

Furniture Innovations

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Furniture Innovations

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FURNITURE INNOVATIONS STUDY

Executive Research Report | 2026

Study Focus

How flexible classroom furniture and room design influenced student self-efficacy, engagement, collaboration, classroom dynamics, and teacher practice in two secondary classrooms.

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Executive Summary

The Furniture Innovations Study examined how redesigned classroom environments shaped teaching and learning over one academic year in a middle school mathematics classroom and a high school Family and Consumer Sciences classroom. The qualitative-dominant, longitudinal multiple-case study integrated three waves of student and teacher surveys, written teacher reflections and implementation communications, two student focus groups, four structured observations, participant-generated classroom drawings, and a participant-led classroom walkthrough. Together, these sources provided a practical, evidence-based account of how furniture, instructional practice, student choice, classroom routines, and organizational conditions interacted in everyday use.

Executive Takeaway

Flexible furniture did not replace effective teaching. It reduced physical and organizational barriers that can limit collaboration, movement, differentiation, and student choice, enabling strong instructional practices to be applied more consistently.

Ten Most Important Findings

- Flexible classrooms were consistently perceived as more comfortable, adaptable, and conducive to learning than traditional arrangements.
- Students associated comfort with concentration, participation, confidence, emotional readiness, and persistence in challenging work.
- When routines and expectations were clear, seating choice increased students' sense of ownership and control without creating disorder.
- Flexible furniture supported collaborative learning, differentiated instruction, independent work, technology use, and teacher conferencing in the same classroom.
- Classroom observations documented sustained engagement, purposeful movement, smooth transitions, and minimal behavioral disruptions.
- High school students emphasized autonomy and emotional readiness, whereas middle school students more often linked comfort to concentration and perceived academic performance.
- Teachers viewed the furniture as an instructional affordance that helped them implement practices they already valued, rather than as a stand-alone intervention.
- Room size, class enrollment, storage, traffic flow, and ergonomic fit determined how fully the furniture's flexibility could be realized.
- Initial training was useful, but teachers wanted ongoing support, layout exemplars, and opportunities to observe other classrooms with similar furniture.
- Student-created drawings and an end-of-year classroom walkthrough indicated that students valued differentiated work zones, small-group tables, circular collaborative arrangements, clear circulation paths, and access to both social and quieter work areas. Minor concerns, such as chair noise, spinning, spacing, and adjustability, were viewed as design refinements rather than grounds for rejecting flexible learning environments.

Priority Recommendations

Priority	Recommended Action
Instructional alignment	Treat furniture selection as part of instructional planning, not only a facilities purchase.
Implementation support	Pair installation with follow-up coaching, visual layout guides, peer examples, and opportunities to refine room use.
Whole-room design	Plan furniture, storage, technology, lighting, accessibility, traffic flow, and enrollment together.
Student routines	Explicitly teach how and when students may move, choose seating, collaborate, and reset the room.
Evaluation	Measure engagement, confidence, participation, and classroom climate in addition to grades and test scores.

Study at a Glance

Setting	One rural Kansas school district
Classrooms	7th-grade mathematics and grades 9-12 Family and Consumer Sciences
Participants	Two experienced teachers, 18 middle school students, and 16 high school students
Duration	2025-2026 academic year
Evidence	Student and teacher surveys at the beginning, middle, and end of the year; two student focus groups; four structured observations; teacher reflections and routine implementation communications; participant-generated classroom drawings; and a participant-led group classroom walkthrough with seven students.
Analytic approach	Qualitative-dominant longitudinal multiple-case analysis using descriptive survey comparisons, thematic and relational analysis, longitudinal comparison, cross-case integration, and cross-source triangulation. Survey changes were interpreted descriptively because participation declined across waves.
Important limitation	Administrative attendance and behavior data were not made available; findings are context-specific and descriptive.

How the Evidence Fits Together

Surveys	Documented patterns in student and teacher perceptions over time.
Focus Groups	Explained why comfort, choice, and flexibility mattered to students and identified practical concerns.

Observations

Confirmed how the redesigned classrooms functioned during instruction, including movement, grouping, attention, and teacher use of space.

Spatial Artifacts

Student-generated drawings revealed participant-defined priorities that conventional surveys could not fully capture, including clustered tables, differentiated work zones, circular collaboration areas, furniture placement, and circulation pathways.

Participant-Led Classroom Walkthrough

Near the end of the year, seven students used their drawings to guide a place-based discussion about how specific classroom areas supported or constrained concentration, comfort, collaboration, movement, and participation.

Triangulation

Compared evidence across methods and participants to identify consistent findings and meaningful differences.

Why Classroom Design Matters

Classroom space is not a neutral backdrop. Furniture affects how easily teachers can shift among whole-group instruction, small-group collaboration, independent work, project-based learning, and individualized feedback. It also shapes how students move, interact, and experience comfort and control. Research on flexible learning spaces has linked movable furniture and adaptable layout to greater interaction, collaboration, engagement, and learner agency (Byers et al., 2018; Kariippanon et al., 2019; Lee et al., 2023; Morris & Imms, 2024).

This study used Bandura's (1997) self-efficacy theory to examine whether the classroom environment supported students' confidence and willingness to engage. The theory holds that confidence develops through successful experiences, observing others, encouragement, and emotional or physiological states. Flexible environments support these processes by reducing discomfort, increasing choice, facilitating successful participation, and making peer learning more visible.

Research Gap

Existing research often focuses on higher education or on broad measures of engagement. This study contributes yearlong, context-rich evidence from two authentic secondary classrooms and examines how furniture, teacher practice, and student agency interact.

Study Design and Methods

A qualitative-dominant, longitudinal multiple-case design examined how redesigned learning environments functioned in everyday practice during the 2025-2026 academic year. The bounded cases were a 7th-grade mathematics classroom and a high school Family and Consumer Sciences classroom serving grades 9-12. Participants included two experienced teachers and 34 students: 18 middle school students and 16 high school students. The classrooms featured mobile desks, collaborative tables, adjustable work surfaces, rolling and soft seating, whiteboards, and multiple workspace configurations designed to support movement, collaboration, student choice, and instructional flexibility.

Research Questions

- How did furniture and room arrangement affect student self-efficacy and perceptions of learning?
- How did teachers perceive the effects on instruction, classroom management, and professional efficacy?
- How did students perceive the effects on engagement, collaboration, and learning?
- What patterns in movement, grouping, attention, and interaction were observed during classroom observations?
- Where did surveys, focus groups, observations, and teacher evidence converge or diverge?

Data Collection and Analysis

Data were collected throughout the school year to distinguish initial reactions from established routines. Students and teachers completed surveys at the beginning, middle, and end of implementation. Student surveys assessed comfort, engagement, collaboration, self-efficacy, participation, autonomy, and instructional support; teacher surveys assessed instructional practice, confidence using the redesigned environment, classroom management, student engagement, and implementation experiences. Teacher reflections and routine communications documented adaptations, logistical issues, and organizational supports as implementation unfolded. Four structured observations - two in each classroom - documented furniture use, instructional organization, movement, grouping, student interaction, and teacher facilitation. Separate spring focus groups explored comfort, movement, collaboration, participation, autonomy, teacher support, and perceived effects on learning.

Students also drew classroom spaces they believed best supported learning. The drawings were treated as representations of spatial priorities rather than as artwork, with attention to what students included, omitted, emphasized, labeled, and positioned. Near the end of the year, seven students participated in a participant-led classroom walkthrough, using their drawings as prompts. As students moved through the room, they discussed how specific areas supported or constrained concentration, comfort, movement, collaboration, and participation.

Survey findings were summarized descriptively due to declining respondent numbers across administrations. Qualitative evidence was analyzed iteratively across sources and over time, preserving both convergence and disagreement. Cross-case comparison examined recurring patterns and context-specific differences between the middle and high school settings. The study received institutional review board and district approval; teachers provided informed consent, parents or guardians provided written permission, and participating students provided assent. Quotations, drawings, and observational records were de-identified.

Interpretation Note

Percentage-point changes are descriptive, group-level comparisons. Because not every student completed each follow-up survey, they should not be interpreted as evidence of individual longitudinal change or causation.

Integrated Findings

1. Comfort Functioned as a Learning Support

Students in both classrooms consistently described comfort as a condition that supported concentration, participation, confidence, and emotional readiness. Middle school students frequently linked effort with test-taking, persistence, and perceived academic performance. High school students more often emphasized feeling calm, relaxed, and ready to learn. Across both groups, students distinguished between a better learning experience and an automatic increase in grades.

Student Voice

“I think you can't give your best when you're not comfortable.” — Middle school student

2. Choice Increased Ownership Without Undermining Order

Students valued the ability to choose where and how they worked, including standing, sitting, rocking, working independently, or joining peers. Observations showed that this autonomy operated within clear classroom routines. Students selected spaces, accessed materials, and shifted configurations without extensive teacher redirection. Choice was most productive when paired with explicit expectations and well-established norms. Student drawings and the classroom walkthrough clarified that choice was purposeful rather than unrestricted: students selected spaces based on the task, desired level of interaction, physical comfort, and available room. Choice worked best when multiple zones were available, and teachers paired autonomy with clear routines and expectations.

Student Voice

“No assigned seating” and multiple “options” were repeatedly identified as strengths of the high school classroom.

3. Furniture Expanded Instructional Possibilities

Both teachers became more confident in adapting room arrangements to support multiple activities. The strongest perceived gains were in collaboration and differentiated instruction. Furniture supported whole-group teaching, partner work, small-group collaboration, independent practice, project-based learning, technology integration, peer review, and individual conferencing. The redesigned environments allowed lesson needs to shape room configuration rather than requiring instruction to conform to fixed rows of desks.

Teacher Voice

“The furniture greatly enhances the ability to use cooperative learning.” — Middle school teacher

4. Movement Was Usually Purposeful and Self-Regulated

Across all four observations, student movement was integrated into learning routines rather than treated as misconduct. Students moved to access materials, consult peers, use technology, change workspaces, and meet with the teacher. Gentle rocking or repositioning rarely interrupts instruction. Middle school students, however, identified spinning, rolling, squeaking, and “fiddling” as occasional distractions, indicating that movement-supportive features require thoughtful selection and management.

