Deriving the Ideal Learning Environment For Communal Intermediate Educational Institutions

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Abstract

The effective dissemination of information that encourages critical thinking has challenged educators for decades in the traditional classroom. Communal education institutions, particularly the 6th and 7th grades, are faced with the obstacle of providing an environment to effectively facilitate learning. Many experts, ranging from educational administrators to psychologists, have begun to recognize the benefits of Montessori-style schooling. To date, numerous studies have demonstrated the advantages of devising an ideal learning environment by creating an autonomy-supportive domain that centers around providing actual tools, choices while learning, and trust from the mentor(s). This literary review will provide original research and explore the direct outcomes of altering the education environment to maximize learning potential. The paper will specifically focus on the neuroscientific literature providing empirical data supporting an autonomy-supportive classroom model.

Introduction

The United States of America's public school system is in a state of disarray. 11,111,000 students were enrolled in the sixth through eighth grades of the American public school system in 2022 (NCES, 2022a). 31% of students graduating middle school were proficient in reading comprehension and only 26% were proficient in math, a decrease from 33% before the COVID-19 pandemic in 2019 (NCES, 2022b). The system has seen a gap in academic proficiency based on race and ethnicity, especially in the case of African-American, Hispanic, and Native-American middle schoolers, with reading proficiencies of 16%, 21%, and 18% respectively in 2022. This marks a stark difference between the 31% national proficiency average and 38% proficiency for white students across the country (NCES, 2022c).

Fred C. Lunenburg deems the orientation of the current public school classroom as the model of custodial orientation. This system focuses on the maintenance of order and unitary pupil-teacher hierarchy. Communication travels down the chain of command, exclusively from the instructor to the student, and resistance is met with disciplinary measures (Lunenberg, 1989).

This model, which has been in place since the inception of Horace Mann's universal public education system in the 1830s, has been correlated with the decreasing proficiency of mathematical and language art concepts amongst the American middle school student population. These topics can range from calculations in the Cartesian plane or the use of rhetorical devices. However, an autonomy-based approach prioritizing confidence and interactivity while learning could be directly related to increasing proficiency.

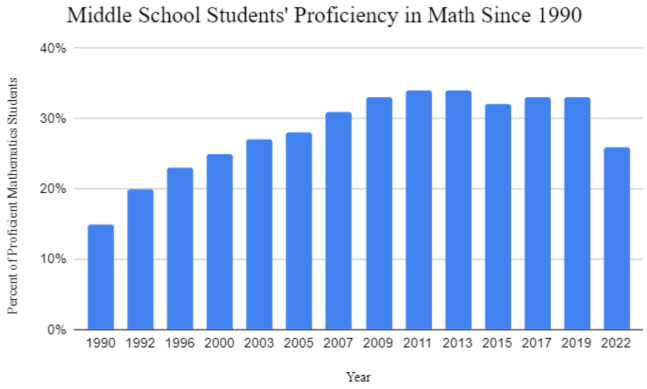


Figure 1: A model created with data from the NAEP Nation's Report Card representing the trend in Middle School Math Proficiency from 1990 until the most recent collection in 2022 (NCES, 2022c).

To date, it is unknown whether it is beneficial to devise an ideal learning environment by creating an autonomy-supportive environment that centers around providing actual tools, choice while learning, and trust from the mentor. On the contrary, an autonomy-based learning environment is positively correlated with the effective acquisition of educational material(s), which is positively correlated with the long-term retention of said material(s), therefore making it the ideal learning environment. As opposed to the custodial orientation, the autonomy-supportive environment prioritizes a bilateral form of pupil-teacher interaction. This is characterized by genuine trust expressed by both parties, resulting in the mentor providing the pupil with the opportunity to freely choose their path of learning and the chance to utilize real tools in the process (Stolk, 2015). This heutagogical (self-determined) learning style, when paired with self-directed priming beforehand, has been proven to facilitate long-term retention in the few classrooms in the process that has been implemented (Sandrone, 2019). Promoting active learning through activities like discussion, practice, and problem-solving engages

students in analyzing, synthesizing, and evaluating class content. This frequent involvement of working memory, through rehearsal, helps convert short-term memory into long-term memory (Baddeley, 1974). This results in increased student performance in the classroom and on test sheets. This study reviews existing research and collects data about learning processes in the context of middle school education to connect an autonomy-supportive learning environment to an increase in student academic performance.

