Spare Parts

INTRODUCTION

BRIEF BIOGRAPHY OF JOSHUA DAVIS

Joshua Davis grew up in California. After graduating college, Davis worked several odd jobs in his early twenties before co-writing an article with a friend for a local San Francisco paper, starting his journalism career. In 2001, Davis became part of the U.S. Arm-wrestling Team and traveled internationally to compete, though he has never won a competitive match. He directed a documentary film about his experiences and won Best Documentary at the Telluride Mountain Film Festival. In 2003, Davis covered the Iraq war for *Wired* Magazine and became a Contributing Editor. In 2005, Random House published Davis's memoir, *The Underdog*, which details his journey through some of the world's most outlandish competitions. In 2013, Davis and Joshuah Bearman formed EPIC, a magazine devoted to telling extraordinary true stories. In 2014, Davis published *Spare Parts*, which was then made into a feature film. He currently lives in San Francisco and continues to write for both *Wired* and EPIC.

HISTORICAL CONTEXT

Davis's account calls for change in American immigration policies, which have been the source of ongoing debate for several decades. This policy became particularly contentious after the system of immigrant quotas (under which each nationality was assigned a quota based on its representation in past U.S. census figures) was abolished by the Immigration and Naturalization Act of 1965. This bill also provided for preferences to be made for those who were relatives of U.S. citizens or permanent residents, those with skills deemed useful to the United States, or people who were refugees of violence or unrest. Through the 1970s, 80s, and 90s, immigrants continued to pour into the United States, spurring the Immigration Reform Act in 1986, which sought to create more possibilities to seek legal immigration. Still, there exists a large population of undocumented immigrants in the United States, particularly from Latin American countries. Estimates in 2015 put the number of undocumented immigrants at 11 million people. Various administrations have sought to reform immigration policies: President George W. Bush ordered 6,000 members of the National Guard to patrol the U.S.-Mexican border in an effort to deter people from crossing. President Obama issued an executive order instructing the government to defer deporting young undocumented immigrants who were brought to the U.S. as children as part of the Deferred Action for Childhood Arrivals (DACA) program. President Trump believes DACA to be unconstitutional, and as of 2018 the program is in limbo as it is being reviewed by courts in several states. President Trump has also made building a more secure border wall a centerpiece of his platform.

RELATED LITERARY WORKS

Spare Parts blends journalism with a narrative style to show the journeys of these four boys and their path to winning the competition while also documenting the larger political forces at work and how they shape their immigration stories. Books that touch on similar stories of immigration include *Enrique's Journey*, which describes one boy's tale of journeying from Honduras to the United States, and Reyna Grande's *The Distance Between Us*, which is a memoir of Grande's own experience immigrating from Mexico to the U.S., where she becomes the first member of her family to graduate from college. In documenting the unlikely success of the Carl Hayden students, Davis's book also has some stylistic similarities with Malcolm Gladwell's *Outliers*, which investigates the factors that contribute to unique and exceptional success—and also how some people are prevented from success through various cultural phenomena.

KEY FACTS

- **Full Title:** Spare Parts: Four Undocumented Teenagers, One Ugly Robot, and the Battle for the American Dream
- **When Written:** 2004-2014
- **Where Written:** Arizona, California
- **When Published:** 2014
- **Literary Period:** Contemporary
- **Genre:** Nonfiction
- **Setting:** Mexico, Arizona, California
- **Climax:** The Carl Hayden students win the 2004 MATE underwater-robotics competition
- **Antagonist:** U.S. immigration policies, poverty
- **Point of View:** Third person

EXTRA CREDIT

Almost like a movie. Davis first wrote about the Carl Hayden students in the magazine *Wired* in 2005 prior to writing *Spare Parts* in 2014. This article led to a film version about the students' triumph in the MATE competition, starring George Lopez as their teacher.

An inspiring contribution. After Davis published his article in *Wired* in 2005, readers of the magazine subsequently raised over $120,000 in scholarship money for the four students.

PLOT SUMMARY

The book opens at the 2004 MATE underwater-robotics competition, where Oscar Vazquez, Cristian Arcega, Lorenzo Santillan, and Luis Aranda are giving their technical presentation about the robot they've built. The judges, Tom Swean and Lisa Spence, are impressed that these high school students from a poor neighborhood in Phoenix have built a robot that can compete with schools like MIT. The team answers the judges' questions about their robot well.

Davis then gives background on each of the characters, all of whom were born in Mexico and were brought to the United States by their parents in the hopes of finding better work and providing their kids better opportunity. Each of the kids also becomes an outsider, however. Lorenzo is mocked in school for his odd-shaped head and mullet; subsequently, he spends a lot of time helping his godfather Hugo in his makeshift auto repair shop, learning how he comes up with creative solutions to different car troubles. Cristian is a skinny kid who has a hard time in school in America at first because he doesn't speak English, but gradually rises to the top of his class. He also watches a home improvement show and is fascinated by the power tools. When he starts high school, his friend Michael Hanck introduces him to Fredi Lajvardi, the marine science teacher who also runs the robotics club. Oscar also feels like an outcast in the U.S. until he joins the ROTC. With the help of Major Glenn Goins, the group's instructor, Oscar becomes a real leader. But, he realizes that because he is undocumented, he cannot enlist in the army. Luis also has few friends in school because he is 250 pounds, six feet, and very quiet, and so other students are intimidated by him.

Davis also describes the rough climate in Arizona surrounding immigration around this time. Police raids are constant, catching 432 undocumented immigrants in one sweep in a Phoenix suburb in 1997. They pull family members out of their homes in the middle of the night, often targeting Hispanic people specifically. Joe Arpaio, the sheriff or Phoenix's county, believes that immigrants are a drain on resources and that they only bring a culture of "gangs, crime, drugs, and violence."