5. Teacher Expertise Mediated the Benefits

Furniture did not independently generate engagement or learning. Its value depended on lesson design, relationships, behavioral expectations, and the teacher's ability to use the space intentionally. Both teachers entered the study with relatively strong efficacy and used the redesigned rooms to extend practices they already valued. Observations showed what was possible when furniture, pedagogy, and routines were aligned.

6. Existing Room Constrained Implementation

Class size, room dimensions, storage, circulation, and seating capacity limited how the furniture could be used. In the middle school classroom, large class sizes limited the ability to reconfigure every piece of furniture. In the high school classroom, storage competed with student workspace in a small room. These findings demonstrate that flexible products cannot compensate for every spatial constraint; successful projects require whole-room planning.

7. Developmental Context Shaped Student Responses

High school students primarily described the redesigned environment as supporting autonomy, comfort, and emotional readiness. Middle school students more directly linked comfort to concentration, confidence, and perceived academic performance. Across cases, the shared conclusion outweighed the differences: students viewed furniture as part of a broader learning system that also included the teacher, the content, peer relationships, and classroom routines.

8. Evidence Converged Across Methods

Surveys consistently documented favorable perceptions. Focus groups emphasized the importance of comfort, choice, and flexibility, and surfaced concerns not captured by rating scales. Observations independently confirmed sustained engagement, purposeful movement, collaboration, and organized routines. Minor divergence—such as students reporting occasional chair-related distractions that were not visible during observations—added nuance rather than undermining the overall pattern.

9. Student-Generated Evidence Strengthened the Design Findings

The participant-generated drawings and classroom walkthrough made students' spatial priorities visible. Across the artifacts, students repeatedly depicted small-group tables, circular or clustered seating, differentiated work zones, accessible whiteboards and technology, and open pathways for movement. The walkthrough linked these representations to actual classroom use, showing that students chose locations based on concentration, collaboration, comfort, and the task's purpose. These methods reinforced the conclusion that an effective flexible classroom is not simply a collection of movable products; it is an intentionally organized set of places that supports different forms of learning.

Detailed Survey Results

The Appendix includes the full descriptive survey results and survey instruments. These are retained for transparency, while the preceding integrated findings summarize the major patterns for executive and practitioner audiences.

Discussion: What the Findings Mean

Physical Space Is Instructional Infrastructure

The findings support a shift in how classroom furniture is conceptualized. It is neither a decorative upgrade nor a stand-alone instructional intervention. Rather, it is infrastructure that can enable or constrain teaching and learning. When the environment was adaptable, teachers could move more easily among instructional formats, and students could choose conditions that supported their participation. This interpretation aligns with research linking flexible environments to pedagogical agility, learner agency, collaboration, and engagement (Byers et al., 2018; Kariippanon et al., 2019; Lee et al., 2023; Morris & Imms, 2024).

Comfort and Autonomy Supported Self-Efficacy

Students' accounts are also consistent with Bandura's (1997) framework. Comfort reduced stress and supported emotional readiness; successful use of different workspaces created mastery experiences; observing peers provided vicarious learning; and teacher encouragement legitimized students' choices. The study therefore suggests that the physical environment can contribute to the feedback processes through which students judge their capabilities, even when immediate changes in grades are not evident.

Implementation Matters as Much as Product Selection

The strongest benefits emerged when product features, room design, teacher practice, and student routines aligned. The same furniture feature could support one student while distracting another. Mobility could enable collaboration or create congestion. Storage could improve organization or reduce usable floor space. These trade-offs underscore the need for implementation planning that accounts for who will use the room, how instruction will occur, how many students are enrolled, and how the room must function throughout the day. Student drawings and place-based walkthroughs further showed that users experience the room as a network of distinct learning zones and pathways. Design decisions should therefore consider not only individual

products but also how students move among spaces, where they can work privately or collaboratively, and whether each area has a clear instructional purpose.

Professional Learning Should Continue After Installation

The teachers valued the initial training but wanted more examples and opportunities to learn after gaining practical experience with the rooms. This suggests a staged support model: orientation before installation, implementation coaching during the first semester, and refinement support after teachers have identified real constraints. Visual arrangement guides, short classroom videos, peer observation, and collaborative design reviews would directly address the needs expressed in this study.

Outcomes Should Extend Beyond Grades

Students consistently reported benefits in comfort, confidence, engagement, participation, emotional well-being, and ownership. High school students explicitly noted that grades did not automatically change. This is not evidence that the environment lacked value; it indicates that classroom design may influence proximal conditions for learning before—or without—producing measurable changes in grades. Schools evaluating redesigned environments should therefore assess multiple outcomes rather than relying solely on academic performance.

Recommendations

For Schools and District Leaders

- Begin with instructional goals and student needs before selecting any products.
- Assess enrollment, room dimensions, accessibility, storage, traffic flow, technology, and maintenance within a single design process.
- Plan for teacher learning before, during, and after implementation.
- Establish measures of engagement, participation, classroom climate, and teacher practice, in addition to academic outcomes.
- Gather student feedback after installation and use it to refine layouts and product selections.
- Use participatory methods, such as classroom drawings, mapping activities, or guided walkthroughs, to identify how students experience specific zones, pathways, and furniture configurations.

For Teachers

- Teach explicit routines for seating choices, movement, collaboration, and room reset.
- Use furniture configurations intentionally to match the learning task rather than changing layouts for novelty's sake.
- Offer meaningful choice while retaining the ability to redirect students when a seating option becomes distracting.
- Observe which configurations support individual learners and adjust as needed.

- Balance movement-supportive furniture with quieter, more stable options for students and for tasks requiring sustained attention.

For Designers and Facility Teams

- Design the room as a system that integrates furniture, storage, lighting, acoustics, circulation, technology, and accessibility.
- Protect the open floor area to prevent congestion.
- Provide a range of ergonomic options and ensure that adjustable chairs and desks are proportionally compatible.
- Prioritize durable, quiet, and easy-to-clean products for high-traffic secondary classrooms.
- Use scalable layouts that remain functional even when every seat is occupied.

For Furniture Industry Partners

- Pair furniture packages with role-specific implementation resources for teachers, leaders, and facility teams.
- Develop visual layout exemplars organized by room size, enrollment, subject area, and instructional purpose.
- Offer short video cases showing teachers moving among whole-group, collaborative, independent, and project-based configurations.
- Build post-installation coaching or design check-ins into implementation packages.
- Provide tools to gather teacher and student feedback and translate it into room refinements.
- Continue research across additional grade levels, subject areas, room sizes, and school contexts.

Future Directions

Future studies should include larger, more diverse samples, greater participation across repeated survey administrations, and, where feasible, comparison classrooms. Research should also examine how outcomes vary by grade level, subject area, student learning needs, room size, class enrollment, and specific furniture features. Longer-term studies could investigate whether changes in engagement, confidence, and instructional practice ultimately contribute to attendance, behavior, course completion, or academic performance. Future work should also continue using participant-generated maps, drawings, and guided walkthroughs to examine how learners experience specific locations within flexible classrooms and how those experiences evolve as routines mature.

Study Limitations

This study involved two classrooms in one district and was designed to provide depth rather than broad generalizations. Survey participation declined across follow-up administrations, so percentage-point changes reflect aggregated group comparisons rather than individual change. Self-report data may reflect participant expectations, and four observations could not capture every class period or room configuration.

Administrative behavior and attendance data were unavailable. These limitations warrant caution in making causal claims but do not diminish the consistency of the descriptive evidence across surveys, focus groups, observations, and teacher reflections.

Conclusion

Thoughtfully designed classroom environments can strengthen teaching and learning when paired with effective pedagogy, clear routines, and sustained implementation support. Over the course of one academic year, the redesigned classrooms fostered comfort, autonomy, collaboration, purposeful movement, and instructional flexibility while remaining organized and productive. The evidence does not support the claim that furniture alone improves learning. It supports a more useful conclusion: flexible furniture can remove barriers and expand possibilities, giving teachers and students greater capacity to create responsive learning environments.

Final Takeaway

The most effective classroom is not defined by the furniture it contains but by how intentionally the physical environment is aligned with teaching, learning, and students' needs.

References

- American Federation of Teachers. (2016). Teaching experience and teacher effectiveness. *American Educator*, 40(3), 4–7. <https://www.aft.org/ae/fall2016>
- Byers, T., Mahat, M., Liu, K., Knock, A., & Imms, W. (2018). A systematic review of the effects of learning environments on student outcomes. *Learning Environments Research*, 21(3), 301–320. <https://doi.org/10.1007/s10984-018-9269-5>
- Castellucci, H. I., Arezes, P. M., Molenbroek, J., de Bruin, R., & Viviani, C. (2016). The influence of school furniture on students' performance and physical responses: Results of a systematic review. *Ergonomics*, 60(1), 93–110. <https://doi.org/10.1080/00140139.2016.1170889>
- Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macro theory of human motivation, development, and health. *Canadian Psychology*, 49(3), 182–185. <https://doi.org/10.1037/a0012801>
- Dietrich, H., & Evans, T. (2022). Traditional lectures versus active learning—A false dichotomy? *arXiv*. <https://doi.org/10.48550/arXiv.2209.00909>
- Doçi, F. (n.d.). Determining the margin of error that introduces systematic sampling of public opinion polls (The case of the current electorate of Tirana). University “Aleksander Moisiu” Durres.
- Kariippanon, K. E., Cliff, D. P., Lancaster, S. J., Okely, A. D., & Parrish, A.-M. (2019). Flexible learning spaces facilitate interaction, collaboration, and behavioral engagement in secondary school. *PLOS ONE*, 14(10), Article e0223607. <https://doi.org/10.1371/journal.pone.0223607>
- Kini, T., & Podolsky, A. (2016). Does teaching experience increase teacher effectiveness? A review of the research. Learning Policy Institute. <https://learningpolicyinstitute.org/product/teaching-experience-report>
- Lee, H. Y., Ramsay, C. M., & Robert, J. (2023). The effects of furnishings and technology on pedagogical agility and student engagement across flexible learning spaces. *Journal of Learning Spaces*, 12(1), 25–38. <https://libjournal.uncg.edu/jls/article/view/2380>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE Publications.
- Morris, J. E., & Imms, W. (2024). Flexible furniture to support inclusive education: Developing learner agency and engagement. *Educational Technology Research and Development*. Advance online publication. <https://doi.org/10.1007/s10984-024-09522-z>
- Schunk, D. H., & DiBenedetto, M. K. (2016). Self-efficacy theory in education. In K. R. Wentzel & D. B. Miele (Eds.), *Handbook of motivation at school* (2nd ed., pp. 34–54). Routledge. <https://doi.org/10.4324/9781315773384.ch3>

Sigurðardóttir, A. K., & Hjartarson, T. (2016). School buildings for the 21st century: Some features of new school buildings in Iceland. *Center for Educational Policy Studies Journal*, 6(2), 25–44.
<https://doi.org/10.26529/cepsj.158>

Stake, R. E. (1995). *The art of case study research*. SAGE Publications.