The Environment and Its Aspects

An environment is comprised of the conditions, influences, or factors that impact the development, behavior, and survival of an organism or system. As a result, it is one of the most influential factors affecting the performance of individuals placed within it. Many studies have demonstrated the link between environment and performance, whether it be in the context of a school environment and student performance or a work environment and job performance (Kweon, 2017). As public domains, especially schools, are directly proportional to socioeconomic status in environments around the globe, both show a stark positive correlation with individual achievement (Dynik, 2024; EdTrust, 2023).

There are many different types of environments, including but not limited to Organizational Structure Dimensions, Milieu Inhabitant Dimensions, Ecological Dimensions, Psychosocial Characteristic and Organizational Climates, and Behavior Settings (Moos, 1973). Organizational Structure Dimensions are environments focused on the arrangement and hierarchy within organizations, like roles, responsibilities, communication patterns, and policies that shape the processes and actions of groups and individuals within the establishment. Milieu Inhabitant Dimensions focus on the traits of people within an environment, consisting of collective, personal, and behavioral characteristics, such as demographics, cultural backgrounds, and social behaviors & relationships. Ecological dimensions focus on the physical environment's factors, especially those related to location, weather, architecture, and layout (Moos, 1973; Smith, 2019). Psychosocial Characteristic and Organizational Climates, on the other hand, highlight the psychological, social, and atmospheric aspects of an environment, like stress levels, morale, group dynamics, and norms. They are very similar to Organizational Structure Dimensions, with the central dissimilarity being the focus on the internal effects of environmental causes. Behavior settings are a mix of both of these environments, where specific patterns of behavior are exemplified in environments such as classrooms, parks, and offices (Moos, 1973).

The learning environment, as a subcategory of the behavior setting, possesses some of the aforementioned types of environmental conditions. The physical area, which is the actual space in which learning occurs, comprises aspects such as the layout, atmosphere, and available resources (OECD, 2009). With the world rapidly tech-accelerating, technological tools have become an increasingly integral part of the physical environment. Aspects of these tools, like hardware, software, online courses, and interactive learning applications, have frequently been utilized to make the environment more accessible (O'Brien, 2011). Conversely, the social environment focuses on emotion-based communication between students, teachers, and peers. This occurs in collaboration between peers, communication between all parties in the environment, and the building of relationships that allow actions like behavior management and genuine criticism to be facilitated (Marzano, 2003). Complementing the social environment is the psychological environment, which includes the emotions, attitudes, and motivations that

influence learning and academic performance. Altering the psychological environment involves manipulation of the learning domain's atmosphere (NRC, 2000). Another element of the learning environment is the cultural climate, which consists of norms, values, and expectations shaping the learning process. The scope of the cultural climate is very important to consider, whether broad or specific (Bronfenbrenner, 1979). The final significant facet of the learning environment is the instructional methodology utilized by mentors and educators to facilitate learning. This includes teaching styles, curriculum design, testing procedures, and the implementation of a variety of curricular content (Marzano, 2003).