Fredi has his own immigration story: he was born in Iran and then moved to the United States, gaining citizenship at nineteen years old. Fredi's classroom philosophy is one of getting the kids excited about learning through hands-on activities. He starts a robotics club at Carl Hayden and recruits another teacher, Allan Cameron, to help. Cristian and Lorenzo arrive at the club around the same time, in May 2003. Fredi gets Cristian excited about the pumpkin-launching trebuchet they are going to build the following school year, and takes Lorenzo under his wing, trying to provide him with some direction. In the fall of 2003, Lorenzo, Cristian, and Michael Hanck start work on the trebuchet. Fredi sees that the young students need direction, and so he asks Oscar to join the club to serve as a leader figure. The four students build a catapult together, but they realize it might be helpful to have someone strong on the team who can help with some of the labor tasks. Fredi offers Luis, who is in his Marine Science Seminar, the chance to work on the robotics club for his class project.

After the students complete the catapult project, they get started on preparing for the 2004 MATE underwater robotics competition. They must design a robot that completes a variety of difficult tasks, like measuring the length of a submarine, testing water temperature, retrieving objects, and extracting a liquid sample underwater. The students raise $900 for the robot from various friends and local businesses. They create a model for their ROV and start to test different mechanisms to complete the tasks. Lorenzo comes up with the idea to use a tape measure to calculate the submarine's length, but they need another strategy to calculate depth. They call Greg De Trey, who sells laser tape measures. When they ask him for advice, he agrees to loan them one of his devices. The same thing happens when they ask other companies about a device that measures temperature and a pincer that can complete their retrieval tasks. The students then start to assemble their robot, buying PVC pipe and testing different ways to ensure the ROV won't be too light.

The team offers the students a sense of belonging, to the point where Lorenzo spends most of his time working in the robotics closet instead of doing his homework. Fredi tells Lorenzo has to get his grades up in order to remain in the club, and Lorenzo starts studying harder and sitting in the front of the class. Inspired by his dedication, the other students follow suit.

Lorenzo comes up with a plan for the ROV's hardest task: extracting a liquid sample from a barrel. He decides to use a simple balloon, a sump pump, copper tubing, and a milk carton to hold the balloon. Both Lorenzo and Fredi are really proud of the ingenious solution he creates. Oscar and Luis also test various motor placements to see which configuration would give them the most power and mobility.

While Lorenzo, Cristian, Oscar, and Luis are working on the MATE competition, the larger Carl Hayden robotics club is also participating in another competition (called the FIRST competition). They must create a robot that collects basketballs and, for bonus points, does a pull-up. They decide to create one that only does a pull-up, which would gain them as many points as collecting ten basketballs. They end up winning 21st place out of 36 teams, but they also win the Engineering Inspiration award. They then travel to Atlanta for the regional championship, where they place 39th out of 73 teams.

After Atlanta, the kids have ten weeks until the MATE competition. The four students have grown to be good friends, and Oscar and Luis graduate from high school. But, they still have to complete the final steps to prepare for the competition. The first is to glue the robot together, which they must do quickly because the glue dries fast. They encounter an issue

when the PVC pipes don't line up with the briefcase housing the robot's battery, but Lorenzo has the idea to use a heat gun to bend the pipes, which works perfectly. They dub the robot "**Stinky**" because of how bad the glue smells.

The four students take Stinky to a nearby Scuba facility to practice. Michael Hanck is also there to help pilot the robot. They practice controlling it and make sure that its buoyancy and balance is right. The team starts to get hopeful about their chances as they become more comfortable completing the various tasks. The day before their departure, however, Fredi and Allan say that Michael cannot join them, as he hasn't gotten his grades up enough to stay in the club. Oscar will pilot the robot instead. Oscar and Cristian are able to practice together for a small amount of time that day.

The next day, the students leave at 4 a.m. for California, where the competition is held. When they test their robot in the pool, they discover a leak. They complete their oral technical presentation and then work on fixing the leak. Lorenzo comes up with the idea to use tampons to absorb excess water, and then Lorenzo and Oscar stay up all night re-soldering the connections to the controls.

At the competition, the students are able to complete many of the tasks, including the water sampling task, which even MIT isn't able to complete. They gain a total of thirty-two points, placing them in third behind MIT and Cape Fear Community College. The final standings will be determined by these scores and the technical presentation evaluation. At the awards ceremony, the Carl Hayden students pull an amazing upset, winning an award for special achievement, the Design Award, the Technical Writing Award, and Overall Winner—beating out MIT. The rest of the participants roar with applause, and the kids are giddy with happiness.

Davis spends the rest of the book tracking the characters after their success: Lorenzo and Luis go on to culinary programs, start a catering business together, and work odd jobs in order to pay the bills. Lorenzo and his family are evicted from their home in 2009.

Cristian graduates and goes on to Arizona State University, but because Arizona passes a bill that prohibits undocumented youths from qualifying for in-state tuition, Cristian's tuition quadruples between his freshman and sophomore year and he is forced to drop out. He then works at Home Depot and creates inventions in his room at night.

Oscar also goes to ASU and distinguishes himself as a leader there. When he experiences the same tuition increase that Cristian does after his sophomore year, the school works to help him pay for his tuition. He graduates in 2009, also newly married and with a daughter on the way. But he realizes that his job prospects are dismal without a green card, and he decides to deport himself. Back in Mexico, he applies for residency in the U.S. but is denied.

Meanwhile, Senator Dick Durbin introduces the DREAM Act in 2010 to make it easier for people like Oscar who have lived in the U.S. for five years and attended college to get citizenship, bringing up Oscar's story specifically in the Senate. The bill fails, but Durbin asks U.S. Immigration to reconsider their stance on Oscar's application. He is then approved for his green card, returns to the U.S., and is able to enlist in the Army. When he returns from his tour in Afghanistan, Oscar works for a train company.

Davis ends his book by comparing the real-life story to the movie that was made about the students in 2013, which ended with the awards at the MATE competition. He notes that the movie allows them a happy ending, an ending that "continues to elude some of the individuals portrayed in the story" because of the laws and the immigration policies in the United States.

