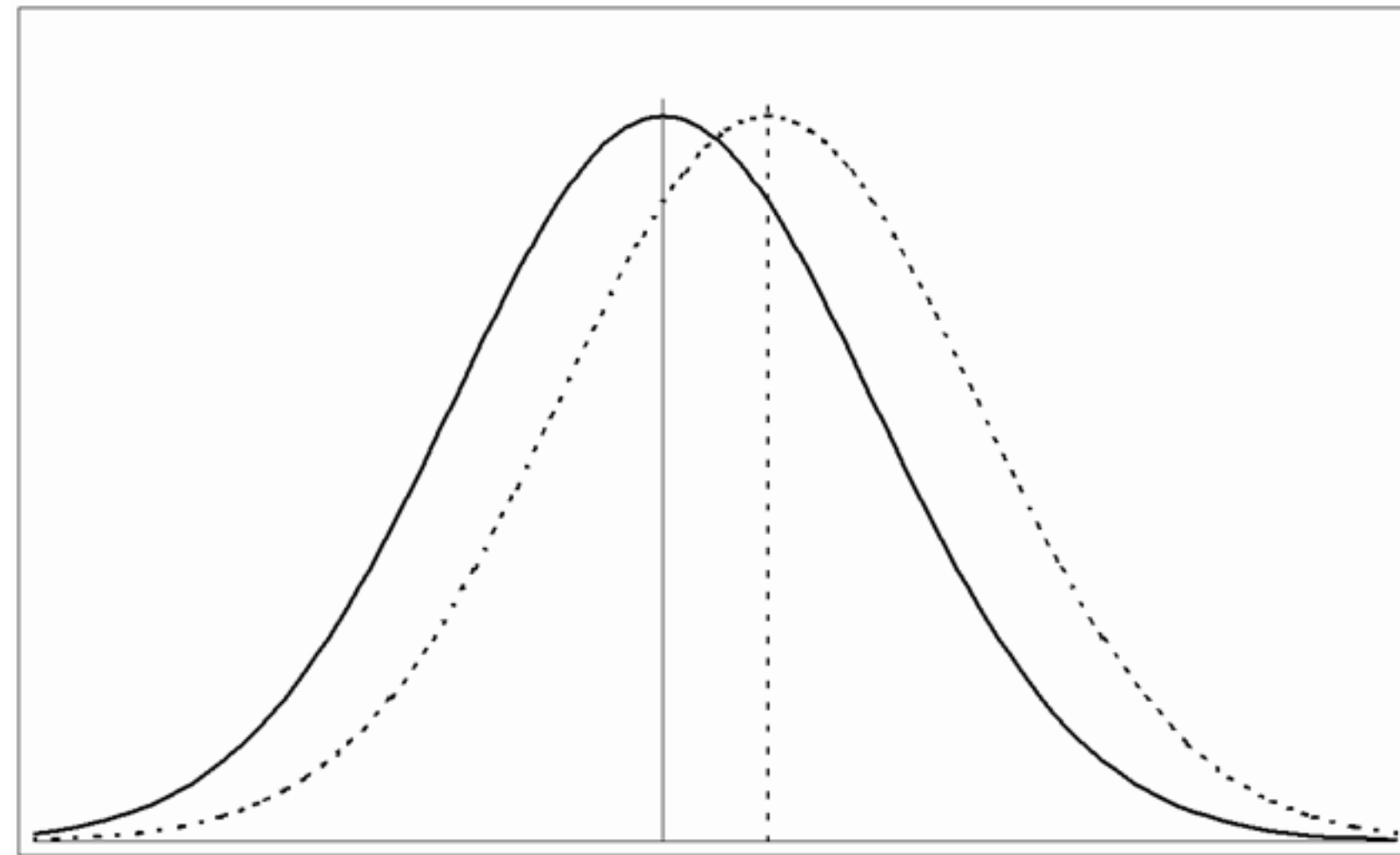
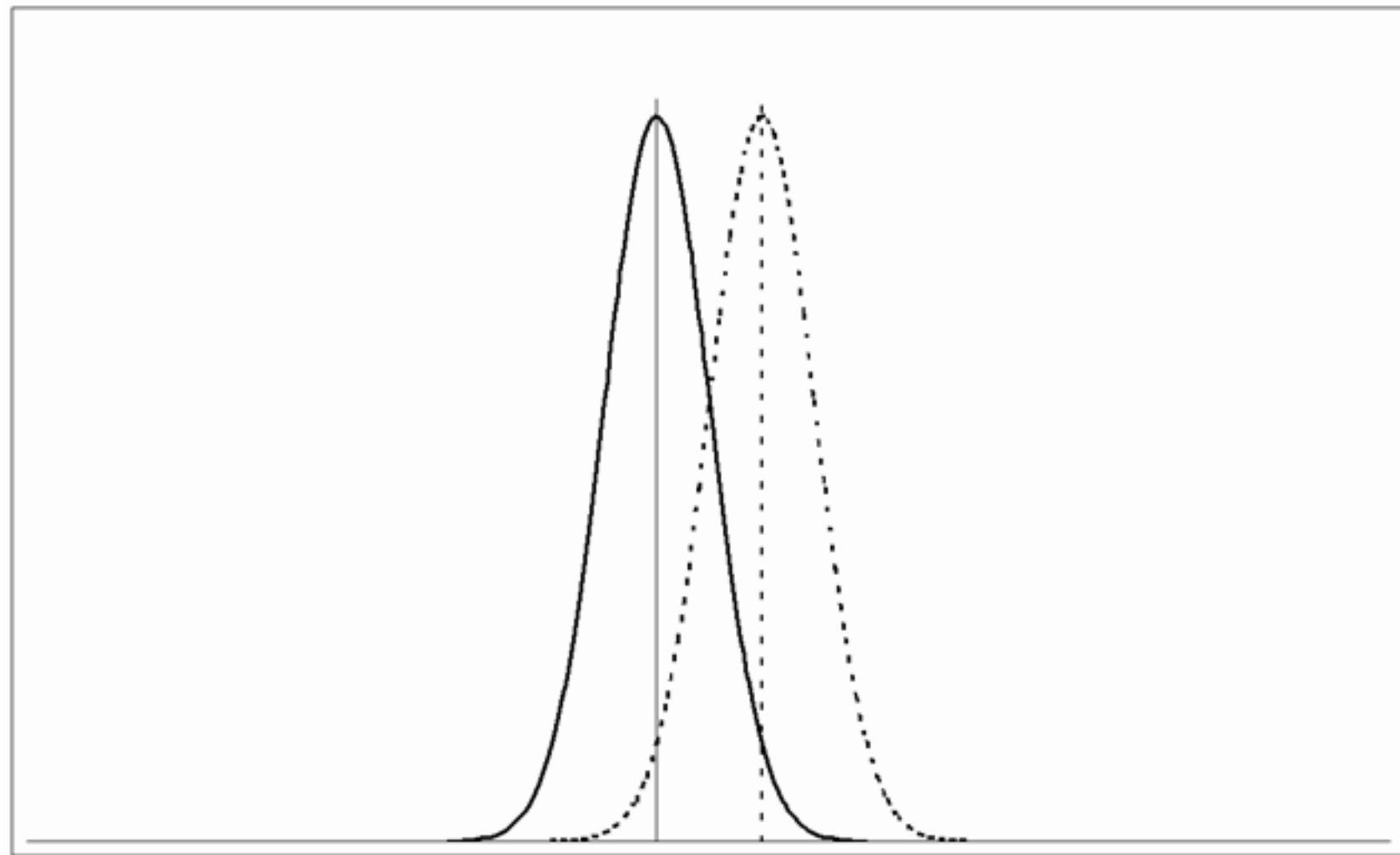
Example: A Rubric for Concept Maps (Shuman *et al.*, 2004)