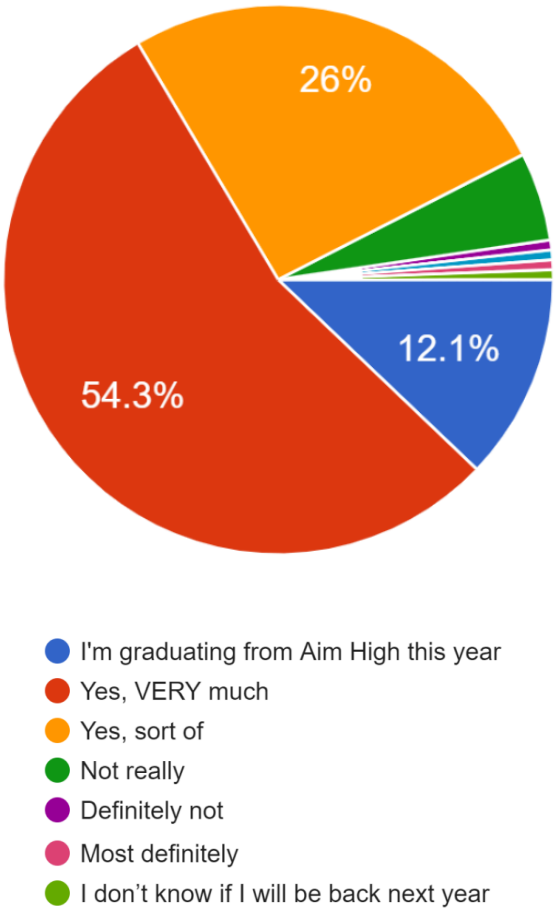
Learning Environment and Performance

The aforementioned pieces of the learning environment can and should be utilized to improve numerous aspects of student learning and academic achievement. In the physical environment, well-designed rooms that are well-lit, well-ventilated, and bearing appropriate seating improve concentration and engagement (Turano, 2005). Along with that, supplying a variety of resources and technologies, from books to computers to a classroom environment can serve a wide range of learning styles, increasing the environment's effectiveness (Lei, 2007). In the psychological environment, the creation of positive teacher-student relationships is vital for fostering a learning environment that enhances student motivation, interest, and success (Roorda, 2011). This can be supplemented with the creation of a sense of security and affinity at school, which has been attributed to greater student engagement, active participation, and improved academic performance (Osterman, 2000). The social environment focuses more on the relationship between peers and the community's effects on one. Peer relationships affect students' feelings regarding learning and academic achievement, as students (adolescents especially) can be supported and motivated to learn with positive peer interactions and vice versa (Wentzel, 2005). The support of a community is also crucial for overall student performance since one prioritizing education can offer resources and opportunities, educational materials, and supplementary support (Bryk, 2002). These combined efforts can improve students' academic performance exponentially.

Another environmental aspect that can positively affect student performance is instructional methods. Successful teaching methods include interactivity, focus on student leading, and flexibility to numerous learning styles. They can improve students' levels of motivation, comprehension, retention, and application of knowledge procured in the space (Arnold, 2011). Pairing these methods with constructive criticism and regular evaluation will assist learners in understanding their fortes and their areas in need of improvement, building their learning path, and supplementing academic performance (Black, 1998). Finally, the cultural environment, utilizing aspects from cultural expectations to an environment's stance on diversity and inclusion, molds every individual student's motivation, attitude toward learning, and sense of belonging and acceptance in a learning environment. Cultures that value education more highly tend to cultivate students who are more motivated to learn and perform well (Ogbu, 1992). Environments that are inclusive and respectful of diversity also expose students to many different perspectives, giving them a sense of attachment and security and producing a more positive learning mindset (Banks, 2019).