CHARACTERS

MAJOR CHARACTERS

Oscar Vazquez – One of the four students who compete in the MATE competition as a part of the Carl Hayden robotics club, along with Cristian, Lorenzo, and Luis. Oscar and his mother, Manuela, followed his father Ramiro to the United States when he was eleven years old, leaving behind his sister Luz and his brother Pedro. They were given green cards for other people and shepherded over the border by two older women in a bus. His mother was not happy in the U.S. without her daughter, though, so the pair returned. When Luz married, Manuela wanted to give Oscar more opportunity, so they journeyed once again to the U.S. with the help of two coyotes. In high school, Oscar proves himself a natural leader in the high school's Junior ROTC. But when he finds out from Major Glenn Goins that he cannot enlist in the army because he is undocumented, Oscar seeks out a new group to lead. Oscar joins the robotics club, helping to ground the younger students' ideas and doing crucial outreach that gives the club more funding and provides them with necessary equipment. Oscar graduates high school just before the robotics competition, and soon finds himself working as a day laborer. When Joshua Davis breaks their story in *Wired*, readers donate scholarships and Oscar subsequently attends Arizona State University, getting married to Karla Perez while he is in college. When his tuition increases based on changing immigration laws, the school helps to support him. After he graduates, he realizes that he will always be haunted by his immigration status, and so he decides to deport himself to Mexico. While working hard as a bean picker, he applies for residency in the U.S. and is rejected. Following this, Senator Dick Durbin introduces the DREAM Act and tells Oscar's story to rally support. The bill fails, but Durbin then reaches out to Immigration to ask them to reconsider their stance on Oscar's application. He subsequently is granted residency, and afterwards is able to

finally enlist in the army as an American soldier. Oscar is the exception, not the rule, of undocumented immigrant kids who are able to find a path to legal residency.

Cristian Arcega – One of the four students who compete in the MATE competition as a part of the Carl Hayden robotics club, along with Oscar, Lorenzo, and Luis. Cristian is the brains of the operation. He grew up in Mexico as a skinny kid with allergies, and so he mostly stayed indoors and took apart any technology he could get his hands on. When he is five years old, Cristian's family drives across the U.S. border. He struggles in elementary school, but when he starts to pick up the language, he quickly excels in every class. Cristian joins the robotics club as a freshman, and he takes the lead on the scientific calculations and programs that need to go into making the **robot** (though sometimes his ideas about how to build the robot are too expensive or outlandish to be feasible). After the robotics competition and he graduates from high school, Cristian also attends Arizona State University. But when his tuition increases, he is unable to receive the same support from the school that Oscar does and he is forced to drop out. At the end of the book, Cristian is working at Home Depot and inventing things in his room at night. His story is placed in direct contrast to Oscar, and also to the students on MIT's robotics team. Even though Cristian has just as much intelligence and talent as they do, the failures of the immigration system mean his promise is largely wasted.

Lorenzo Santillan – One of the four students who compete in the MATE competition as a part of the Carl Hayden robotics club, along with Cristian, Oscar, and Luis. Lorenzo was brought to the United States by his mother Laura because he needed better medical attention for a head injury that he experienced as an infant. In the U.S., Laura is supportive of Lorenzo, but his father Pablo can sometimes be abusive. Lorenzo goes through elementary school and high school largely looking for a group of people to which he can belong. He has an odd-shaped head and grows a long mullet, which leads many students to tease him. He tries to join a gang, and when that fails, he attempts to join the marching band. When that also proves unsuccessful, he watches his godfather Hugo work in a makeshift auto repair shop, observing how he makes creative uses of the tools he has. Lorenzo soon meets Fredi, who takes him under his wing and introduces him to the robotics club. In the club, Lorenzo takes the lead on coming up with cheap, practical, and creative solutions on how to build the **robot: for instance,** engineering a water sampling mechanism with a balloon and a sump pump, or coming up with the idea to use tampons to soak up leaking water. After the competition, Lorenzo's family is evicted from their home, and like Cristian, he finds that his potential mostly stagnates. He goes to culinary school and starts a catering business with Luis, but still has to pick up odd jobs to make ends meet.

Luis Aranda – One of the four students who compete in the MATE competition as a part of the Carl Hayden robotics club, along with Oscar, Lorenzo, and Cristian. Luis was brought by his mother, Maria Garcia, to the U.S. to give him better educational opportunities, and ultimately his father Pedro is able to get him and the rest of the family green cards. Through middle school and high school, Luis also starts working in various restaurants to help support the family. Luis is not particularly interested in school, but he understands the sacrifices his parents have made for him to go. During his senior year, Luis takes Fredi's Senior Science Seminar and Fredi tells him he can get credit by joining the robotics team (particularly because the kids need a little more strength on their team to help build the **robot**). Luis serves as the brawn of the operation, at six feet tall and 250 pounds. He is also a very quiet kid, and so most students in the school leave him alone because they are intimidated by him—that is, until Oscar befriends him. Luis proves crucial in not only helping the other students to build the robot, but also when he shows the judges that he has also been learning the science behind the machine they've built. Like Lorenzo and Cristian, Luis also has a hard time building a successful life after the competition. He starts a catering business with Lorenzo, but mostly he works as a garbageman.

Fredi Lajvardi – The teacher and advisor for the robotics club at Carl Hayden. Fredi grew up as an Iranian immigrant and was often made fun of and even beaten up in high school, particularly during the Iranian revolution and the taking of hostages in the American embassy in Iran. In high school, Fredi's parents expect him to become a doctor, but with the help of his own science teacher, Ann Justus, Fredi realizes that he's meant to be a teacher. Fredi's classroom philosophy is based on hands-on learning, getting the kids to learn by making science fun. Fredi also becomes very invested in afterschool programs for the kids. Even with a wife and two children with special needs, Fredi dedicates a lot of time to the robotics club, particularly in taking Lorenzo under his wing and giving him a sense of belonging in the club. With Allan Cameron, Fredi encourages the students to think outside the box when building their **robot**, allowing them to go far beyond what they ever thought they could achieve and win the competition. After the 2004 MATE competition, the robotics team grows even larger and Fredi continues to achieve success with many subsequent years of students.

Allan Cameron – Another teacher at Carl Hayden who helps Fredi with the robotics club. Allan grew up in the 50s as a mischievous kid before serving in the Navy during the Vietnam War. After he returns, he decides to become a teacher in the very new field of computer science. He learns how to encourage kids by pushing them away from the low expectations that everyone has of them and that they have of themselves. When Fredi asks him to help him the robotics club, Allan readily accepts and helps Cristian with the **robot**'s

programming, and also with the group morale in general. After the competition, Allan helps lead the robotics club to future successes. He and his wife Debbie also help Oscar after he deports himself, bringing him furniture, appliances, and anything else he might need to start a new life in Mexico before he is able to return. Even after retiring, Allan still volunteers his time with the robotics team.

