**Site Design at Crozet Elementary**
(Technical Paper)

**An Analysis of Overcrowding in Northern Virginia Public Schools**
(STS Paper)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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## Introduction

Overcrowding has been affecting over 20% of public schools in the United States for more than two decades (Overcrowding, Condition of America's Public School Facilities, 2000). In recent years, that figure has continued to grow as 60% of the fourth-graders and 66% of the eighth-graders who participated in the 2019 National Assessment of Educational Progress math assessment were enrolled in public schools with overcrowded classrooms (Cai, 2021). This trend presents a growing problem for the American public education system. Overcrowded classrooms lead to more noise and distractions, less personalized instruction for students, a rise in disciplinary problems, and poor building or environmental conditions (5 Ways That Overcrowded Classrooms Affect Education, n.d.). In order to prevent these effects of overcrowding from coming to pass, many schools have put countermeasures in place; however, they are almost entirely temporary solutions that do not address the root cause. The proposed STS research paper analyzes the overcrowding of public schools in the US, specifically Northern Virginia.

The second proposed project in this prospectus covers the technical work involved in designing school grounds to mitigate the impact of an enlarged student population. The threat of seriously overcrowded public schools has come to the town of Crozet, a relatively small community located approximately 11 miles west of Charlottesville, Virginia. As a result of recent redistricting, Crozet Elementary School needs to construct an additional academic wing to accommodate the imminent rise in student population. Furthermore, the school requires increased parking capacity and improved circulation for cars, buses, and pedestrians. The proposed technical project will create a new design for the site to ensure that the students, parents, and teachers of Crozet Elementary can access the school and navigate the property both

safely and efficiently. The final technical deliverable will be a comprehensive set of construction documents detailing the exact specifications of the site plan.

**Site Design at Crozet Elementary School**

Enrollment in the Albemarle County Public School system has grown in the Crozet area in recent years, and due to this trend, both Brownsville and Crozet Elementary School are now overcrowded (Crozet/Brownsville Redistricting - Albemarle County School District, n.d.). Brownsville was forced to construct six new mobile classrooms during the 2019/2020 school year, resulting in eight total on the campus, to make space for their nearly 900 students (Additions and Renovations - Crozet Elementary School, n.d.). In an effort to reduce the more significant overcrowding at Brownsville, the Albemarle County School Board approved a plan to transfer 219 students from Brownsville to Crozet (Dunn, 2022). Crozet is able to accommodate this influx of students because of a new 28,000 square foot addition to the existing building that will provide "17 classrooms, 3 smaller resource classrooms, 2 offices, a faculty workroom and various support spaces," which increases the capacity of the school from under 400 students to 680 (Additions and Renovations - Crozet Elementary School, n.d.).

The new academic wing and increased enrollment at Crozet Elementary School also requires that the entire site be redesigned to provide more parking, better access and circulation for cars, buses and pedestrians, and larger playground spaces. The existing layout of the site has several issues that the school would like to ensure are not repeated in the new design. The first of these concerns is the manner in which the students load onto their buses at the end of the day. Currently, the buses line up in two lanes side-by-side in front of the school. This formation prevents teachers and other school personnel from being able to see the children as they walk behind the first row of buses and also forces the students to walk through the exhaust fumes

coming out of the vehicles. As a remedy to this situation, the school is requiring that there be 12 designated bus parking spaces that are oriented so that their doors are visible from the nearest entrance. The school also has issues with the current queue length for the parent pick-up and drop-off location and wants to make certain that the new design will provide enough space so that the line of cars will not stretch out into the main road, Crozet Avenue. The capstone team, comprised of five undergraduate civil engineering students, will coordinate with the project's architect and landscape architect to develop a new design for the campus that satisfies these main objectives and complies with all applicable local, state, and federal codes.

The capstone team will provide a complete set of construction documents that would enable a contractor to construct the finalized design. These documents will contain plans showcasing the team's designs for site grading, stormwater management, Americans with Disabilities Act (ADA) accessibility, utilities, and traffic circulation. An erosion and sediment control plan will also be included to prevent the contractor from damaging downstream waterways and property with construction runoff. Once these documents are perfected, the school will be able to transform its grounds into a safer and more efficient environment. The students that attend Crozet Elementary will no longer have their educational experience negatively affected by a site that cannot accommodate all of them.