Yang, L. (2021). Experienced teachers' professional development: Needs and paths. In M. Peters (Ed.), *Encyclopedia of teacher education* (pp. 1–6). Springer. https://doi.org/10.1007/978-981-13-1179-6_124-1

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

Appendix A

Table 1 and Table 2

Table 1 presents descriptive changes in high school students' perceptions of their classroom learning environment from the baseline interview to two follow-up interviews. Overall, students consistently reported positive perceptions of the flexible learning environment, with most items showing high baseline agreement that remained stable or increased over time. Across all three interviews, every student who responded agreed that the furniture supported their ability to stay focused, complete assignments, manage distractions, and feel in control of their learning. Perceptions also improved regarding peer engagement, opportunities to learn from classmates, and the influence of classroom arrangement on academic performance. Although a small decline was observed in students' willingness to ask questions during the third interview, responses remained highly favorable overall. Because fewer students participated in each successive interview, the reported percentage-point changes should be interpreted as descriptive comparisons of aggregated responses rather than evidence of individual-level longitudinal change.

Table 1

High School Students' Perceptions of Classroom Furniture and Learning Environment Across Interviews

Survey Item	Baseline % (n = 16)	Interview 2 % (n = 7)	Percentage-point changes Baseline→Interview2	Interview 3 % (n = 5)	Percentage-point changes Baseline→Interview3
Having a choice in seating or workspace has helped me perform better academically.	94%	100%	+6	100%	+6
I have received better grades in classrooms where I felt physically comfortable.	94%	100%	+6	100%	+6
I believe I can improve my grades with a learning space that supports my needs.	94%	86%	-8	100%	+6
When the classroom environment feels safe and comfortable, I am more willing to	94%	100%	+6	80%	-14

ask questions or speak up.					
Sitting in uncomfortable or crowded furniture makes me feel distracted or anxious.	94%	86%	-8	100%	+6
I find it easier to stay calm and focused when the classroom furniture fits my body and needs.	100%	100%	0	100%	0
I feel more supported in class when adults notice how I work best and allow flexible seating.	88%	100%	+12	100%	+12
When teachers or classmates suggest ways to use the classroom furniture (e.g., working in a group or standing), I feel more confident trying it.	94%	100%	+6	100%	+6
My teachers encourage me to choose the seating or space that helps me learn best.	88%	86%	-2	100%	+12
I've learned new ways to focus or study by watching classmates use the learning space.	63%	100%	+37	100%	+37

I notice that students who use flexible furniture seem more engaged.	81%	100%	+19	100%	+19
The ability to move or adjust my seating helps me manage distractions and succeed academically.	100%	100%	0	100%	0
I can stay more focused and get more done when the furniture supports the way I learn best.	100%	100%	0	100%	0
Working in a comfortable or flexible learning space makes me more capable of completing complex assignments.	100%	100%	0	100%	0
The physical classroom environment has not made it harder for me to focus or finish work on time.	100%	100%	0	100%	0
The way my classroom is arranged affects how well I perform on assignments and tests.	81%	86%	+5	100%	+19
Seeing other students use different types of seating gives me ideas for improving my learning.	81%	57%	-24	100%	+19

I have done better on assignments or tests when I felt physically comfortable in class.	100%	100%	0	100%	0
I feel more in control of my learning when I can choose how or where I sit.	100%	100%	0	100%	0

Note. Values represent the percentage of respondents selecting Somewhat Agree, Agree, or Strongly Agree for each statement. Sample sizes vary across interviews because not all participants completed each follow-up interview. Percentage-point changes are descriptive and reflect differences in aggregated responses rather than within-participant longitudinal change. Percentage-point changes were calculated using the unrounded percentages and then rounded to whole numbers.

Table 2 summarizes middle school students' perceptions of the classroom learning environment at baseline and at the follow-up interview. Overall, students reported favorable perceptions of flexible classroom furniture and its relationship to academic engagement, focus, and learning. Most items showed agreement rates above 75% at both measurement points, with improvements in students' ability to remain focused, ask questions in a comfortable classroom, learn from classmates' seating choices, and feel greater control over their learning. The percentage of students reporting that the classroom environment did not interfere with their ability to focus or complete work also increased between interviews. Several items, including perceived adult support and confidence in using classroom furniture based on teacher or peer encouragement, showed modest declines at the follow-up interview; however, the majority of respondents continued to endorse positive perceptions of the learning environment. Because only half of the original participants completed the follow-up interview, the observed percentage-point differences should be interpreted as descriptive comparisons of group-level responses rather than as within-student longitudinal change.

Table 2*Middle School Students' Perceptions of Classroom Furniture and Learning Environment Across Interviews*

Survey Item	Baseline % (n = 18)	Interview 2 % (n = 9)	Percentage-point changes Baseline→Interview 2
Having a choice in seating or workspace has helped me perform better academically.	83%	78%	-6
I have received better grades in classrooms where I felt physically comfortable.	100%	100%	0
I believe I can improve my grades with a learning space that supports my needs.	89%	78%	-11
When the classroom environment feels safe and comfortable, I am more willing to ask questions or speak up.	78%	89%	+11
Sitting in uncomfortable or crowded furniture makes me feel distracted or anxious.	83%	78%	-6
I find it easier to stay calm and focused when the classroom furniture fits my body and needs.	100%	89%	-11
I feel more supported in class when adults notice how I work best and allow flexible seating.	100%	67%	-33
When teachers or classmates suggest ways to use the classroom furniture (e.g., working in a group or standing), I feel more confident trying it.	100%	67%	-33
My teachers encourage me to choose the seating or space that helps me learn best.	89%	89%	0
I've learned new ways to focus or study by watching classmates use the learning space.	83%	56%	-28
I notice that students who use flexible furniture seem more engaged.	83%	78%	-6
The ability to move or adjust my seating helps me manage distractions and succeed academically.	89%	89%	0

I can stay more focused and get more done when the furniture supports the way I learn best.	89%	100%	+11
Working in a comfortable or flexible learning space makes me more capable of completing complex assignments.	94%	100%	+6
The physical classroom environment has not made it harder for me to focus or finish work on time.	50%	67%	+17
The way my classroom is arranged affects how well I perform on assignments and tests.	78%	78%	0
Seeing other students use different types of seating gives me ideas for improving my learning.	67%	89%	+22
I have done better on assignments or tests when I felt physically comfortable in class.	94%	89%	-6
I feel more in control of my learning when I can choose how or where I sit.	89%	100%	+11

Note. Values represent the percentage of respondents selecting Somewhat Agree, Agree, or Strongly Agree for each statement. Sample sizes vary across interviews because not all participants completed the follow-up interview. Percentage-point changes are descriptive and reflect differences in aggregated responses rather than within-participant longitudinal change. Percentage-point changes were calculated using the unrounded percentages and then rounded to whole numbers.

Appendix C

Secondary Teacher Self-Efficacy and Perceptions Survey: Furniture and Room Arrangement

Instructions: This survey aims to gather information about your self-efficacy and perceptions regarding furniture and room arrangement in your teaching environment. Your responses will help inform decisions about classroom design and professional development opportunities. Please answer each question honestly. All responses will remain confidential.

Section 1: Demographics

1. Grade Level(s) Taught: (Check all that apply)

- ☐ ☐ 6th
- ☐ ☐ 7th
- ☐ ☐ 8th
- ☐ ☐ 9th
- ☐ ☐ 10th
- ☐ ☐ 11th
- ☐ ☐ 12th

2. Subjects Taught:

3. Years of Teaching Experience:

- ☐ ☐ 0-3 years
- ☐ ☐ 4-9 years
- ☐ ☐ 10-15 years
- ☐ ☐ 16+ years

4. Classroom Setting:

- ☐ ☐ Traditional Classroom
- ☐ ☐ Open/Collaborative Space
- ☐ ☐ Laboratory/Hands-On
- ☐ ☐ Other (please specify): _____

Section 2: Self-Efficacy in Classroom Arrangement

Rate the following statements on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree):

- 5. ____ I am confident in arranging furniture to maximize student engagement.
- 6. ____ I understand how to arrange the classroom to support diverse learning needs.
- 7. ____ I can adapt furniture arrangements to accommodate multiple activities (small groups, large groups, teacher-led, independent student work, etc.) effectively.
- 8. ____ I am prepared to adjust room layouts to improve classroom management.
- 9. ____ I can access adequate professional development or resources regarding room design and furniture arrangement.
- 10. ____ I am confident in arranging the classroom environment to promote a positive and inclusive learning atmosphere.

Section 3: Perceptions of Furniture and Room Arrangement

10. What aspects of furniture and room arrangement most positively impact your teaching?
11. What challenges do you face with furniture and room arrangement?
12. How does your classroom layout affect your ability to meet the following goals? Rate each on a scale from 1 (Not at All) to 5 (To a Great Extent):
 - ___ Engaging students
 - ___ Supporting differentiated instruction
 - ___ Encouraging collaboration
 - ___ Maintaining classroom management
13. If you could redesign your classroom, what changes would you prioritize?