Joshua Davis – The author of the book. Davis largely absents himself from the narrative, with one exception. Davis breaks the story about Oscar, Cristian, Lorenzo, and Luis for *Wired* for the first time in 2005. As a result, readers from all over the country send money to chip in for the students' college education, ultimately raising over $120,000. To Davis, it is also important to tell both sides of the students' story: the successes and the struggles. He makes a point of noting how the movie version of their story ends in triumph, while real life is much more complicated than that. For him, the book is a way of showing how much potential kids can have—even undocumented kids from a poor neighborhood—but how as a result of the U.S.'s immigration policies, that potential is currently being thrown away.

Michael Hanck – Another student who is a part of the larger robotics team at Carl Hayden. He is Cristian's age and invites Cristian onto the team. Michael helps build the pumpkin-throwing trebuchet, but when the robotics team starts to work on the **robot**, Michael's participation is more haphazard. He has a hard time in school and struggles to maintain his grades. Subject to Fredi's rule that if he cannot keep his grades up he cannot be on the team, Fredi and Allan announce that Michael will be unable to go on the trip to Santa Barbara just one day before they leave, forcing the other students to adapt and shift Michael's responsibilities to Oscar.

Joe Arpaio – The sheriff of Maricopa County (the county that includes Phoenix). Arpaio holds deep-seated prejudices about Mexican immigrants and inspires citizens to form vigilante posses, many of which use violence or intimidation tactics in order to scare immigrants out of the country. Arpaio also orders officers into predominantly Latino neighborhoods and tells them to enforce all traffic laws so that they can catch people on minor infractions and then deport them. The Department of Justice eventually determines that his office is discriminatory, and in 2011, the government revokes his authority to detain immigrants.

Major Glenn Goins – The instructor of Oscar's high school ROTC group. Goins teaches Oscar leadership, dedication, and also that the Declaration of Independence gives rights to all people, not just American citizens. Goins is impressed with Oscar, promotes him to cadet major, and awards him the Officer of the Year trophy. Oscar looks up to Goins and hopes to enlist after high school, until he realizes that he is unable to because of his immigration status.

Ann Justus – Fredi's high school science teacher. Justus not only inspires Fredi's philosophy of emphasizing hands-on work and making classwork exciting, but she also inspires Fredi to be a teacher. Even though he goes to college to become a doctor, she tells him that he is meant to be a teacher, and he follows her advice and starts taking education classes.

Russell Pearce – An Arizona State representative who in 2004 gives a speech saying that he views the immigration policies in America as being too lenient on immigrants and not good for the country. When the Carl Hayden team's story breaks, he also urges people not to get too emotional in reading about their story when there is so much damage to the country as a whole due to undocumented immigrants.

Dick Durbin – An Illinois Senator who introduces the DREAM Act in 2001. It fails to make it to a vote. In 2010, he reintroduces the bill and talks about Oscar as a prime example of a person for whom the government would want to ease the path to citizenship. When the bill is blocked again, Durbin contacts the U.S. Citizen and Immigration Services and asks them to reconsider their stance on Oscar's application. As a result, Oscar's residency application is approved.

Laura Alicia Santillan – Lorenzo's mother and Pablo's wife. After accidentally dropping Lorenzo on his head as a child, she takes him to the United States to get better medical attention. She and Pablo then decide to stay in the United States because there is more opportunity for work there. She works as a hotel maid to help support the family. Laura is very supportive of some of Lorenzo's eccentricities, like growing his hair into a mullet.

Pablo Santillan – Lorenzo's father and Laura's husband. He moves to the United States with Laura, Lorenzo, and José when Lorenzo is an infant and gets work as a landscaper. He has a hard time adjusting to life in the United States and drinks heavily to cope. Sometimes he is kind to Lorenzo; other times he is abusive.

Hugo – Lorenzo's godfather. Hugo has set up a makeshift auto repair shop in his driveway, and Lorenzo cleans the tools for him. Hugo doesn't have a lot of money or equipment, and so he must be creative in coming up with solutions to fix the cars. Lorenzo gets some of his ingenuity from watching Hugo work.

Dean Kamen – A young inventor who starts the annual FIRST (For Inspiration and Recognition of Science and Technology) robotics competitions in order to get kids more interested in science and technology. Cristian, Oscar, Lorenzo, and Luis compete in the FIRST competition in 2005, in which students are meant to build a robot that plays basketball.

Donald Rodocker – The president of SeaBotix, an ROV manufacturing company. Rodocker takes Oscar and Luis on a tour of his facility during a class field trip. He also allows Oscar to borrow a pincer prototype, which he is no longer using, for their competition. This allows them to complete the tasks in

which they have to retrieve objects.

MINOR CHARACTERS

Frank Swankoski – A temperature engineer at a thermometer supplier in Connecticut. Oscar calls him to get advice on a temperature-reading task in the competition. Swankoski is impressed with the boys' initiative and donates a thermocouple to the team.

Greg De Trey – The owner of Distagage, a company that sells laser tape measures. De Trey gives Oscar and the team advice, testing his laser for them to see if it would work underwater. He also offers to let them borrow one of his devices.

Ms. Hildebrandt – Cristian's eighth grade chemistry teacher. Ms. Hildebrandt encourages him to work on independent projects, which inspires him to conduct his first experiment: exploring the effect of different fin designs on a rocket.

Leticia Arcega – Cristian's mother and Juan's wife. Leticia crosses the border with Cristian in order to join Juan, who goes ahead of them to send money back to the family. Leticia encourages Cristian's experiments by giving him toys that he can take apart and put back together.

Juan Arcega – Cristian's father and Leticia's husband. Juan travels to the United States looking for better work opportunities. He goes ahead of Cristian and Cristian's mother, and later the family rejoins him in the U.S.