**An Analysis of Overcrowding in Northern Virginia Public Schools**

Northern Virginia, commonly defined as the counties of Arlington, Fairfax, Loudon, and Prince William, is a region where over the most recent decade, the population grew by approximately 31,000 people every single year (NOVA Releases New Report Highlighting a Decade of Regional Change - Northern Virginia Community College, 2020). As a result of this population boom, enrollment in the area's public schools has also increased drastically (Shaver,

2018). Overcrowding has quickly become the biggest issue facing the various public school systems in Northern Virginia, as ten of the high schools in Fairfax County alone were overcrowded by 2019 (Fox, 2019). In order to attempt to avoid the negative impact that an overcrowded classroom has on the quality of education a student receives, Fairfax County forced more than 22,000 of its students to learn in cheap wooden trailers during the 2019-2020 school year (Elk, 2019). These controversial trailers, which were intended to serve as temporary solutions, are now seen year after year on school grounds throughout all four counties and they bring with them a host of new problems for students and teachers, such as mold and insufficient heating (Elk, 2019). Despite the struggles the school systems are currently facing, housing developments continue to expand and large corporations, such as Amazon, are encouraged to put major offices in the region (Elk, 2019; Shaver, 2018). Arlington Public Schools predicts that Amazon's HQ2 will generate as many as 98 new students per year over the next 12 years, and that is while estimating that only 15-20% of the new Amazon employees will live in Arlington (Arlington Schools Brace for Overcrowding from Amazon HQ2, 2019). Northern Virginia's population will continue to rise in the coming years and it is clear that further analysis of this grim situation is required to understand what has caused the problem, beyond simply blaming population growth, and what can be done to provide more sustainable solutions (McCaffrey, 2022).

The issue of overcrowding in Northern Virginia will be studied through the sociotechnical framework of Actor Network Theory (ANT). Darryl Cressman (2009), a scholar of the discipline of science and technology in society (STS), describes ANT broadly as "tracing the complex relationships that exist between governments, technologies, knowledge, texts, money and people." ANT examines the associations between heterogeneous actors, which can be

either human or non-human because entities of both kinds are able to interact with other actors and play important roles within an actor-network (Cressman, 2009). The significance that is given to nonhuman elements in ANT has been a major critique of the framework (Michael, 2017). A few actors that are currently being considered for this analysis are school boards, local governments, real estate developers, and large corporations. The final network will be determined as further research is conducted.

Punctualization is a vital practice when using ANT in which the sociotechnical complexities of certain actor-networks are disregarded so that they may be combined with others into a larger actor-network (Cressman, 2009). This procedure will be employed to ensure the analysis is appropriately concise and focused. The choices made during the process of punctualization are an often-criticized aspect of an ANT analysis because other scholars will have different opinions on what deserves to be punctualized based on their own beliefs (Cressman, 2009). Therefore, it is vital to have sound justification for the decisions that are made about which actor-networks to punctualize. The necessity of punctualization is an inherent weakness of the framework as a whole because of the selection biases that are involved (Cressman, 2009). Nonetheless, ANT is still an effective medium for analyzing networks and it will provide structure to this important research paper so an effective conclusion can be drawn.

**Research Question and Methods**

The following question will serve as a guide for the research that will be conducted to write this paper: How do the relevant actors contribute to the issue of overcrowding in Northern Virginia public schools? In order to find informative sources to use in answering this question, discourse analysis will be used as the prominent research methodology. Discourse analysis involves investigating the use of language, which can be the expression of content, known as

transactional, or the expression of social relations and personal attitudes, referred to as interactional (Brown & Yule, 1983). The research for this paper will be conducted by reviewing news and magazine articles, watching interviews with local residents, and observing recordings of public hearings for school boards and local governments. These kinds of sources, and others that are discovered, will fuel further understanding of what people in Northern Virginia see as the main drivers of the issue and how they feel it would best be solved. The research should also provide information about what restrictions the school boards and local governments face in fulfilling the needs of their constituents. Analyzing the discourse surrounding school overcrowding in Northern Virginia will ensure that the relevant actors contributing to the situation are identified and thoroughly understood so that a solution can be found.

**Conclusion**

Overcrowding is an issue for public schools in many areas across the US, but the situation has become especially concerning in Northern Virginia. This research will seek to determine who the relevant actors are for this dilemma and how they have contributed to the region's overcrowded school systems. The end goal is to use a newfound understanding of the actor-network to develop a solution, or multiple potential solutions, that will alleviate the overcrowding that currently plagues Northern Virginia public schools.

The technical portion of this project is driven by the overcrowding that is beginning to become a serious burden for the elementary schools in Crozet, Virginia. The team will present a design for the layout of Crozet Elementary School that will accommodate its new academic wing and the influx of students it is set to receive. The design will remedy the existing logistical and safety problems of the site while also satisfying the other main objectives set by the school. The final deliverable will be a comprehensive set of construction documents that would give a

contractor the ability to construct this improved campus for the parents, students, and teachers to enjoy.

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