Survey

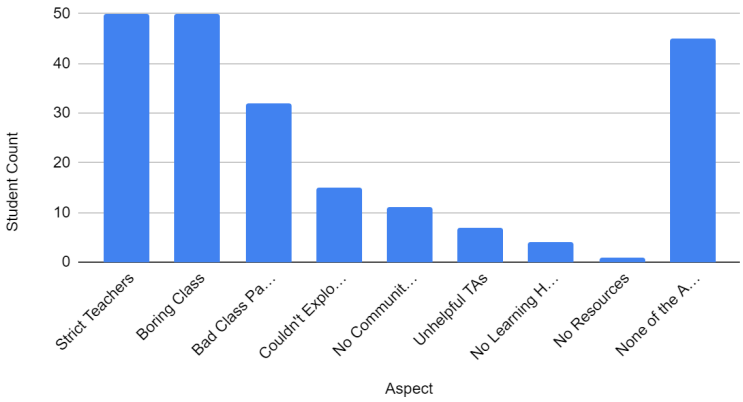
Multiple surveys have been administered to demonstrate the relationship between the learning environment and academic performance. One of these surveys was facilitated in the summer of 2024 by an education nonprofit organization, Aim High St. Louis. The organization provides a tuition-free 5-week summer enrichment program for middle school students in underserved communities and school districts across St. Louis. Each one uses a version of the aforementioned custodial orientation. It uses small class sizes, prioritizes interactive and hands-on learning, mandates students to take elective classes, and employs dedicated high school and college students as teaching assistants to personalize each student's learning experience and give each learner control over their academic journey (Aim High, n.d.).



The survey was administered online and included many multiple-choice, multiple-select, and open-ended questions. The Aim High administration surveyed all students in the program under the impression that it would yield a clearer collective student opinion. They also received consent via forms from the students' parents/guardians to maintain complete transparency regarding the survey. As an extra measure to ensure the safety of the students, they enabled students to be completely genuine with their responses by confirming that their responses would not be used against them. The survey was originally administered in Google Forms and utilized Google's technology to analyze the data and create visual aids, like pie graphs and bar graphs, for the multiple choice and multiple select questions.

Figure 2 (right). An example question and its responses from a survey administered to middle school students. Students responded to: **"**Are you looking forward to attending Aim High next year?". A total of 173 responses were recorded. (Aim High, 2024)

This survey's data provides important insight regarding the effectiveness of increased autonomy on the middle school student population. The vast majority of respondents eligible for returning to Aim High next year (91.4%) reported that they were looking forward to returning. These findings align with previous results and historical survey data, demonstrating Aim High's effectiveness on student retention. The students expressed amiable feelings for the Aim High community, especially with the teaching assistants (69.4%), the classmates they had so strongly bonded with (57.2%), and the engaging teachers (31.8%) (Figure 3a). Many students also enjoyed the



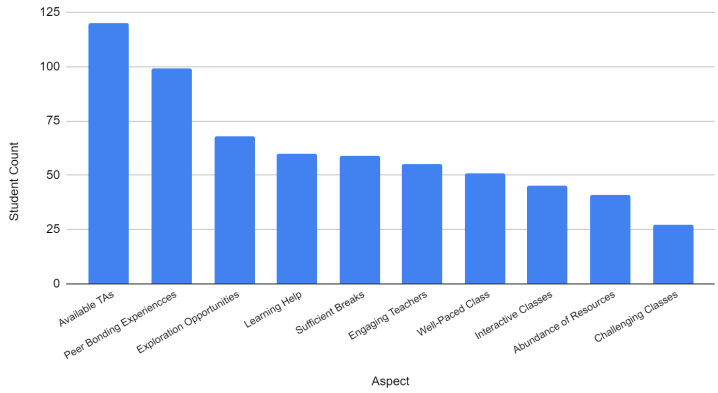


Figure 3a (above). An example question and its responses from a survey administered to middle school students. Students responded with their favorite aspects of the program. A total of at least 3 responses from 173 responders were recorded (Aim High, 2024).