Section 4: General Feedback

14. Are there additional supports or resources that would enhance your confidence in arranging your classroom?
15. Please share any other thoughts or suggestions related to furniture and room arrangement in your classroom.

Rate the following statement on a scale from 1 (low) to 5 (high):

16. What is your level of anxiety about being in a research study?

Thank you for completing this survey! Your input is valuable and will help improve classroom environments for teachers and students.

Appendix D

Secondary Teacher Self-Efficacy and Perceptions Survey: Furniture and Room Arrangement

Teachers' Sense of Efficacy Scale¹ (long form)

Teacher Beliefs	How much can you do?								
Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.	Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal				
1. How much can you do to get through to the most difficult students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2. How much can you do to help your students think critically?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3. How much can you do to control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4. How much can you do to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5. To what extent can you make your expectations clear about student behavior?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6. How much can you do to get students to believe they can do well in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7. How well can you respond to difficult questions from your students ?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8. How well can you establish routines to keep activities running smoothly?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9. How much can you do to help your students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10. How much can you gauge student comprehension of what you have taught?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11. To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12. How much can you do to foster student creativity?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
13. How much can you do to get children to follow classroom rules?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
14. How much can you do to improve the understanding of a student who is failing?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
15. How much can you do to calm a student who is disruptive or noisy?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
16. How well can you establish a classroom management system with each group of students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
17. How much can you do to adjust your lessons to the proper level for individual students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
18. How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
19. How well can you keep a few problem students from ruining an entire lesson?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
20. To what extent can you provide an alternative explanation or example when students are confused?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
21. How well can you respond to defiant students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
22. How much can you assist families in helping their children do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
23. How well can you implement alternative strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
24. How well can you provide appropriate challenges for very capable students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Teachers' Sense of Efficacy Scale¹ (short form)

Teacher Beliefs		How much can you do?								
Directions: This questionnaire is designed to help us gain a better understanding of the kinds of things that create difficulties for teachers in their school activities. Please indicate your opinion about each of the statements below. Your answers are confidential.		Nothing	Very Little	Some Influence	Quite A Bit	A Great Deal				
1.	How much can you do to control disruptive behavior in the classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2.	How much can you do to motivate students who show low interest in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3.	How much can you do to get students to believe they can do well in school work?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4.	How much can you do to help your students value learning?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
5.	To what extent can you craft good questions for your students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
6.	How much can you do to get children to follow classroom rules?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
7.	How much can you do to calm a student who is disruptive or noisy?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
8.	How well can you establish a classroom management system with each group of students?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
9.	How much can you use a variety of assessment strategies?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10.	To what extent can you provide an alternative explanation or example when students are confused?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
11.	How much can you assist families in helping their children do well in school?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12.	How well can you implement alternative strategies in your classroom?	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Directions for Scoring the Teachers' Sense of Efficacy Scale¹

Developers: Megan Tschannen-Moran, College of William and Mary
Anita Woolfolk Hoy, the Ohio State University.

Construct Validity

For information the construct validity of the Teachers' Sense of Teacher efficacy Scale, see:

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing and elusive construct. *Teaching and Teacher Education*, 17, 783-805.

Factor Analysis

It is important to conduct a factor analysis to determine how your participants respond to the questions. We have consistently found three moderately correlated factors: *Efficacy in Student Engagement*, *Efficacy in Instructional Practices*, and *Efficacy in Classroom Management*, but at times the make up of the scales varies slightly. With preservice teachers we recommend that the full 24-item scale (or 12-item short form) be used, because the factor structure often is less distinct for these respondents.

Subscale Scores

To determine the *Efficacy in Student Engagement*, *Efficacy in Instructional Practices*, and *Efficacy in Classroom Management* subscale scores, we compute unweighted means of the items that load on each factor. Generally these groupings are:

Long Form

<i>Efficacy in Student Engagement:</i>	Items 1, 2, 4, 6, 9, 12, 14, 22
<i>Efficacy in Instructional Strategies:</i>	Items 7, 10, 11, 17, 18, 20, 23, 24
<i>Efficacy in Classroom Management:</i>	Items 3, 5, 8, 13, 15, 16, 19, 21

Short Form

<i>Efficacy in Student Engagement:</i>	Items 2, 3, 4, 11
<i>Efficacy in Instructional Strategies:</i>	Items 5, 9, 10, 12
<i>Efficacy in Classroom Management:</i>	Items 1, 6, 7, 8

Reliabilities

In Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing and elusive construct. *Teaching and Teacher Education*, 17, 783-805, the following were found:

	Long Form			Short Form		
	Mean	SD	alpha	Mean	SD	alpha
OSTES	7.1	.94	.94	7.1	.98	.90
<i>Engagement</i>	7.3	1.1	.87	7.2	1.2	.81
<i>Instruction</i>	7.3	1.1	.91	7.3	1.2	.86
<i>Management</i>	6.7	1.1	.90	6.7	1.2	.86

¹ Because this instrument was developed at the Ohio State University, it is sometimes referred to as the *Ohio State Teacher Efficacy Scale*. We prefer the name, *Teachers' Sense of Efficacy Scale*.

Appendix E

Student *Furniture Innovations* Study Survey 1, 2, and 3

Aligned with Bandura's Self-Efficacy Theory

Bandura's Self-Efficacy Theory refers to an individual's belief in their ability to perform tasks and reach goals successfully. According to psychologist **Albert Bandura**, self-efficacy influences how people think, feel, motivate themselves, and act. People with high self-efficacy tend to take on challenges, persevere through difficulties, and recover from setbacks.

Bandura identified **four primary sources** that shape self-efficacy:

1. **Mastery Experiences** – Personal success builds confidence.
2. **Vicarious Experiences** – Seeing peers succeed boosts belief in one's abilities.
3. **Verbal Persuasion** – Encouragement from others can strengthen belief in capability.
4. **Physiological and Emotional States** – Comfort, stress, and mood can enhance or hinder self-confidence.

Mastery Experiences (agree/disagree)

1. Working in a comfortable or flexible learning space makes me more capable of completing complex assignments.
2. I can stay more focused and get more done when the furniture supports the way I learn best.
3. I have done better on assignments or tests when I felt physically comfortable in class.
4. The ability to move or adjust my seating helps me manage distractions and succeed academically.

Vicarious Experiences (agree/disagree)

5. I notice that students who use flexible furniture (like standing desks or wobble stools) seem more engaged.
6. Seeing other students use different types of seating gives me ideas for improving my learning.
7. I've learned new ways to focus or study by watching classmates use the learning space.

Verbal Persuasion (agree/disagree)

8. My teachers encourage me to choose the seating or space that helps me learn best.
9. When teachers or classmates suggest ways to use the classroom furniture (like working in a group or standing), I feel more confident trying it.
10. I feel more supported in class when adults notice how I work best and allow flexible seating.

Physiological & Emotional States (agree/disagree)

11. I find it easier to stay calm and focused when the classroom furniture fits my body and needs.
12. Sitting in uncomfortable or crowded furniture makes me feel distracted or anxious.

13. When the classroom environment feels safe and comfortable, I am more willing to ask questions or speak up.
14. I feel more in control of my learning when I can choose how or where I sit.

Reflection (open-ended)

15. Describe a time when the classroom setup helped or hurt your learning ability. What changed?
16. What kinds of furniture or seating arrangements make you feel the most confident in class?
Why?
17. What would it look like if you could design your ideal classroom to help students feel successful?

Additional Questions

Academic Performance and Grades (agree/disagree)

1. I believe I can improve my grades with a learning space that supports my needs.
2. The way my classroom is arranged affects how well I perform on assignments and tests.
3. I have received better grades in classrooms where I felt physically comfortable.
4. Having a choice in seating or workspace has helped me perform better academically.

Academic Performance and Grades (open-ended)

5. Do you feel your grades would improve if you had more control over your learning space?
6. In which class do you earn your highest grade? Why do you think you have the highest grade in that class?
7. Has the physical classroom environment ever made it harder for you to focus or finish work on time?
8. What is your current GPA or average grade in your classes?
9. Do you think your grades reflect your true ability as a student? Why or why not?
10. What changes to your classroom space would help you improve your academic performance?

Appendix F

What changes to your classroom space would help you improve your academic performance? (May 2025)

Students' recommendations for improving the classroom environment focused on lighting, seating, space, and environmental comfort, though several students noted that few or no changes were necessary. Three students specifically requested dimmer lighting, making it the most frequently requested improvement, while others suggested more comfortable seating, wheeled chairs, or additional seating to increase flexibility. Several responses addressed the physical environment, including warming the room, reducing clutter ("less stuff everywhere"), and addressing overcrowding. One student emphasized the importance of greater autonomy in choosing where to sit, while another suggested minimizing distractions by ensuring students were not seated near close friends or romantic partners. Notably, several participants said the classroom should remain unchanged or that they could think of no additional improvements, with one student commenting that "the way it is now is working for me right now." Collectively, these responses suggest that students generally viewed the redesigned classroom positively while identifying relatively minor refinements—particularly related to lighting, comfort, and space—that could further enhance their academic experience.

