‘The more you dig into it, you think, Oh, God.’ A growing mission seeks to reduce toxic chemicals in schools

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Jack McCarthy, executive director of the Massachusetts School Building Authority, aims to slash the number of toxic chemicals used in construction and renovation projects in the state's schools. JONATHAN WIGGS/GLOBE STAFF

The image is seared in Jack McCarthy’s mind: a group of pre-kindergarteners gathered for story time, sitting in a circle on the carpet of a classroom, amid an invisible witches’ brew of chemicals lurking in the dust on the floor.

Ever since he heard a talk a couple of years ago about health problems linked to flame retardants, stain repellents, and other potent building chemicals, McCarthy, executive director of the Massachusetts School Building Authority, has been on a mission to slash the number of such substances in the state's schools. His vision is taking hold in a $305 million construction project for a new Bristol-Plymouth Regional Technical School, the first time the authority has embarked on a project-wide initiative to reduce chemicals linked to cancer, hormone disruption, and other health problems.

"We are trying to do as much as we can without overdoing it," McCarthy said. "We don't want to make perfect the enemy of the very good."

The action is part of a growing push by environmental groups, fostered by the work of Harvard University scientists, to encourage more schools and large companies to leverage their buying power by contracting with manufacturers who agree to remove several classes of chemicals from their materials. The hope is that if enough large construction and renovation projects source non-toxic materials, manufacturers will stop using these chemicals, and the benefits will be more widespread for consumers.

Already, environmental groups have made substantial progress. They have persuaded many large manufacturers to phase out carpets with stain- and water-resistant chemicals, and some big-box stores, such as Home Depot, have pledged to sell products with fewer toxins. At least two dozen states have pending legislation aimed at studying, reducing, or banning a variety of chemicals.

“Most people don’t realize when you buy a chair or carpet, it doesn’t come with an ingredient list like a food nutrition label,” said Joseph Allen, an environmental scientist and director of the Healthy Buildings program at the Harvard T.H. Chan School of Public Health. “We want to know what’s in it.”

Substances such as PFAS, or per- and polyfluoroalkyls, a group made up of thousands of different chemicals, have long been used in furniture, carpet, clothing, paint, nonstick pans, and dozens of other products to help them resist grease, oil, water, and heat. They are known as a “forever chemicals” because they never fully break down.

PFAS and other chemicals, such as flame retardants and phthalates, leech out of products and settle in the dust on tables, chairs, and in carpets. The dust ends up on people’s hands, and is often inadvertently ingested. Some of these chemicals can build up in the body and have been linked to diabetes, cancer, thyroid disease, immune system dysfunction, and deficits in children’s cognitive development.

Harvard formally launched its Healthier Building Academy to reduce chemicals of concern in 2016, and the university’s Smith Campus Center renovation was its first project. It targeted interiors for removal of at least three of the most toxic chemical classes in building materials — PFAS, chemical flame retardants, and antimicrobials — from as much of the carpet, flooring, and furniture in the center as possible, said Heather Henriksen, Harvard’s chief sustainability officer.

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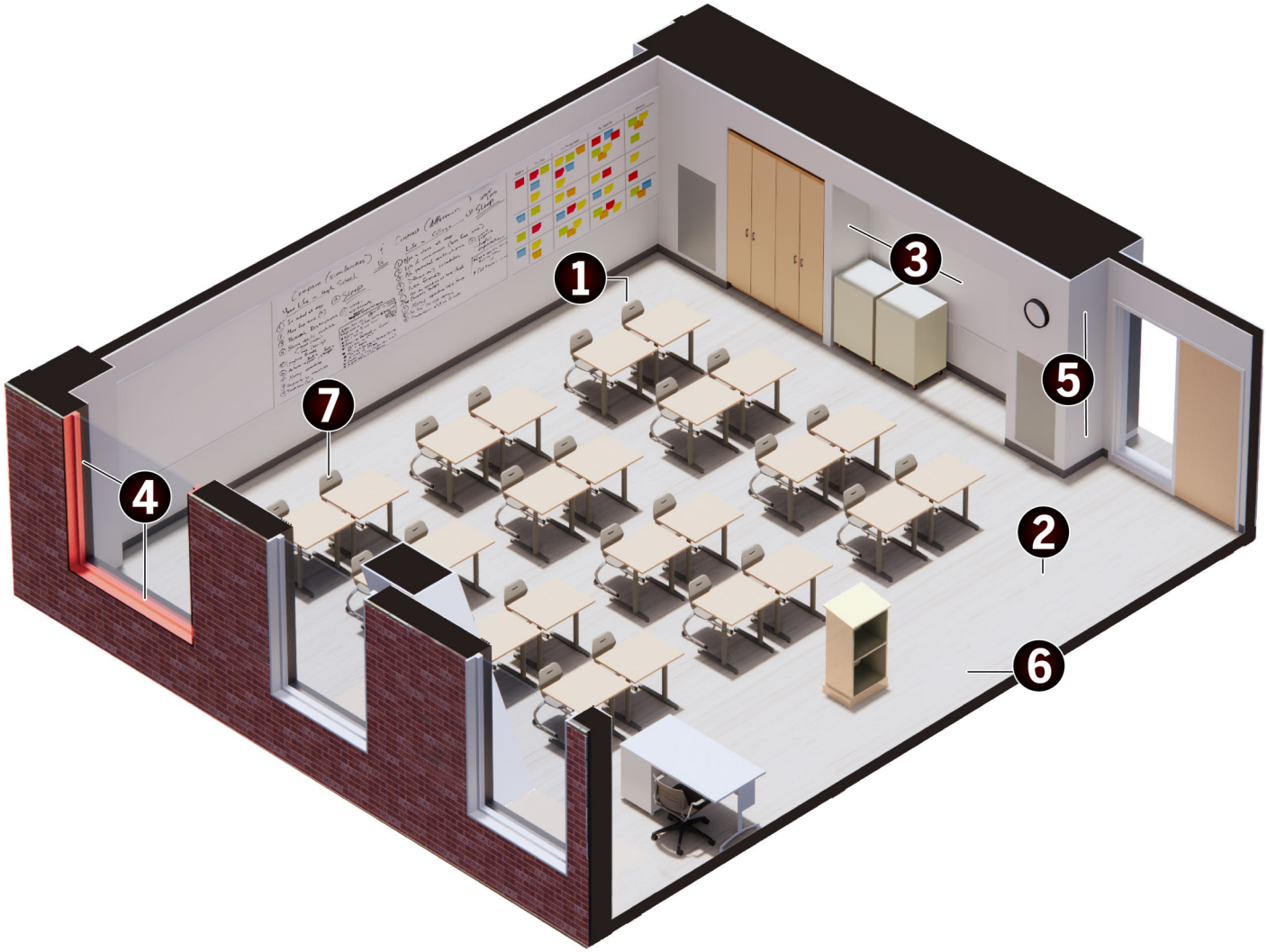
To date, the university has used this approach in 43 construction and renovation projects representing over 3 million square feet, and has built a list of manufacturers who now provide ingredient transparency in more than 30 products, including furniture, flooring, window treatments, and ceiling tiles.