Figure 3b (beneath). An example question and its responses from a survey administered to middle school students. Students responded with their least favorite aspects of Aim High. Options included “Bad Class Pacing”, “Couldn’t Explore Interests”, “No Community”, “No Learning Help”, and “None”. 173 responses were recorded
(Aim High, 2024) .

self-direction that the program enabled them to explore. They loved the opportunities to pursue interesting activities (39.3%), especially through electives, which 88.5% of students reported that they had enjoyed (Aim High, 2024). The scholars also expressed satisfaction with the sufficiency of breaks (34.1%), abundance of hands-on learning opportunities (26%), and access to learning tools and resources (23.7%) (Figure 3a). One respondent said that they selected their choices “because the teachers help [them] learn by… [facilitating] art projects and games,” giving the students “opportunities to try new things by getting out of [their] comfort zone and growing confidence.” (Aim High, 2024)

The respondents also expressed their concerns with some of Aim High’s custodial mannerisms. Despite 31.8% of the students finding the teachers engaging, Figure 3b conveys that 28.9% of students found their teachers boring and lackluster, which impaired their motivation to learn. 28.9% of students also found the teachers too strict, hampering their ability to feel respected and comfortable. 26% of students expressed no concerns with the Aim High program as a whole, and some wanted to continue learning with Aim High even after the end of the summer session. (Aim High, 2024).

A strong majority of students also expressed that the program helped them learn something new or have a new experience (Figure 4) and provided a more prepared sentiment going into the upcoming school year (Figure 5). Many students also expressed a general preference for the Aim High campus’s cleanliness, the health and taste of the food, and the balance of work and play as compared to the school they attended in the spring (Figure 6).

Aim High St. Louis tracked the academic progress of all of the 2024 scholars in the program through two series of tests: 3 pre-tests administered at the beginning of the program (one each for math, science, and the humanities) and 3 corresponding post-tests after the program's completion. The average growth of the scores between the 20 days of each test was +24.82%, equating to >1% for every day of attendance. A subject-by-subject analysis shows a common improvement between each subject, with ELA students scoring a collective 16% better, Mathematics students scoring 20% better, and Science students scoring a staggering 30% better on their respective post-tests (Aim High, 2024).

The survey results provided by Aim High St. Louis demonstrate valuable insights into the connection between an enhanced learning environment and academic achievement among middle school scholars. The high retention rate of 91.4% of students into the program conveyed in Figure 2 highlights Aim High St. Louis' success in nurturing an engaging and helpful community environment. Students appreciated the devoted teaching assistants, the bonded feeling between classmates, and the hands-on learning experiences. Regardless of the concerns regarding teacher engagement and rigidity, the generally positive feedback and substantial academic progress demonstrate the program's effectiveness. Aim High's approach to interactive, autonomy-based learning demonstrates significant potential for improving overall academic performance for students in underserved communities. These results confirm the crucial nature of such educational initiatives and provide an example for other organizations aiming to grow student satisfaction and academic success

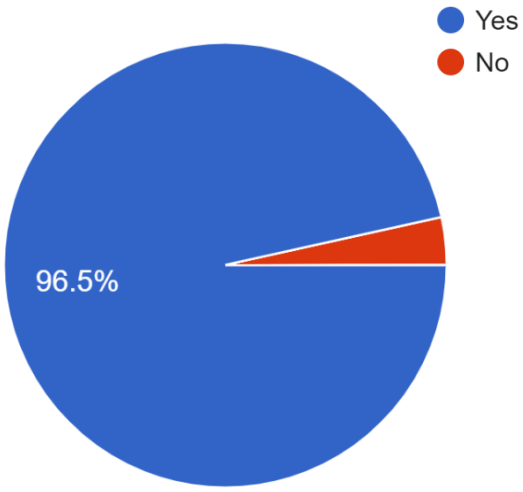


Figure 4 (left). An example question and its responses from a survey administered to middle school students. Students responded to: **"**Have you learned anything new, or had any new experiences as a result of participating in Aim High?" A total of at least 3 responses from 173 responders were recorded. (Aim High, 2024)