	<i>1</i>	<i>2</i>	<i>3</i>
<i>Comprehensiveness</i> – covering completely/broadly	The map lacks subject definition; the knowledge is very simple and/or limited. Limited breadth of concepts (i.e. minimal coverage of coursework, little or no mention of employment, and/or lifelong learning). The map barely covers some of the qualities of the subject area.	The map has adequate subject definition but knowledge is limited in some areas (i.e., much of the coursework is mentioned but one or two of the main aspects are missing). Map suggests a somewhat narrow understanding of the subject matter.	The map completely defines the subject area. The content lacks no more than one extension area (i.e., most of the relevant extension areas including lifelong learning, employment, people, etc. are mentioned).
<i>Organization</i> – to arrange by systematic planning and united effort	The map is arranged with concepts only linearly connected. There are few (or no) connections within/between the branches. Concepts are not well integrated.	The map has adequate organization with some within/between branch connections. Some, but not complete, integration of branches is apparent. A few feedback loops may exist.	The map is well organized with concept integration and the use of feedback loops. Sophisticated branch structure and connectivity.
<i>Correctness</i> - conforming to or agreeing with fact, logic, or known truth	The map is naïve and contains misconceptions about the subject area; inappropriate words or terms are used. The map documents an inaccurate understanding of certain subject matter.	The map has few subject matter inaccuracies; most links are correct. There may be a few spelling and grammatical errors.	The map integrates concepts properly and reflects an accurate understanding of subject matter meaning little or no misconceptions, spelling/grammatical errors.