HMFH Architects, the Cambridge firm designing the $305 million Bristol-Plymouth Regional Technical School, is reviewing lists of chemicals in thousands of products potentially used in the new school. The team is trying to reduce the number of toxic chemicals in many surfaces likely to be touched by students and staff, such as carpets, paint, linoleum, window shades, even toilet fixtures. The schematic below shows what a typical classroom in the school might look like and some of the more common chemicals the team is targeting.



1. **Water and stain repellants known as PFAS are often found in chair fabric**
2. **Phthalates are found in some vinyl floor coverings**
3. **Phthalates are also found in some paints**
4. **Phthalates are found in caulk**
5. **Flame retardants are found in some paints and coverings**
6. **Flame retardants are found in some rebonded carpet padding**
7. **Flame retardants are also found in some furniture material**

Source: HMFH Architects and Green Science Policy Institute

But significant challenges remain, most notably the issue of chemical whack-a-mole. As manufacturers phase out these chemicals, they are often replaced with ones that are later discovered to be just as problematic, said Anna Young, associate director of Harvard's Healthy Buildings Program.

"We know there are 4,700 types of PFAS on the market," Young said. "We are trying to reduce PFAS as an entire group of chemicals, instead of trying to regulate them one at a time."

In a study published last year, Young and her colleagues tracked 255 office workers from 36 buildings in the United States, Britain, India, and China, who each wore a silicone wristband for four consecutive days in the office. The wristbands absorb chemicals from the air, dust, and products people interact with and have proved to be an accurate proxy of the substances people inhaled and ingested.

"We found that office workers were being widely exposed to chemicals used in building materials," she said. "They are exposed to even legacy chemicals that were phased out in the countries decades ago."

"The decisions we make today," Young added, "are going to have decades-long impact."

Harvard's sustainability team is now advising HMFH, the Cambridge architecture firm

designing the new Bristol-Plymouth Regional Technical School. Architects specify in their building plans the types of materials to be used in the project, everything from roofing to paper towel holders, and the HMFH team has been spending months talking with manufacturers and scrutinizing lists of chemicals in thousands of products.

“We are starting with all the touch surfaces in the schools: carpet, linoleum, paint, window shades, everything down to the toilet fixtures,” said Tina Stanislaski, principal architect.

“Then maybe we’ll consider things in the wall like insulation and wiring. Wiring has tons of bad stuff in it,” Stanislaski said. “The more you dig into it, the more you find out. And you think, ‘Oh God.’ ”

Because the project is subject to public contracting and bidding laws, Stanislaski faces larger hurdles than projects at Harvard, a private school.

“If we specify materials, they have to be durable and have to last for 50 years,” she said. “And they have to be close by so we are not importing things from [faraway places like] Norway. And they have to be affordable.”

Plans are for the new school to open in the fall of 2026.

Much of the pioneering work for removing such chemicals from products has been done by Arlene Blum, executive director of the Green Science Policy Institute in California. Blum’s work is credited with persuading manufacturers to significantly reduce the amount of PFAS in carpeting, and her institute has made inroads in the level of flame retardants in furniture.

“Changing the manufacturing processes is really expensive,” Blum said. “In addition to having healthier ingredients, you still have to have a functional product.”

Blum said flame retardants often delay ignition by only a few seconds and can make fires more dangerous due to increased smoke and toxic gases. The institute has concluded that

other methods, including self-extinguishing cigarettes, photoelectric smoke detectors,

sprinkler systems, fire safety education, and accessible escape routes can be more effective and healthier ways to prevent fire deaths.

Blum said the Institute's Buyers Club — a group of large companies that use their considerable combined market clout to negotiate safer materials in building and renovation projects — is starting to focus on finding less toxic adhesives and sealants, substances that are used in flooring and furniture, as well as for caulking, between joints in floors, and between doors and walls.

In addition to Harvard, members of the club include Google, Kaiser Permanente, Salesforce, and Facebook (Meta).

The Bristol-Plymouth Regional Technical School project is benefiting from Harvard's early work, being introduced to manufacturers with less toxic products.

McCarthy, executive director of the Massachusetts School Building Authority, is hopeful but pragmatic about bringing this chemical-removing initiative to more schools.

"We are in our infancy trying to do this and ... we can't do it all at once," he said. "Eventually I want to have zero of these chemicals in any of the buildings we touch."

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