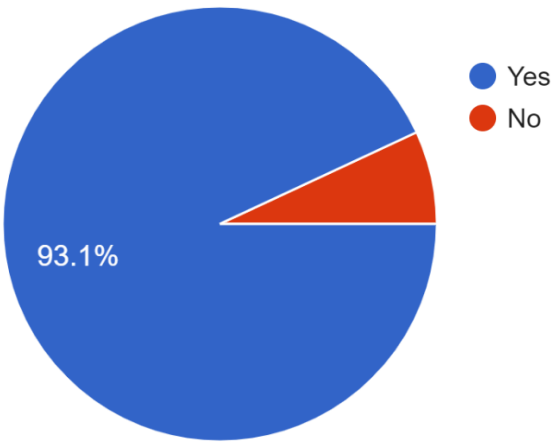


Figure 5 (right). An example question and its responses from a survey administered to middle school students. Students responded to: "Has Aim High assisted in preparing you for the next school year?". A total of 173 responses were recorded. (Aim High, 2024)

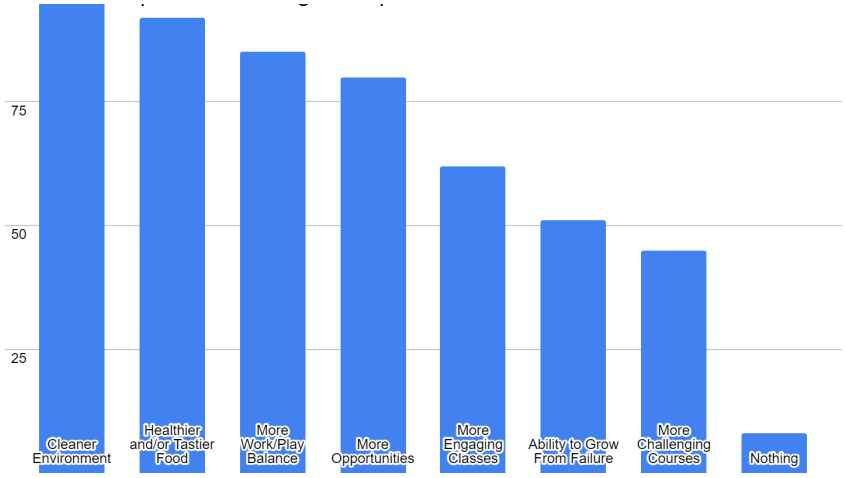


Figure 6 (above). An example multiple-select question and its responses from a survey administered to middle school students. Students responded to: "Are there any aspects of Aim High that are better than your school, and if so, what are they?". A total of 173 responses were recorded. (Aim High, 2024)

Initiative-Based Learning and Overall Student Achievement

There is no doubt that there are multiple facets of the learning environment that directly influence the performance of students in it. This section will delve into the specific ways in which introducing autonomy-supportive, initiative-based learning into the classroom benefits students' overall academic achievement. One way this occurs is through allowing students to gain experience in subjects directly (Bland, 2010). When exposing students directly to the topic they are learning about, the scholars engage more directly with their material (Kolb, 1984). By stimulating the brain's reward system and boosting memory consolidation, direct engagement promotes neural plasticity. This hands-on participation assists students' creation and fortification of related neural pathways to the subject matter. As a result, working in a hands-on manner allows students to explore, understand, and make connections about concepts in greater detail (Immordio-Yang, 2007). Autonomy-supported learning also frequently utilizes the use of theoretical concepts in real-world contexts and practical applications, helping students visualize the significance of their material. This is crucial in facilitating the improvement of their problem-solving skills, producing better performance in the classroom (Brown, 2014). By engaging the brain's analytical areas, like the prefrontal cortex, utilizing knowledge in real-world situations reinforces cognitive pliability and critical analysis/thinking (Zull, 2002). The survey, related test score results, and testimonials also corroborate this observation, as a significant pool (26%) of the students reported that they enjoyed the hands-on learning experience (Aim High, 2024). A student from a similar Australian study voiced that they "would like to learn around a lake" so that "[o]n the jetty [they] can stick your head in the water and look at the fish up close." They elaborate on that observation, mentioning that "[t]he learning space would be a great idea for a kid or any student doing a project on water animals and birds," even increasing the learning timeframe by introducing "camp[ing] overnight and observ[ing] the night animals" (Bland, 2010).