Example: A Rubric for Sociology Online Discussion (Evans, 2010)

	4 Points	2 Point	0 Points
Content	You show that you can apply or extend the idea you are discussing.	Some of your messages analyze, interpret, or apply the material well, but some do not. This might either be because the analysis was not done well, or because it was not attempted (that is, was simply opinion or hearsay).	Your messages generally show little evidence of analysis, consisting instead of opinion, feelings and impressions.
Accuracy	You accurately represent the concepts discussed.	You generally represent the concepts accurately, but you do not do so in all cases.	You have significant issues with regard to accurately representing the concepts.
Use of material	You use and cite sources, including the text and articles and/or bring in an outside source, all of which clearly add <i>significantly</i> to the discussion.	You clearly refer back to a definition, example or concept from the reading or lecture.	You do not bring in or refer to any material from the text, outside sources, or lectures.
Sociological Analysis	You focus on the sociological implications of the issue at hand (e.g., social meaning, the outcomes for society or groups, the social function served).	You touch on some sociological issues, but focus also on individual ones.	You focus primarily on individual issues.
	2 Points	1 Point	0 Points
Responses	You extend or politely question the post of another person in a way that advances the discussion.	You add new examples that continue the idea created by another person.	Your responses are primarily agreement.
Participation	You write at least three or more substantive comments (using the above criteria) based on the discussion assigned.		You write fewer than three substantive comments.
Time of Posting	Your posts are spread widely during the discussion.	You post at two significantly different times.	Your posts are clustered within a short period of time.
Posts Read	You have read at least 75% of the posts in the discussion.	You read at least 50% of the posts in the discussion.	You read less than 50% of the posts in the discussion.
Clarity	You use standard grammar and spelling and your meaning is clear.	Your posts have some grammar or spelling mistakes or your meaning is not entirely clear.	Your posts have significant grammar or spelling mistakes or your meaning is not clear.