Student Drawings January 2026

What changes to your classroom space would help you improve your academic performance? (January 2026)

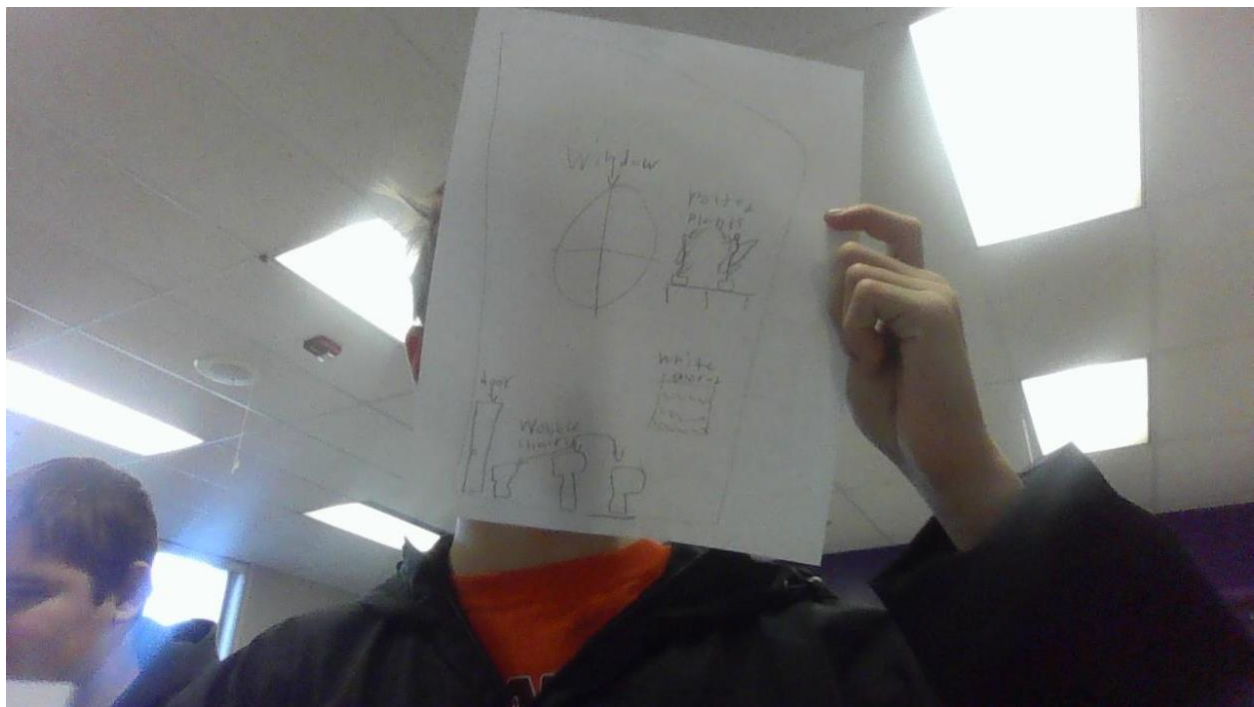
Students' responses in January 2026 indicated that comfort, flexibility, and environmental conditions were the primary classroom characteristics they believed could further support their academic performance. The most frequently identified recommendation was for more comfortable seating, with students requesting "more cushioned seats," "soft seats where you can really lean back," "soft and tall seats," and seating that was "relaxing... but not too relaxing." Several students also emphasized the importance of adjustable and mobile furniture, suggesting chairs that rolled, spun, or could be adjusted to individual preferences, as well as standing desks and tables that supported both collaborative and independent work.

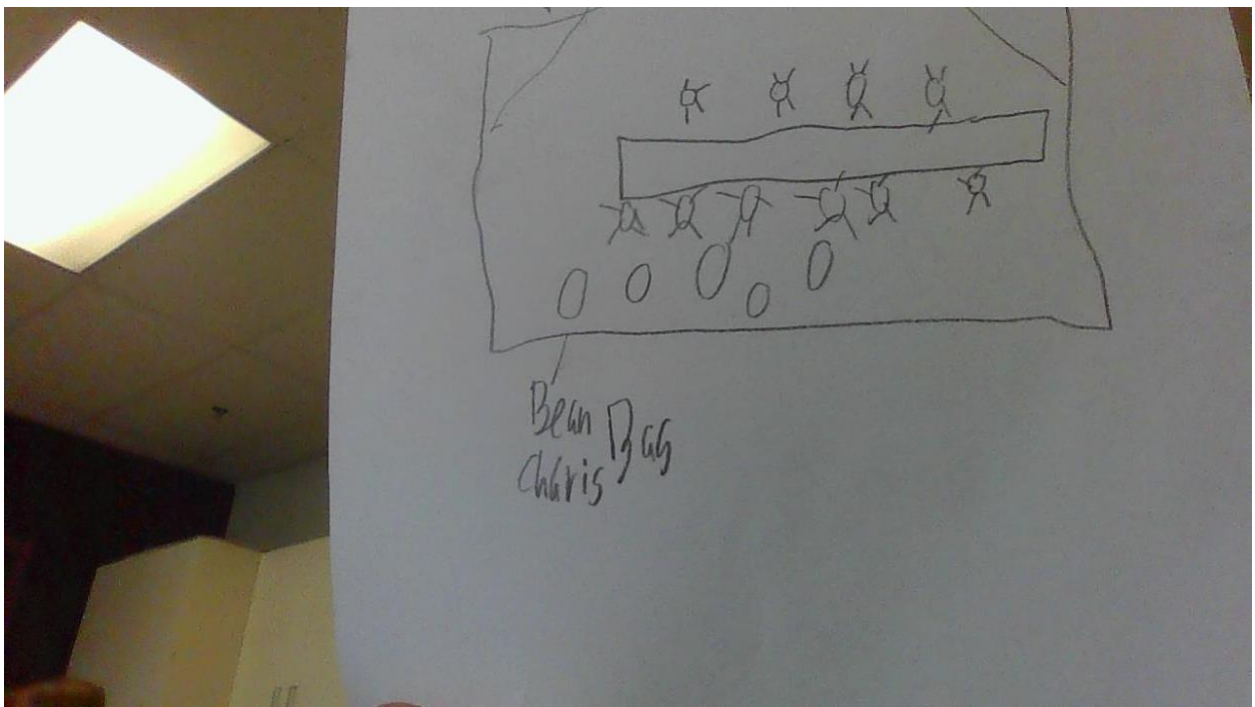
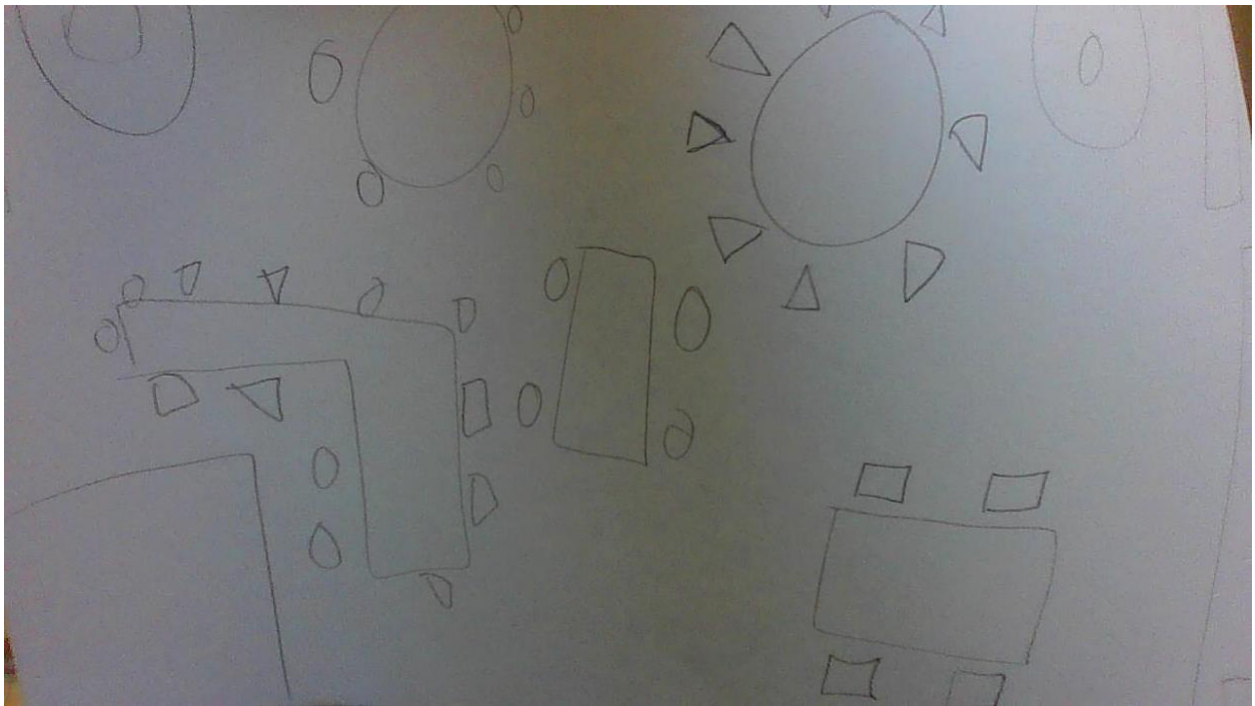
A second prominent theme concerned the physical classroom environment. Multiple students recommended improving the lighting, including adding lamps or using softer lighting. In contrast, others suggested increasing classroom space, creating "different spaces around for different people," or rearranging the classroom layout to better support learning. These comments suggest that students valued environments that could accommodate different learning preferences rather than a single, fixed classroom configuration.