The interpolation of autonomy-supportive learning in the classroom also creates an ideal environment through an optimal learning experience that allows students to enter a "flow state"

(Crescio, 2022). A “flow state” is defined as a mental state of complete immersion and focus into a task. Initiative-based learning environments can help students enter and remain in this state of optimal learning able to increase motivation and productivity (Csikszentmihalyi, 1990). Maintaining flow correlates with higher levels of dopamine and engagement of the brain’s reward system and circuitry. The intense state of attention accelerates material acquisition and retention and strengthens cognitive functioning (Dietrich, 2004). This optimal learning experience requires an optimal level of challenge to be significantly effective in achieving flow. If scholars are allowed to select projects or goals aligning with their interests and their skill levels, autonomy-supportive learning environments provide a balanced level of difficulty and skill that provides an optimal challenge. This equilibrium advances sustained motivation, interest, and performance for every student in the environment (Schunk, 2007). The aforementioned equilibrium assists with uninterrupted learning and cognitive effort, which connects with the prefrontal cortex’s and dopamine pathways’ responses to challenge through activation when students face tasks that aren’t too facile or too complicated (McEwen, 2011). 29.5% of students at Aim High expressed that the classes weren’t too easy or too hard and moved at a comfortable pace, which assisted in their ability to work as efficiently as possible and perform with significantly greater efficacy (Aim High, 2024).

The final method utilized is the means of testing the student’s ability to utilize active recall to retain more information and assess their strengths and weaknesses to plot opportunities for improvement (Landowski, 2023). Initiative-based learning promotes the use of active recall techniques, like self-testing and retrieval exercises, to help students assess their comprehension of academic material, recognize gaps in knowledge, and reinforce the learning process (Roediger, 2011). The active recall process strengthens neural connections associated with the active memory retrieval of information, utilizing the hippocampus and prefrontal cortex to complement long-term memory retention (Karpicke, 2011). Students gain the ability to understand their strengths and weaknesses in a subject by regularly testing their knowledge. Self-tests allow students to focus on topics needing improvement and properly modify their learning plans (Andrade, 2009). Self-evaluation and adaptation engage zones of the brain involved in metacognition (awareness of thought) and executive functioning (goal orientation), aiding more effective learning procedures and enhanced scholarly achievement (Dunning, 2011). Teachers at Aim High frequently facilitate self-graded quizzes to help students retain information better, which translates into a significant improvement in exam scores by the end of the session (Aim High, 2024).

Instituting autonomy-supportive, learner-led learning into the environment allows students to engage in subjects directly, achieve optimal learning conditions to achieve flow, and procure opportunities to employ active recall for improved information retention. These methods utilize neurological concepts to refine cognitive function, motivation, and academic achievement. In the long run, these learning procedures greatly contribute to overall student success and performance.

Impact

The learning environment is incredibly important, impacting each student’s academic performance, motivation, and general development. While providing autonomy-supportive domains can greatly improve student learning experiences and outcomes, the deprivation of such environments leads to several negative results (Ryan, 2000). Students in custodial

environments demonstrate less engagement and are less intrinsically motivated, which can develop a lack of interest in learning, lowered effort, and weaker classroom performance. They also may struggle to manage their learning successfully and may not be able to regulate their abilities to set goals, manage their time, and assess their knowledge without assistance. Finally, the academic achievement of students in custodial orientations lagged behind those in more learner-led environments (Brown, 2014).