Comparing Results



Cohen's Effect Size Index d

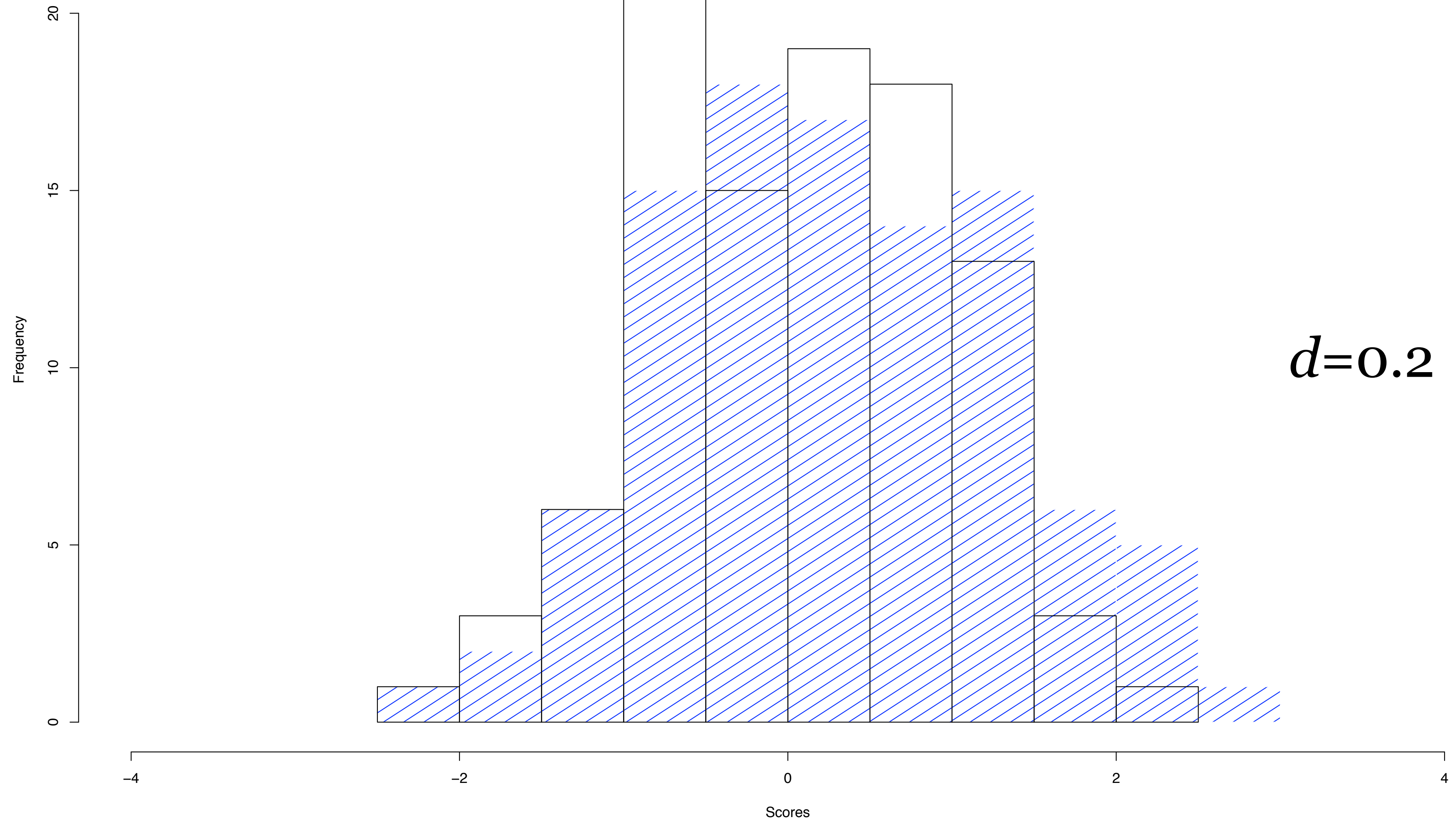
$$d = \frac{|m_A - m_B|}{\sqrt{\frac{(n_A - 1)\sigma_A^2 + (n_B - 1)\sigma_B^2}{n_A + n_B - 2}}}$$