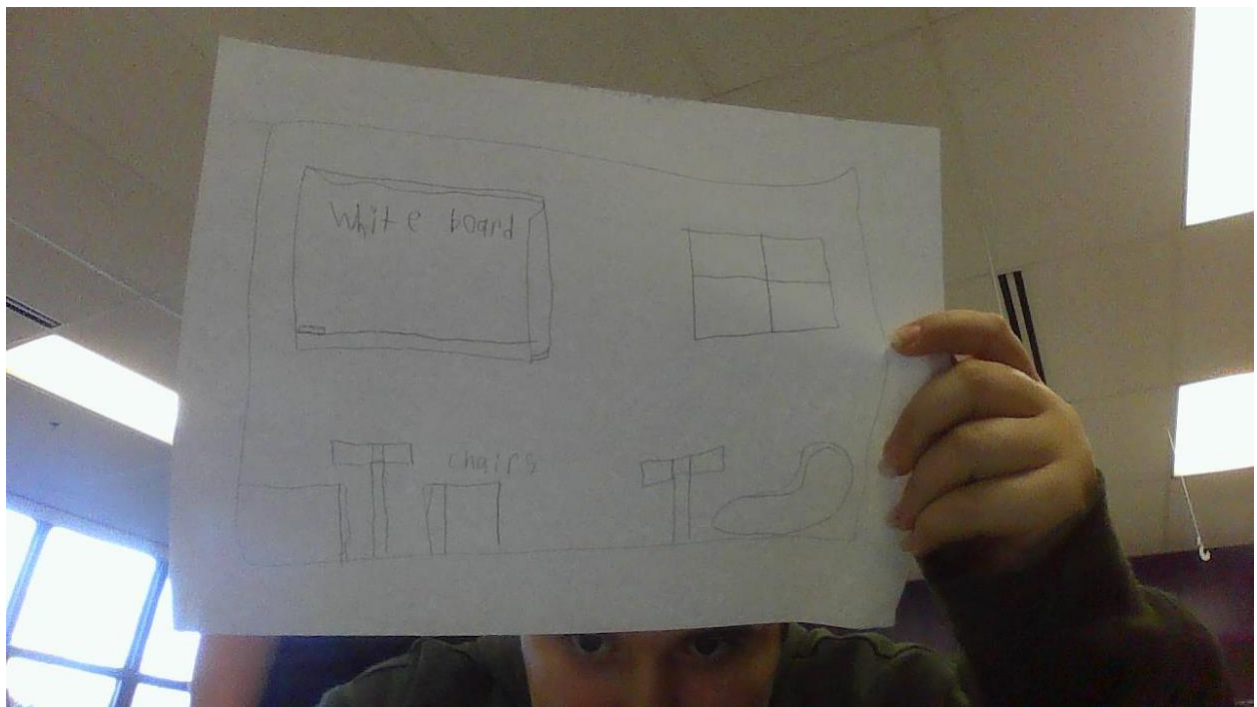
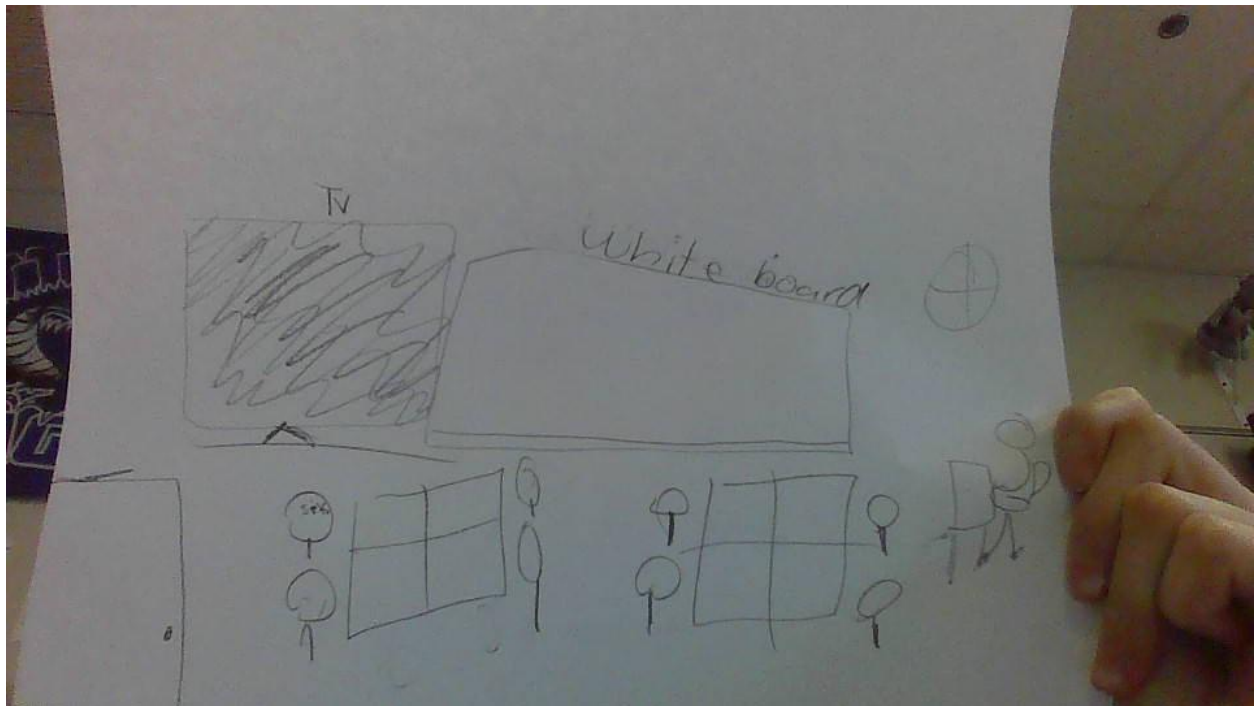
Students also highlighted the importance of psychological comfort and minimizing distractions. Several responses emphasized the need for a "comfortable environment," a classroom that felt "comfortable and safe," or seating arrangements that minimized distractions by keeping other students from sitting nearby. One student suggested that "having food with me" would improve concentration, while another noted that "the class being more fun" would enhance academic performance. Together, these responses indicate that students viewed both the physical and social aspects of the learning environment as contributing to their ability to focus and succeed academically.

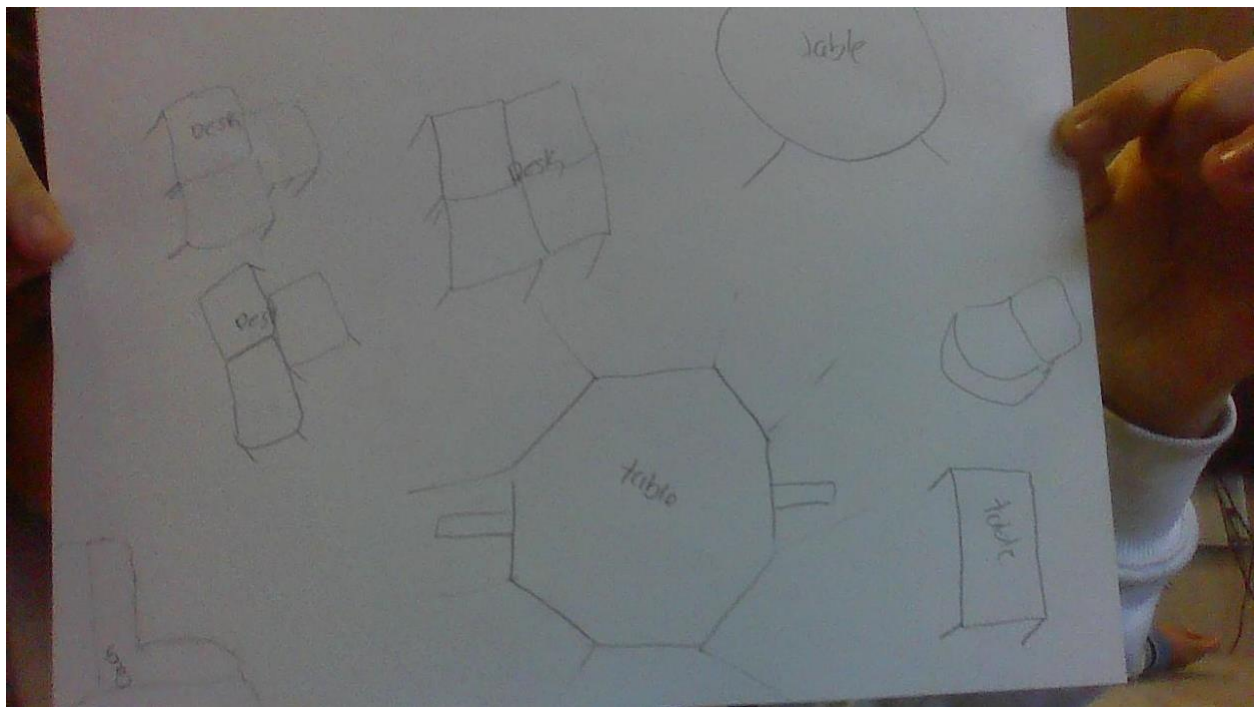
Despite these suggestions, several students expressed satisfaction with the current classroom design. Responses such as "Nothing, I like it the way it is," "I don't think there are really any changes to the classroom environment that would change my grades," "Not much changes," "Nothing," and "none" indicate that a substantial proportion of students believed the classroom already met their learning needs. Rather than calling for extensive redesign, most recommendations focused on incremental refinements to seating comfort, lighting, flexibility, and personal space.