Ramiro Vazquez – Oscar's father and Manuela's husband. He sells a pig in order to travel to the United States so that he can make more money working in a factory. Ramiro is deported, but works to return to the United States with his family.

Manuela Vazquez – Oscar's mother and Ramiro's wife. When Oscar's father Ramiro leaves for the United States, Oscar and Manuela join him, but Manuela is heartbroken, having left her daughter Luz behind. Only after Luz marries does she see the benefit of the United States for Oscar.

Pedro Aranda – Luis's father and Maria Garcia's husband, who travels ahead of Maria Garcia and Luis to the United States to find work. Eventually, he obtains permanent residency and is able to get green cards for Maria Garcia and Luis.

Maria Garcia Aranda – Luis's mother, and Pedro's wife, who brings him to America so that he might have a better life than she and her husband do.

Tom Swean – One of the judges in the technical presentation portion of the MATE ROV competition, along with Lisa Spence. Swean runs the Navy's Ocean Engineering and Marine Systems program.

Lisa Spence – One of the judges in the technical presentation portion of the MATE ROV competition, along with Tom Swean. Spence is the flight lead at NASA's Neutral Buoyancy Laboratory.

Bryce Merrill – The host of the awards ceremony at the MATE ROV competition, who is also a recruiting manager for an industrial ROV firm.

Tina Lowe – The woman who runs the Scuba Sciences facility, where the Carl Hayden students use the pool to test drive their **robot**.

Harold – Luis's boss at the restaurant. Hearing about Luis's participation in the underwater-robotics competition, he is so impressed that he writes a check for $100 for the team.

Pam Nuñez – Fredi's wife. Pam is the school psychologist, but she takes time off of work after having their two kids, Alex and Bijan.

Karla Perez – Oscar's girlfriend, whom he meets while he is in college. They eventually marry and have a daughter.

Bijan – Fredi and Pam's older son, who has Asperger's syndrome.

Alex – Fredi and Pam's younger son, who is diagnosed with pronounced autism at two years old.

Reza Lajvardi – Fredi's father.

Tooran Lajvardi – Fredi's mother.

Alladin (Ali) Lajvardi – Fredi's younger brother.

José Santillan – Lorenzo's older brother.

Pedro Vazquez – Oscar's older brother.

Luz Vazquez – Oscar's older sister.

TERMS

Remotely operated vehicle (ROV) – A tethered, underwater robot. ROVs are usually piloted by a crew on land via cables that send signals and power to the robot. In *Spare Parts*, the Carl Hayden students compete in the MATE competition, which requires them to build an ROV. This ROV (which they dub "Stinky") must be able to complete several tasks, including retrieving items, measuring depth, extracting water samples, and calculating temperature.

DREAM Act – An Act introduced in 2001 by Senator **Dick Durbin** to help provide a path for undocumented immigrants who had arrived in the U.S. as children and who had attended college. "DREAM" is an acronym for Development, Relief, and Education for Alien Minors Act. In 2001, the bill did not even make it to a vote. Durbin reintroduced the bill in 2010, speaking about **Oscar**'s story on the floor of the U.S. Senate to try to persuade others to support the bill. The vote was blocked, however, by a Republican filibuster. In June 2012, President Barack Obama announced that his administration would stop deporting undocumented immigrants who matched criteria included in the DREAM Act (often known as "dreamers") under a new program called the Deferred Action

for Childhood Arrivals (DACA) program. Thousands applied, including **Cristian** and **Lorenzo**. Since then, the Trump administration has rescinded the program, and as of 2018 the program is in limbo as several courts debate its constitutionality.

Coyotes – A slang term for smugglers who facilitate the migration of people across the Mexico-United States border. When **Oscar** and his mother **Manuela** return to the United States, they find two coyotes who guide them through a hole in the border fence in order to join Oscar's father, **Ramiro**, in Phoenix.

THEMES

In LitCharts literature guides, each theme gets its own color-coded icon. These icons make it easy to track where the themes occur most prominently throughout the work. If you don't have a color printer, you can still use the icons to track themes in black and white.

UNDERDOGS AND OVERCOMING ODDS

Spare Parts centers on the story of four immigrant high schoolers living in a poor neighborhood in West Phoenix, Arizona, and their extraordinary path to winning a national underwater robotics competition against teams from prestigious colleges like MIT. The four students—Oscar Vazquez, Cristian Arcega, Lorenzo Santillan, and Luis Aranda—must overcome tremendous odds and obstacles in order to accomplish this achievement, including their immigration status, their lack of funding, and their inexperience in the competition. But Davis does more than simply enumerate the ways in which the team is an underdog; he also demonstrates how being an underdog can actually be an asset, and how the things that make the students and the team different or disadvantaged are also the reasons that they are able to succeed.

Even prior to the robotics competition itself, Lorenzo, Cristian, Luis, and Oscar are outsiders at Carl Hayden Community High School. This outsider status leads them to find a community in and bring a unique perspective to the robotics team. Lorenzo grows up with an odd-shaped head; when he is teased by other students, he grows his hair in a mullet, but that only gives them more reasons to tease him. He isn't able to join a gang because he is too honest, and he also isn't able to join the school marching band because he doesn't know how to play an instrument. To find something to do, he then watches his godfather Hugo work on cars in the makeshift auto repair shop he has set up in his driveway. Thus, what initially is an escape becomes Lorenzo's foundation for building things and working creatively. Cristian becomes an outcast too: in elementary school, he has a hard time making friends because he is still learning English, as his parents had just moved to the United States from Mexico. He is too tiny for sports and also develops allergies early in his life, and as a result he spends much of it indoors. This leads him to watch Bob Vila's home improvement show and to try to take apart any technology he can get his hands on. His early struggles thus lead him to his interest in engineering and to practical hands-on knowledge that helps him succeed later. Luis, on the other hand, is almost too big for sports. He is six feet and 250 pounds, and he is also generally quiet. His stature and his silence intimidate other kids, and he has a hard time making many friends. However, these are the very reasons that the other students ask him to join the robotics team: he can provide some of the necessary muscle for lifting and building the robot. Oscar finds a community within the ROTC, but his biggest disadvantage is an obstacle that all of the students face: they are living in the country illegally. For this reason, Oscar cannot enlist in the Army, and must instead find another community. This brings him to the robotics team, where his leadership and motivation become invaluable. Thus, like the other boys, he turns a rejection into a path towards a new field.