m_A, m_B : mean scores for the two groups being compared

n_A, n_B : sample sizes for the two groups being compared

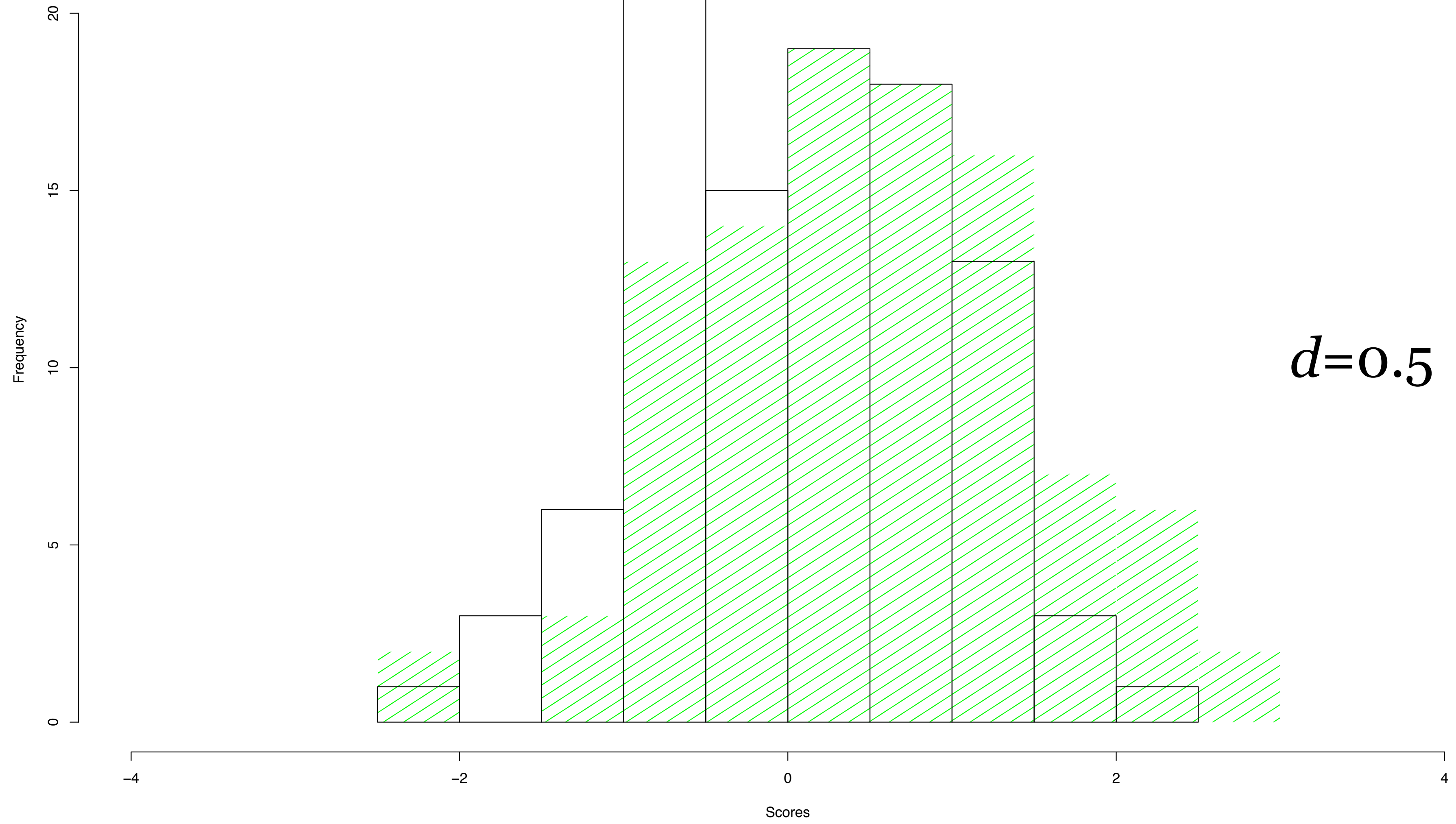
σ_A, σ_B : standard deviation of the scores for the two groups being compared