Long-term exposure to a learning environment can have several developmental consequences, especially in cognitive, emotional, and social development. Concerning cognitive development, long-term subjection to a learning environment can affect one's critical thinking by creating a student's approach to learning and challenges. While those in traditional learning environments may not have the opportunity to grow in these areas, learners in autonomy-supportive environments develop critical thinking and problem-solving skills, allowing them to take on challenges and think creatively without assistance. These learners also improve their memory retention and comprehension of the material through the initiative-based environment's incorporation of memory-boosting methods like self-assessment and active recall (Brown, 2014). Now in the scope of emotional and social development, confidence and self-efficacy (the ability to believe in one's capabilities) are fostered at different levels depending on the environment one learns. While the custodial classroom's students' mental capacity and self-confidence remain stunted, the autonomy-supportive classroom's students developmentally grow in these regards. The latter environment also encourages overall self-growth by allowing the scholars to translate these skills into other life situations. Learning environments that promote autonomy typically also highlight methods to manage stress, which can further emotional regulation and resilience (Deci, 2008).

Other results of long-term exposure to a learning environment are the level of readiness for future obstacles and the commitment to learning throughout one's lifetime. Scholars experiencing autonomy-supportive academic environments are better equipped to face the roadblocks of college education and occupational obstacles. They are also more likely to be self-driven, flexible, and proactive in their work life. The environment imbues a love of learning and a dedication to individual and occupational development, nurturing each student's desire to continue their search for knowledge throughout their lifetime (Pink, 2009).

All of these aforementioned points relate to the development of the initiative-based learning environment by assisting in the design of effective learning environments, teacher training, and development. There are three major aspects of designing effective learning environments: the incorporation of student choice, the fostering of a growth mindset, and the implementation of active learning strategies. Autonomy-supported learning environments allow students to make choices about their academic path, from choosing interesting topics to determining project formats, encouraging ownership of and engagement towards their education. Secondly, environments stressing improvement and development over flawlessness aid the development of a learner's resilience and positive attitude. This can be devised by adjusting the culture of the classroom to one that encourages feedback and celebrates effort versus one that demands perfection from imperfect students. Finally, the implementation of strategies focused on active learning can make learning more dynamic and effective. These techniques, such as active recall, collaborative projects, and hands-on activities, are situated with how the brain instinctively acquires and retains information (Schunk, 2007). Another way to streamline the interpolation of these methods is through training teachers in the areas of professional development and collaborative teaching. Teachers need training in

autonomy-supportive methodology, and professional development programs can arm educators with the skillset to devise engaging scholar-centric academic environments. Promoting collaboration among teachers can also facilitate the distribution of the best systems and the advancement of more practical autonomy-supportive strategies (Arnold, 2011).

Conclusion

Growing evidence demonstrates that providing autonomy in the classroom strengthens information acquisition, retention, and comprehension. The literature, survey data, and government-based data reviewed in this paper support the idea that the implementation of an autonomy-supportive environment in middle school domains can improve student academic performance significantly. Recent data from 2018 indicates that countries recently implementing initiative-based, autonomy-supportive learning environments, such as Estonia, Poland, and Ireland, see growth in math, reading, and science proficiencies from some prior years as seen from the recent PISA assessment results (OECD, 2019; OECD, 2020; ERC, 2019).

The success of the school systems in these three countries demonstrates the capacity of the current global pool of education systems in general. The American public middle school system needs to implement some of these initiatives taken on by Estonia, Poland, and Ireland, which would result in significant growth in academic achievement and subject-based proficiency. This can be demonstrated through the administration of professional development workshops for professors and the formulation of autonomy-supportive classroom orientations that promote the incorporation of student choice, the nurturing of a growth mindset, the implementation of active learning strategies, and the development of a collaborative culture among both students and teachers.

Lastly, although the administered surveys and information provide insightful outlooks regarding the situation, they are not completely comprehensive for each school. For this reason, each school district needs to mandate the implementation of its surveys to administer to all middle school scholars. This would also allow students to voice their opinions on the school and classroom climates, from the teachers to their peers to the classroom layout. This would provide each district with personalized information to consider centered around the methods they should continue to enforce and those they need to alter or eliminate. As a result, intermediate schools can constantly evolve to fit the educational needs of their student bodies and allow each student to reach their fullest academic potential, setting them up for future success in higher education and the workplace.

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