Once the boys have joined the underwater-robotics competition, their disadvantages (particularly their lack of funding and even their initial lack of knowledge) lead them to come up with creative solutions in building their robot, **Stinky**. The Carl Hayden students are up against vastly favored college teams; MIT's team, for example, has fifteen engineering students and a $10,000 grant from ExxonMobil. By comparison, Carl Hayden has four students competing and about nine hundred dollars in total. But this lack of budgeting causes them to get creative: instead of buying or building with expensive materials, they have to find simple solutions. Instead of using machined metal and glass-syntactic foam to build their robots, for instance, they use PVC pipes. Where MIT students use vacuum-sealed containers and a syringe to get a sample from a barrel, Lorenzo comes up with the idea to use a balloon, copper tubing, and a sump pump. This lesson in simplicity is what earns them the Design Award at the competition, and so their lack of resources actually becomes a helpful limitation. Additionally, the students turn to the experts when they don't know how to solve a task, unafraid to ask for help. One of the robot's requirements is to measure the depth of a mock-up U-boat, and so they call Greg De Trey, who owns a company that sells laser-range finders. When they ask if his equipment works underwater, De Trey not only tests the laser for them, but offers to lend them one of his own—equipment that would normally cost between $375 and $725. The same thing happens when they call Frank Swankoski for advice about measuring temperatures underwater. He gives them expert information and donates a thermocouple to help them. Thus, by not having all the information but being willing to learn, the students are able to gain valuable resources that allow them to triumph as the overall winners in the competition.

As Davis notes, it would be very easy for the students to get caught in a downward spiral of poverty and low expectations. Instead, they are able not only to develop real talents for robotics, but also to overcome the socioeconomic barriers they face in order to succeed. In charting their paths, Davis implies that under the right circumstances, and with motivation and teamwork, any student has the potential to excel, even if they are overcoming severe odds.

IMMIGRATION, PREJUDICE, AND THE AMERICAN DREAM

While Davis shows how the Carl Hayden students are able to overcome almost insurmountable odds in their competition, there is also a less hopeful theme concerning the United States' immigration policies and the detrimental effect they have on the students' lives. Even as the students show immense promise and ingenuity, they and other immigrants are still stereotyped, discriminated against, and have their potential cut short. Davis points out the tragic irony in the fact that the students and many other undocumented immigrants simply want the quintessential American Dream—the idea that every person should have an equal opportunity to achieve success and prosperity through hard work, determination, and initiative—but are denied this opportunity simply because of the technicality that they were not born on U.S. soil.

The book's first few chapters document the reasons that each of the students' families come to the United States, and their journeys to get to Arizona. Here Davis shows that they are in fact risking everything and working exceptionally hard to make sure that their children have a better life, contrary to many of the stereotypes that people hold about them. Lorenzo's mother Laura brings Lorenzo to the U.S. to receive better medical attention for a head injury he experiences as a child. But once they are in the U.S., they decide to stay so that the family might get better opportunities to work: Laura works as a hotel maid, while Lorenzo's father, Pablo, works as a landscaper. Oscar's father, Ramiro, goes to the United States without the rest of his family so that he can send money back to support them. When they have enough money, Oscar and his mother Manuela join Ramiro, traveling to the U.S. for eight months before deciding to come over permanently. The second time they enter the U.S., they risk a dangerous journey with two coyotes (people who smuggle immigrants across the border). Cristian and Luis have similar stories: their fathers go to the U.S to find better working conditions so that they can support their family better. The families soon realize that America will give their sons more opportunities for success, and so the rest of the family moves with them. Cristian doesn't remember much about crossing the border because he sleeps in the car on the way there, but Luis and his mother Maria Garcia sneak through a hole in a chain link fence on the border, risking getting caught or separated. By highlighting the difficulty and danger inherent to coming to the U.S., Davis underscores these immigrants' strength and the depth of their desire for better lives and opportunities—laudable qualities that, in theory, are essential to fulfilling the American dream.

Davis contrasts these personal stories with perceptions and laws enacted in America: he notes throughout the book that many people are prejudiced against immigrants, believing that they are lazy, involved in crime, and draining resources from citizens. The actions taken by legislators and law enforcement reflect this deep prejudice. As the story progresses, Davis gives background info on the raging immigration debate in America. In 2004—the year of the robotics competition—Arizona passes several laws, including Propositions 200 and 300, which make it impossible for undocumented immigrants to receive public benefits, despite the fact that most of them pay taxes. Senator Dick Durbin proposes the DREAM Act in 2001, which tries to provide a pathway to citizenship for young immigrants who had been in America for at least five years and were attending college, but the bill fails to even make it to a vote. When he reintroduces it in 2010, Senate Republicans block the vote. The lawmakers are uncompromising when it comes to giving children a helping hand, because they argue that it is a reward for illegal activity. Durbin points out, however, that it is unfair to punish children for the actions of their parents.

Even beyond the laws, there is deep discrimination that runs rampant in the country's citizens and law enforcement. Joe Arpaio, the sheriff of Phoenix's county, views Mexicans as "disease-carrying criminals." He creates civilian vigilante posses to literally hunt for undocumented immigrants and inspires others to do the same. There are constant law enforcement raids in which police use discriminatory policies to find, arrest and deport people—once as many as 432 in one night.

After illuminating the discrepancy between American perception and reality regarding immigrants, Davis finishes by showing readers how those policies fail Lorenzo, Cristian, Oscar, and Luis. Even though the students show incredible promise, they are unable to escape the consequences of policies that make it impossible for them to go to college or hold down steady jobs. Lorenzo and Luis do not go to four-year colleges, instead, attending culinary programs and starting a catering business together. When that doesn't make them enough money, they pick up odd jobs in restaurants or taking out the trash.