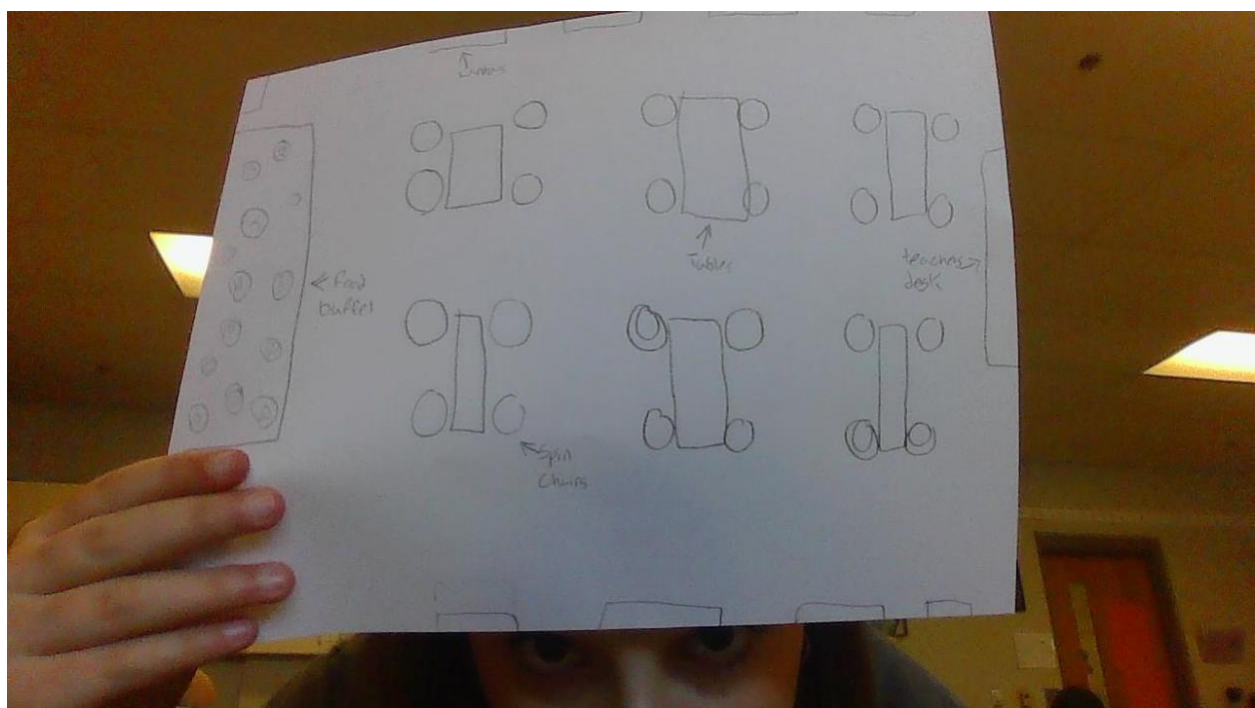
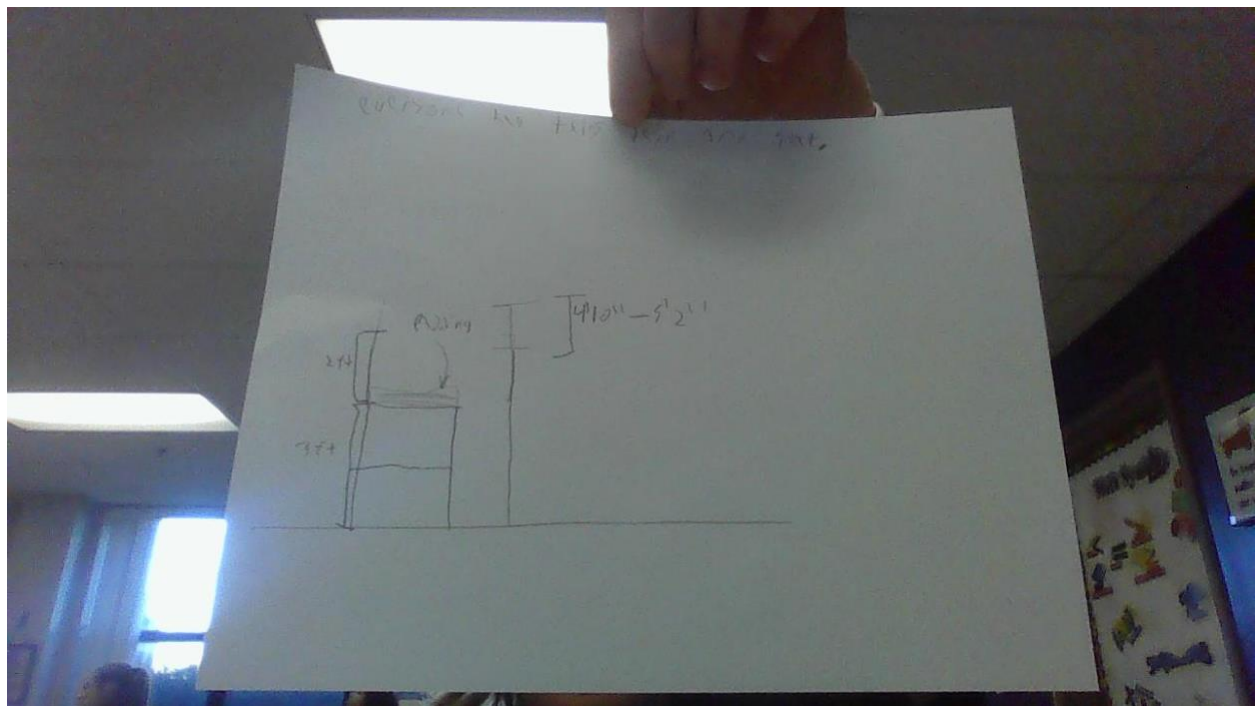
Collectively, the January 2026 responses indicate that students viewed the redesigned classroom positively while identifying opportunities to further optimize the environment. The recommendations emphasized enhancing physical comfort, increasing flexibility, and creating spaces that supported individual learning preferences without fundamentally altering the classroom's existing design. These findings reinforce the broader pattern observed throughout the study: students perceived the classroom environment as an important facilitator of learning, with comfort, choice, and adaptability as key characteristics of an effective instructional space.

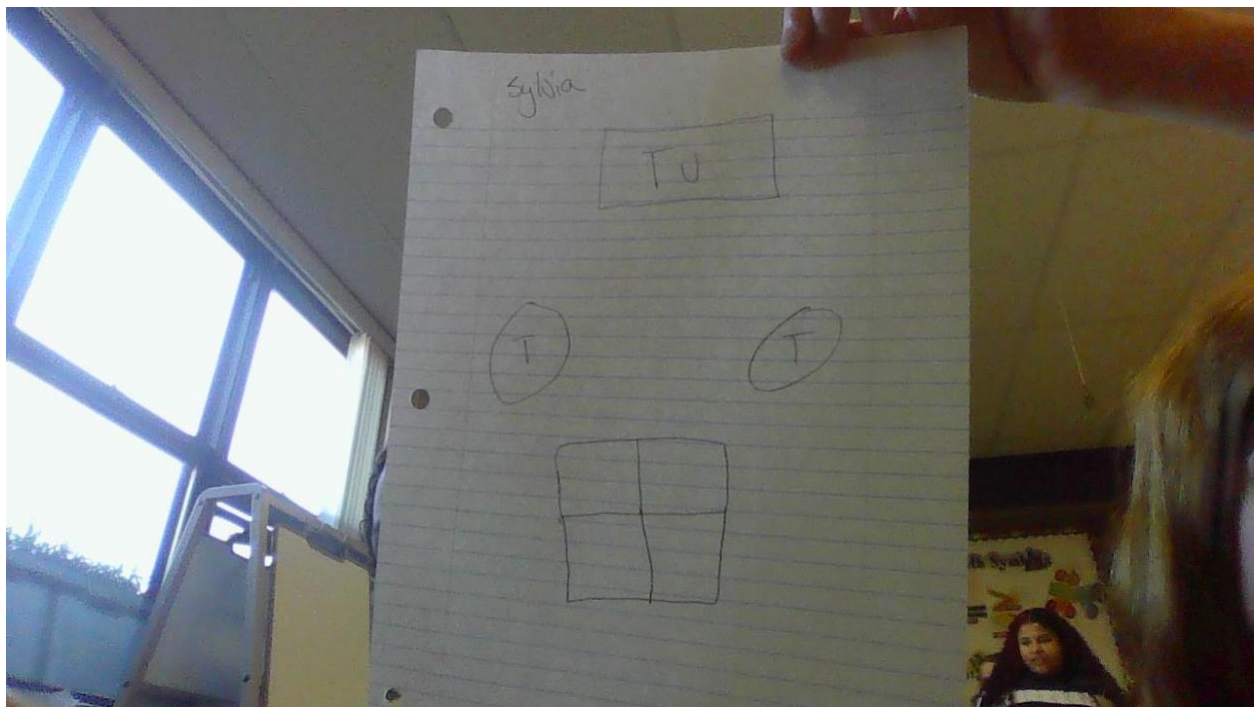
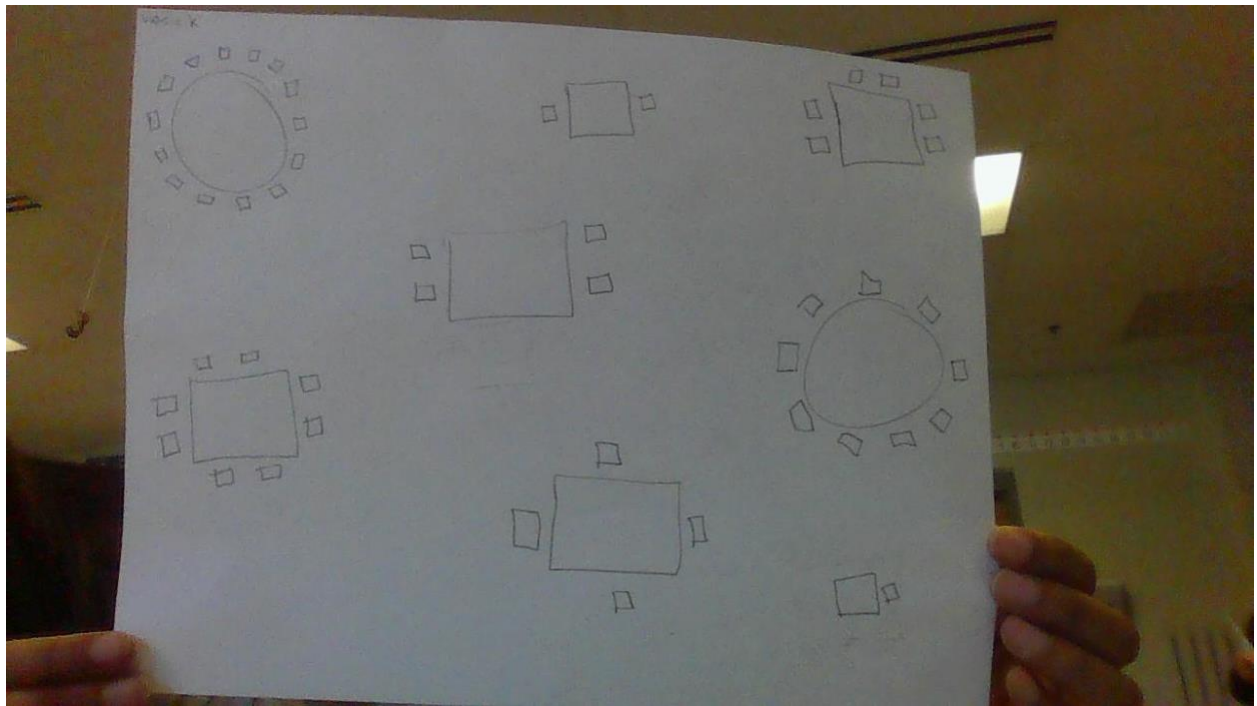