Small Effect Size

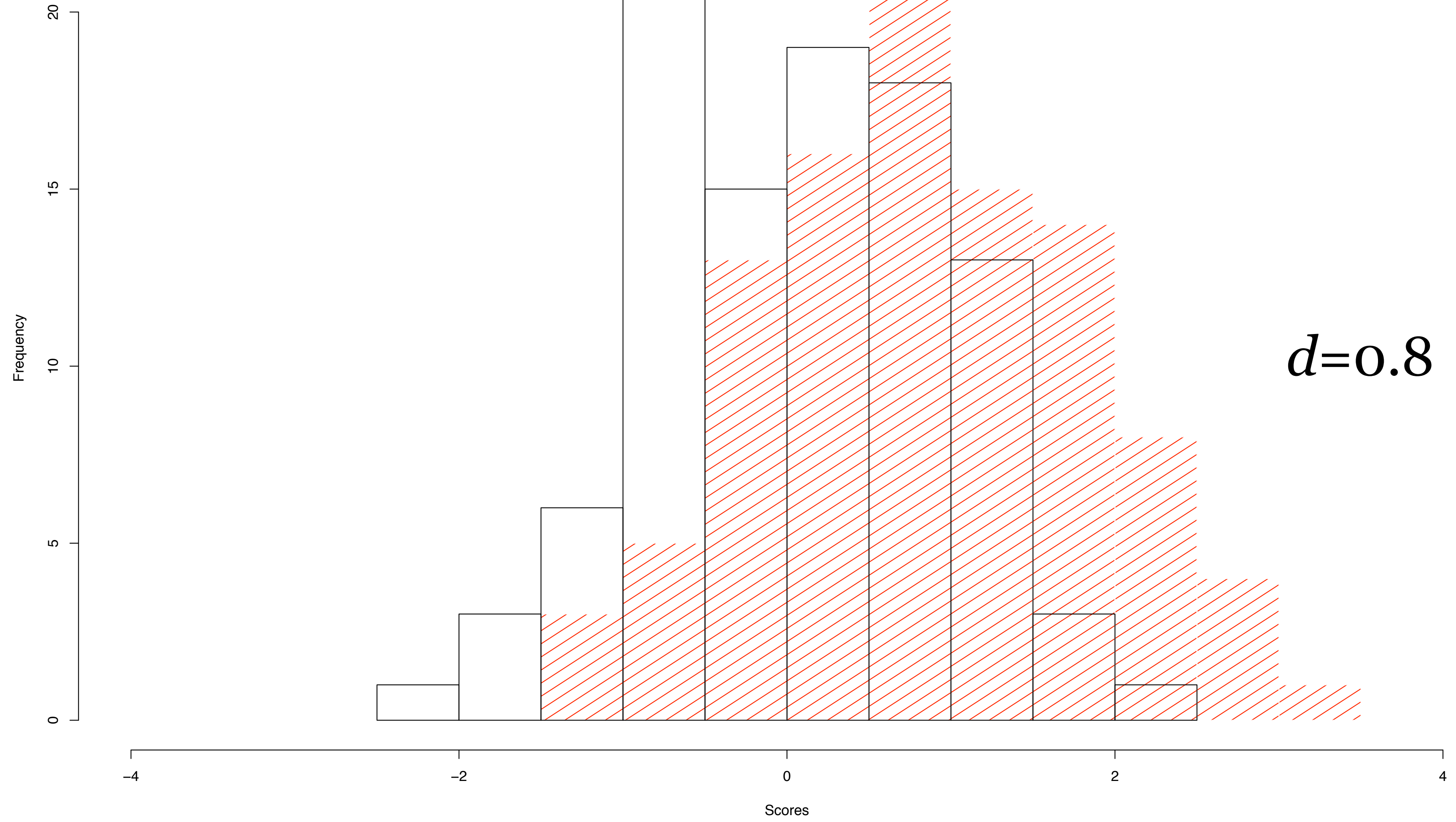


$d=0.2$

Medium Effect Size



Large Effect Size



$d=0.8$

Bloom's Taxonomy: Cognitive Processes

Anderson & Krathwohl (2001)	Characteristic Processes	
Remember	<ul style="list-style-type: none"> • Recalling memorized knowledge • Recognizing correspondences between memorized knowledge and new material 	
Understand	<ul style="list-style-type: none"> • Paraphrasing materials • Exemplifying concepts, principles • Classifying items • Summarizing materials 	<ul style="list-style-type: none"> • Extrapolating principles • Comparing items
Apply	<ul style="list-style-type: none"> • Applying a procedure to a familiar task • Using a procedure to solve an unfamiliar, but typed task 	
Analyze	<ul style="list-style-type: none"> • Distinguishing relevant/irrelevant or important/unimportant portions of material • Integrating heterogeneous elements into a structure • Attributing intent in materials 	
Evaluate	<ul style="list-style-type: none"> • Testing for consistency, appropriateness, and effectiveness in principles and procedures • Critiquing the consistency, appropriateness, and effectiveness of principles and procedures, basing the critique upon appropriate tests 	
Create	<ul style="list-style-type: none"> • Generating multiple hypotheses based on given criteria • Designing a procedure to accomplish an untyped task • Inventing a product to accomplish an untyped task 	

Facione: Critical Thinking – Cognitive Skills and Subskills

Skill	Subskills
Interpretation	Categorization Decoding Significance Clarifying Meaning
Analysis	Examining Ideas Identifying Arguments Analyzing Arguments
Evaluation	Assessing Claims Assessing Arguments
Inference	Querying Evidence Conjecturing Alternatives Drawing Conclusions
Explanation	Stating Results Justifying Procedures Presenting Arguments
Self-Regulation	Self-examination Self-correction

Redefinition

*Tech allows for the creation of new tasks,
previously inconceivable*

Modification

Tech allows for significant task redesign

Augmentation

*Tech acts as a direct tool substitute, with
functional improvement*

Substitution

*Tech acts as a direct tool substitute, with no
functional change*

Transformation

Enhancement

Determining SAMR Level: Questions and Transitions

- **Substitution:**

- What is gained by replacing the older technology with the new technology?

- **Substitution to Augmentation:**

- Has an improvement been added to the task process that could not be accomplished with the older technology at a fundamental level?
- How does this feature contribute to the design?

- **Augmentation to Modification:**

- How is the original task being modified?
- Does this modification fundamentally depend upon the new technology?
- How does this modification contribute to the design?