The students win the robotics competition in 2004; in April 2005, Davis breaks their story in *Wired*. Cristian goes to Arizona State University with financial help from readers who want to chip in, but because of the newly-enacted Proposition 300, tuition quadruples after freshman year and Cristian is forced to drop out. Thus, the most promising member of the group is forced to work at Home Depot and content himself with inventing things in his room at night. Oscar's story is a

little more successful: he is also able to go to Arizona State University with financial help from the *Wired* readers. When he experiences the same tuition increase, the school is able to support him for his final year. Following college, however, he still worries about his job prospects. Realizing he wants to do things the right way, he deports himself and then applies for residency in the U.S. His residency is denied, however, until Senator Durbin steps in to help him get the decision reversed.

After Davis publishes his article, and while he is still writing *Spare Parts*, a movie is made about the Carl Hayden students in 2013. Davis finishes his book by noting how different his ending is from the movie. While the film ends in triumph at the robotics competition, the book ends on a much more melancholy note, documenting the struggles that the students face after the competition. In ending this way, Davis calls for change in U.S. immigration policies. Even though these boys are brilliant, and all of them consider themselves American, the current policies fail to allow them to live out their potential. They prove themselves completely capable of achieving the American Dream—if only America would let them.

TEAMWORK, FRIENDSHIP, AND MOTIVATION

Each of the Carl Hayden students—Oscar, Cristian, Lorenzo, and Luis—is able to bring a unique skillset to the table as the team prepares for the robotics competition. In addition, the competition demonstrates that, as with all exceptional teams, the students' work together is greater than the sum of its parts. Not only do the students inspire each other and add to each other's work when building their **robot**, but their friendship and teamwork becomes essential in providing them with a purpose and a sense of motivation to achieve their goals.

The team becomes a way of providing the Carl Hayden students with that invaluable sense of belonging that comes with friendship. The students begin the story as outcasts: Lorenzo in particular is constantly teased by other students because he has an odd-shaped head and wears his hair in a long mullet. Luis has a tough time making friends because of his formidable size, and also because he doesn't speak very often. Oscar starts the story as a part of a group with ROTC, but when he finds out that he cannot enlist in the Army due to his immigration status, he seeks out another team that he can be a part of and lead. At first, the students rib each other and are skeptical of each other's suggestions as they focus on their own ideas on how to build the robot. Oscar worries about Lorenzo's dedication, for instance, and Cristian thinks he's smarter than everyone else. As they each take the lead on different tasks that the robot is supposed to complete as a part of the competition, however, they start to respect each other's ideas; for example, when Lorenzo invents a way to test liquid using only a balloon, a milk container, and a sump pump, the other boys start to view him as a valuable member and are friendlier to him.

As they learn to trust each other, they become closer and closer on a personal level. By the end of the book, Lorenzo describes how their club becomes "a new kind of gang" and leads to meaningful friendships beyond the competition. They develop conversational short-hands and inside jokes, which become the sort of friendly trash talk that often characterizes high school relationships. Lorenzo even brings in food from his cooking class for them all to share. It's clear that all four young men gain a community through the robotics team, and that community gives them confidence and the ability to succeed.

Indeed, their friendship is presented as a specific source of motivation for both their group and individual success, and they regularly seek to lift each other up. Oscar, who was a leader in his ROTC battalion, becomes the de facto leader and makes sure to get everyone motivated for the competition. He constantly puts positive spins on anything that goes wrong, so that the other students retain confidence about the progress they are making. Lorenzo goes through a personal transformation as a result of the club. Initially, he is late to their meetings and is also a jokester, which prevents Oscar from trusting him fully. When Lorenzo lets his grades slip as he dedicates more and more time to the robotics club, the leader of the program, Fredi, tells him to get his grades up or he can no longer be a part of it. Lorenzo proceeds to sit in the front of all of his classes and do all of his homework, and as such is able to raise his GPA. By the end, the dedication that Lorenzo shows impresses even Oscar. When Oscar has to stay up until 2:30 a.m. the night before their competition re-soldering their controls, Lorenzo offers to stay up with him, and Oscar feels immense respect and gratitude for his teammate. Impressed by Lorenzo's dedication, Cristian, Oscar, and Luis follow suit in making sure they keep up their grades. This reveals that motivation is contagious and allows the students to succeed in many different facets of their life.

The book shows that there are many reasons and unique circumstances that allow the Carl Hayden students to succeed. But it's clear that without each other's support, they could not have come anywhere close to achieving what they do. The robotics team does what the best kind of communities do: provide a sense of belonging, a means for teamwork, and a constant motivation to improve both oneself and others.

MENTORSHIP

The four Carl Hayden students are extremely self-motivated and support each other while they complete their robotics project, but they certainly don't achieve their success without help. Along the way, they have several mentors that guide them to their success against some of the top schools in the country. Mentorship not only provides the Carl Hayden students with the lessons and

knowledge they need to succeed, but also the inspiration and the confidence to follow their passions and live up to their potential.

Many of the characters in the book have early role models who encourage their successes and give them the tools to follow their aspirations. Cristian has good grades throughout middle school but is largely bored with the work until his chemistry teacher, Ms. Hildebrandt, inspires his first experiment when she suggests that he conduct an independent project. He tests different fin designs on a rocket, and even though the experiment is relatively unsuccessful and the rocket explodes, he becomes so enthusiastic about the work that he immediately tries to find another experiment. Oscar similarly finds his own mentor early in high school: Major Glenn Goins, the leader of the ROTC program at the school. Goins's instruction gives him the discipline and the leadership he needs to succeed not only in the ROTC program, but also in all aspects of his life and eventually on the robotics team. This is proven when Oscar motivates the other students on the team, and runs practice drills on tasks like putting their **robot** together and setting up their command tent at the competition. Fredi, the teacher in charge of the robotics program, also had his own mentor growing up: Ann Justus, his high school science teacher. She emphasized hands-on learning and inspired him to build ever more impressive hovercrafts in successive years. Fredi graduated from high school and went on to college, but comes back to help younger students in her class. Justus then encourages him to become a teacher instead of fulfilling his parents' expectations and going to medical school. This kind of permission and support is what allows Fredi to find something that makes him truly happy. Through all of these relationships, the book implicitly argues for the power of mentorship to push young people to believe in their own abilities.