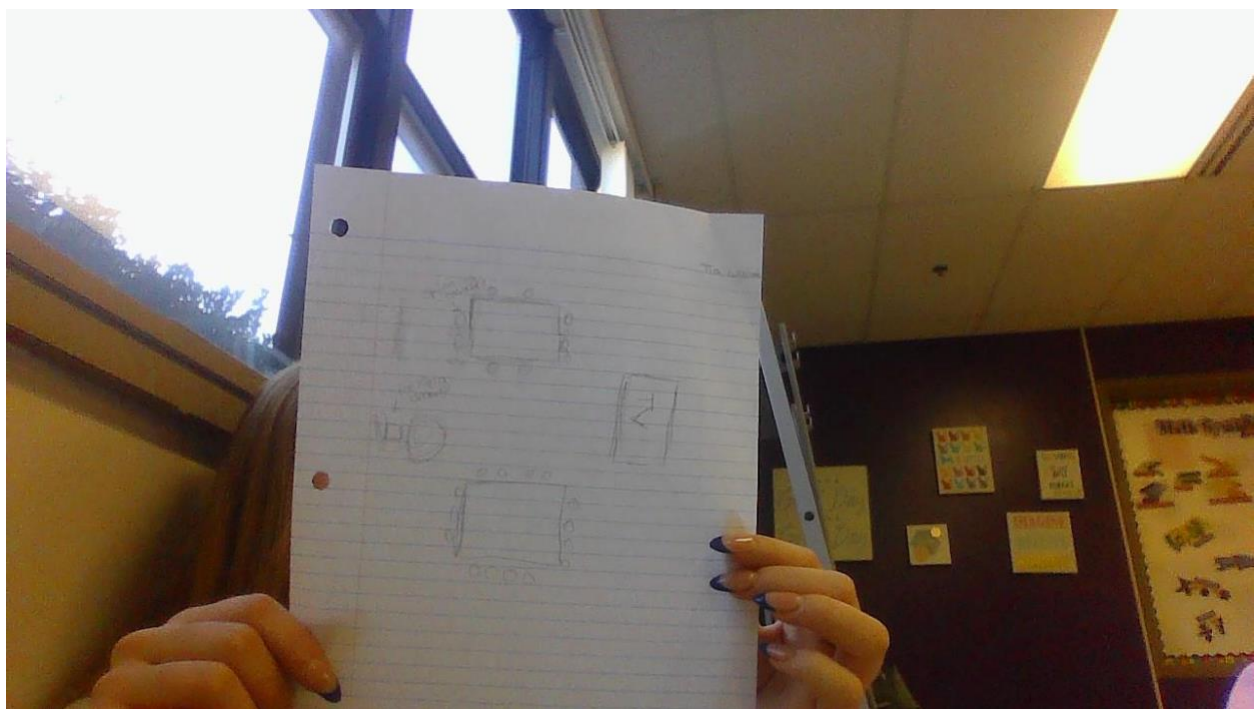
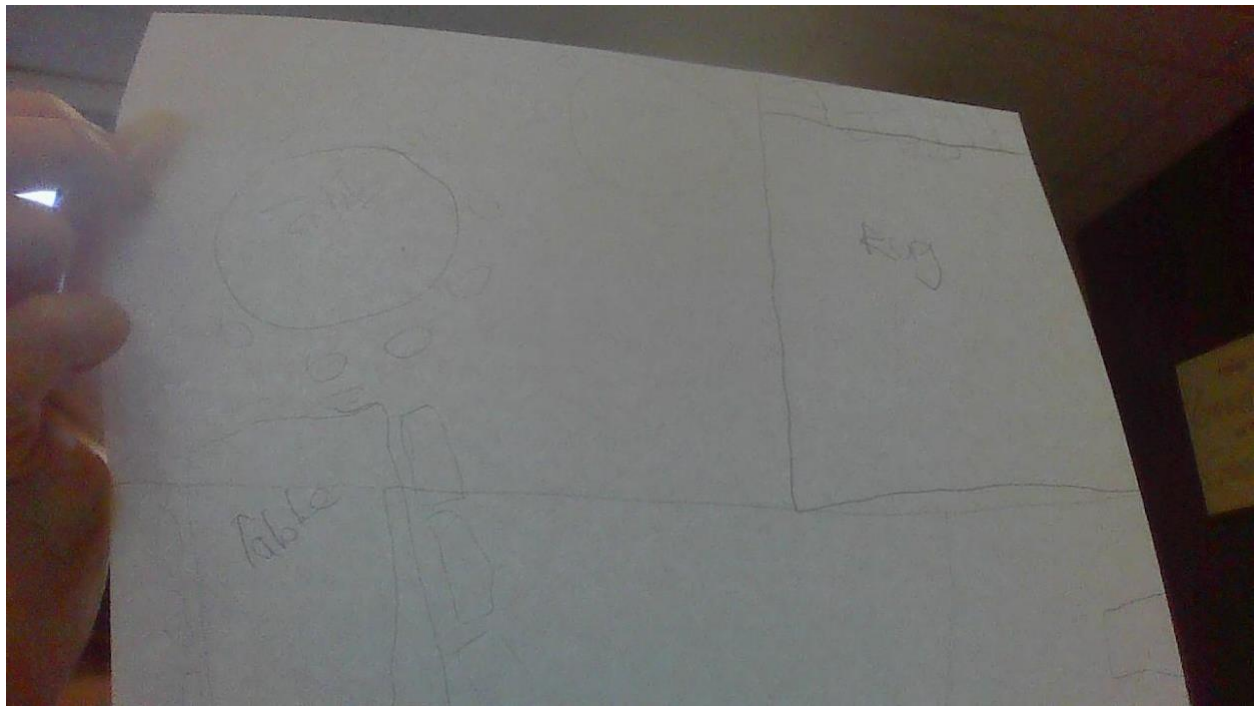


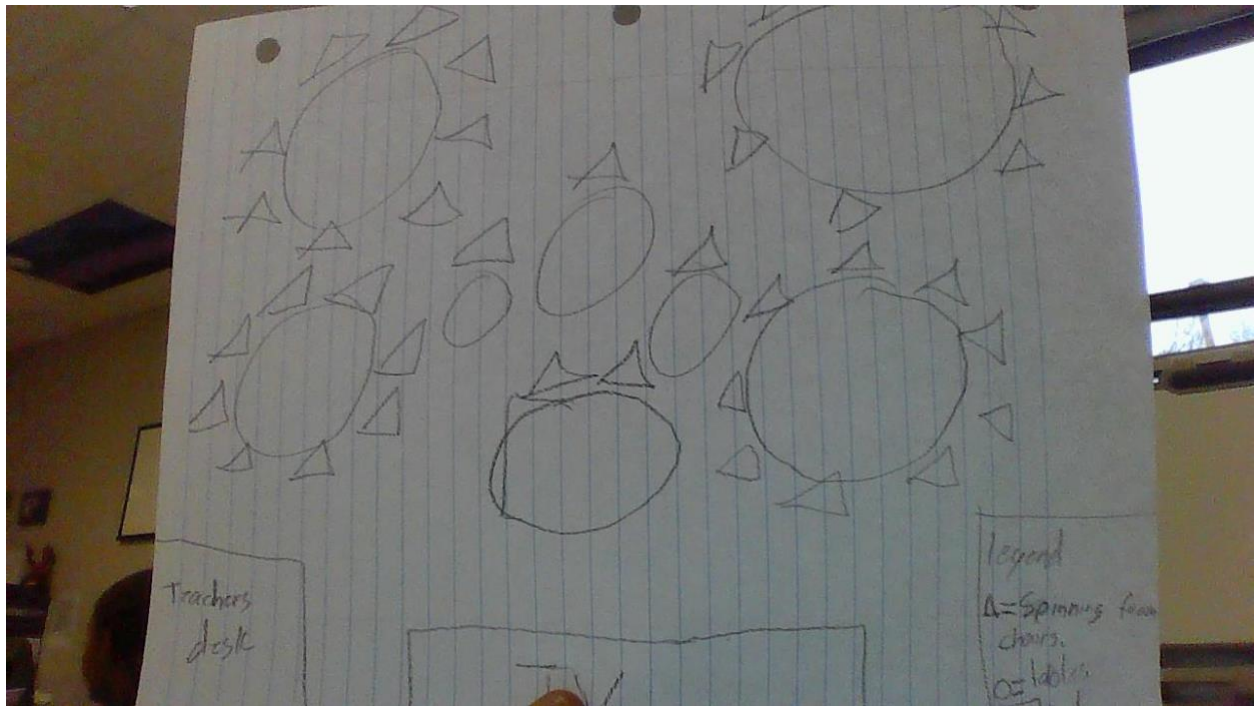












What changes to your classroom space would help you improve your academic performance? (May 2026)

Students' responses in May 2026 continued to emphasize comfort, classroom atmosphere, and flexibility as factors that could further enhance their academic performance. However, the small number of responses suggests that relatively few students identified additional changes by the end of the study. The most common recommendations focused on creating a more comfortable, visually inviting learning environment. Students suggested "comfy and dim lighting," adding "more color," incorporating beanbag seating, and providing more room to move around. These responses indicate that students viewed the physical environment not only for its functionality but also as a contributor to comfort and the overall classroom climate.

Several responses also emphasized the importance of flexibility and autonomy. One student recommended unassigned seating, noting that the ability to choose where to sit remained beneficial for learning. Another student requested more space, reinforcing earlier survey comments about the value of an environment that allows movement and reduces feelings of crowding.

Notably, one student responded simply with "none," indicating satisfaction with the current classroom environment and suggesting that no additional modifications were necessary. Compared with earlier survey administrations, the May responses reflected fewer requests for substantive changes and instead focused primarily on minor refinements related to aesthetics, comfort, and personal choice.

Collectively, the end-of-year responses indicate that students were generally satisfied with the redesigned classroom environment after nearly a full year of use. Rather than recommending major modifications, students identified minor adjustments, such as softer lighting, additional color, alternative seating options, and increased flexibility, that they believed could further enhance an already positive learning environment. This progression across the study supports the broader finding that students increasingly viewed the classroom as an adaptive learning space, with comfort, autonomy, and environmental quality serving as features that complemented, rather than fundamentally determined, their academic experiences.