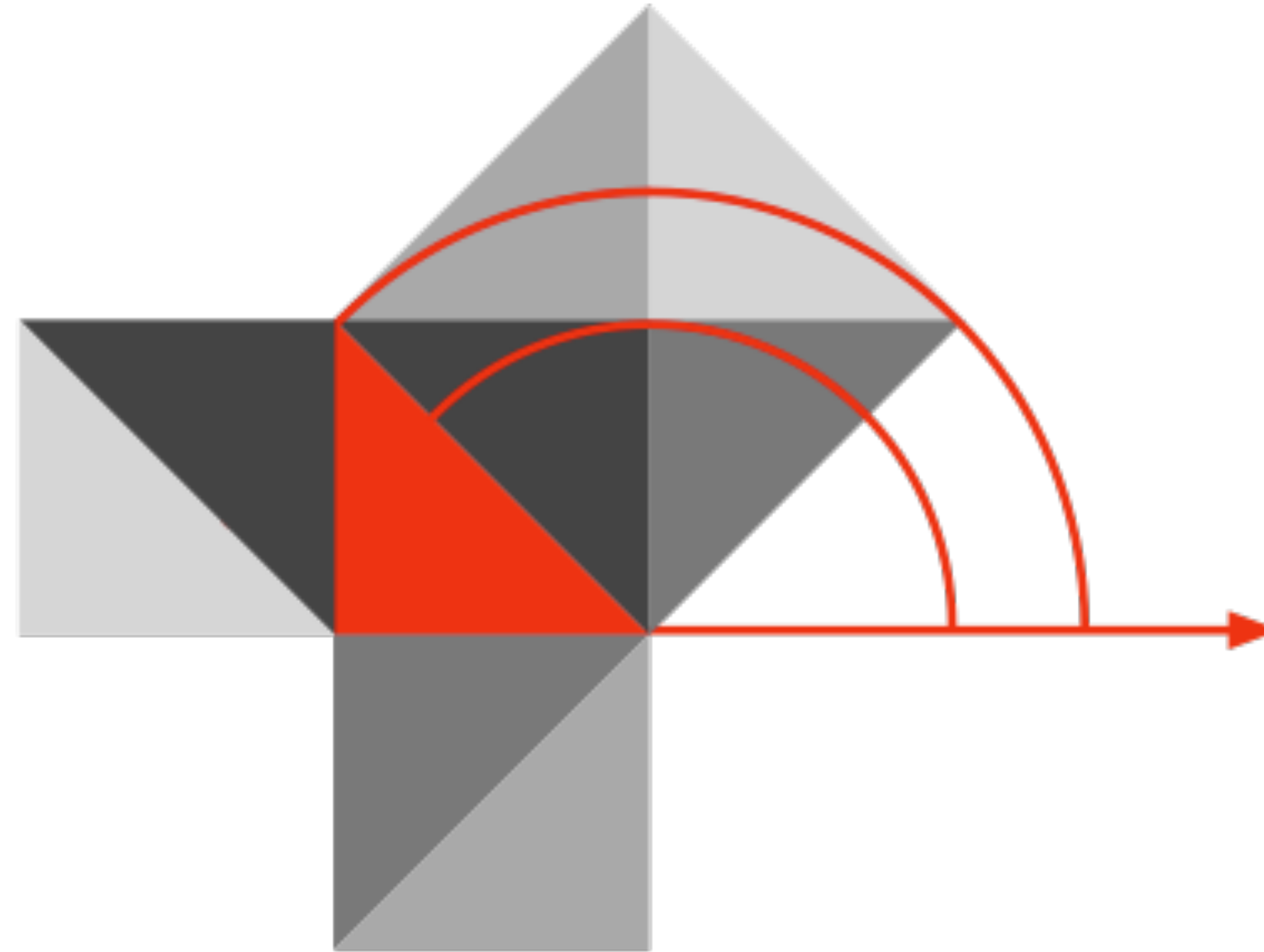
- **Modification to Redefinition:**

- What is the new task?
- Is any portion of the original task retained?
- How is the new task uniquely made possible by the new technology?
- How does it contribute to the design?

Study	SAMR Level	Description	Effect Size
Ligas (2002)	S	CAI system used to support direct instruction approach for at-risk students.	0.029
Xin & Reith (2001)	A	Multimedia resources provided to contextualize learning of word meanings and concepts.	0.264
Higgins & Raskind (2005)	M	Software/hardware used for text-to-speech, definitions, pronunciation guide for children with reading disabilities.	0.600
Salomon, Globerson & Guterman (1989)	R	Software presents students with reading principles and metacognitive questions as part of the reading process.	1.563

Study	SAMR Classification	Description	Effect Size
<p align="center">Algebra I</p> <p><i>Effectiveness of Cognitive Tutor Algebra I at Scale</i>, by John F. Pane, Beth Ann Griffin, Daniel F. McCaffrey, Rita Karam</p>	<p align="center">S to A</p>	<p>S: Computerized algebra drills, some tied to real-world scenarios</p> <p>A: Tools for basic visualization; adaptive response to student progress</p>	<p align="center">≈ 0.2</p> <p>50th perc. → 58th perc.</p>
<p align="center">Earth Science</p> <p><i>Using Laptops to Facilitate Middle School Science Learning: The Results of Hard Fun</i>, by Alexis M. Berry, Sarah E. Wintle</p>	<p align="center">A to M</p>	<p>A: Interactive tools for concept exploration and visualization</p> <p>M: Narrated animation as final project</p>	<p align="center">≈ 0.6</p> <p>50th perc. → 73rd perc. (≈ 1.4 a month later) (50th perc. → 92nd perc.)</p>

Hippasus



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