Fredi, in turn, becomes the best kind of mentor for the Carl Hayden students: he doesn't give them all of the answers, but he creates an enthusiasm for their work and provides them with the necessary support to succeed. Fredi's philosophy in the classroom is based on encouraging the students and getting them excited to learn. He doesn't lecture, instead giving them hands-on projects in which they can feel personally invested. Fredi particularly invests in Lorenzo, whom Fredi sees as slightly adrift. When Lorenzo takes Introduction to Marine Science, he starts hanging around Fredi's classroom. Fredi teaches him to feed the fish in the room and clean their tanks. Lorenzo had never had this kind of responsibility before, and is amazed that someone entrusts him even with the lives of a handful of fish. When Fredi sees Lorenzo's grades drop as a result of his involvement in the robotics club, he tells him he must bring his GPA up in order to stay, thus ensuring his success in multiple aspects of his life. For Fredi, giving the kids the ability to learn and do well is more important than winning. He expresses concerns to Allan, another teacher helping out with the club, that it's important that the students view the experience as valuable and also have the confidence to know that they can compete with other teams. Fredi also makes sure to give the students the tools to overcome their obstacles: he encourages them to reach out to people in order to raise money, and to get advice from experts so that they have a foundation of knowledge and resources to build their robot.

Fredi and Allan's successes don't end with Lorenzo, Oscar, Cristian, and Luis: in 2005 and 2006, the robotics team swells to more than fifty members. They place third and second in the MATE robotics competition, respectively, beating MIT again both times. This continued success proves that teachers in many ways become a child's most valuable resource, because they not only instill them with knowledge, but spark an interest in learning and give them the capacity to believe in themselves. In the end, it is Fredi's original desire for the students simply to go beyond what they think their capabilities are that gives them a pathway to win the entire competition.

CURIOSITY, CREATIVITY, AND ADVENTURE

One of the questions that Davis investigates in *Spare Parts* is the continued issue of how to keep kids invested in school—particularly in math and science—regardless of socioeconomic status. The story focuses on the idea that finding ways to make science fun can get kids excited about intellectual pursuits; the fact that the robotics team is hands-on and creative is a huge part of why the Carl Hayden students become so invested in their project. Davis demonstrates how the sciences can be just as engaging as any other pursuit by harnessing a child's curiosity, allowing them to flex their creativity, and instilling projects with a sense of adventure.

The students easily become hooked on scientific exploration when they find early outlets for their curiosity. Lorenzo's godfather Hugo fixes cars in a driveway near his house; even though Hugo doesn't allow him to help, Lorenzo is curious about how his godfather, who doesn't have a lot of tools or money, comes up with new ideas and adapts to the problems in front of him. This sparks Lorenzo's interest in constructing things and using power tools. Cristian's curiosity is even more apparent than Lorenzo's. At four years old, he takes apart the family radio and plugs it back into the wall to see what might happen. He shorts the power in the house, and inspired by this unexpected result, begins to experiment with his toys and take apart anything he can. He also watches a home improvement show on TV and is instantly smitten by tools like the circular saw and the cement mixer. In both instances, an early interest in machines and building things is what leads them to Fredi's class and the robotics club.

Still, curiosity in and of itself only *sparks* interest. Fredi then

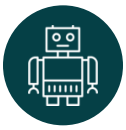
takes this initial desire to learn more about the world and gives the boys the ability to actually be creative themselves. Fredi tries to make his classroom a center for creativity in order to get kids excited about the work they're doing, by playing electronic music and sending students on individual assignments to solve by the end of the period. In doing so, Fredi presents science as almost game-like, and encourages a sense of personal investment that builds up his students' self-worth. Armed with this notion of science as a creative pursuit, when the students are building their **robot** they trust in their ability to come up with inventive solutions to problems. For example, Cristian suggests they put the battery on board the robot to stabilize it, reduce voltage loss, and lessen the number of cables needed, setting them apart from many of their peers in the competition. Lorenzo also comes up with a low-tech solution of a balloon and a milk carton to sample liquid from a barrel. He even comes up with the idea of using tampons to soak up liquid when they discover a leak inside their robot. Finding these creative solutions gives the students an immense sense of pride in their work, which spurs them on even more.

The competitions themselves find ways to capture an adventurous spirit as well, linking a sense of fun to engineering and scientific problem-solving. Dean Kamen starts the FIRST competition, a smaller robotics competition in which the students also compete. The year that Carl Hayden competes, the students must build a robot that collects basketballs and does a pullup, because Kamen realizes that kids are losing interest in sciences in comparison with other pursuits like sports and entertainment. The MATE underwater-robotics competition in which the Carl Hayden students compete also keys in to a sense of adventure. They create scenarios and stories for their competitions to make the kids feel like they're completing a mission: exploring and rescuing a sunken U-boat. And while the competition day creates a sense of excitement, even creating the robot itself is not without its thrilling moments, like when the students must glue it together under a tight timeframe, inadvertently getting high from the fumes in the robotics closet.

It's one thing for a student like Cristian, who has a natural aptitude for science, to become interested in robotics and engineering. But the competitions also engage Oscar, Lorenzo, and even Luis, who may not otherwise have had that interest and learned information needed to compete. In a country that is quickly being outpaced in math and science, the book provides a good guide as to how to ensure that kids continue to be engaged in those subjects.

SYMBOLS

Symbols appear in **teal text** throughout the Summary and Analysis sections of this LitChart.



STINKY THE ROBOT

The four students—Oscar, Luis, Lorenzo, and Cristian—name their robot "Stinky," and Stinky both represents the boys as underdogs and becomes a symbol of the ability for underdogs to overcome adverse odds. As implied by its name, Stinky doesn't smell very good due to the glue holding its PVC pipes together; in comparison with robots from schools like MIT, it has a very gaudy paint job and looks, as the book's full title implies, pretty ugly. At the same time, there are aspects of the robot that at first seem like potential disadvantages, but in reality become its greatest assets. Though it is made of cheap materials, the PVC pipes actually work perfectly because they allow the cables to run throughout the robot, and the air in the pipes give the robot extra buoyancy. The boys do not have the money or knowledge to outfit the robot with complicated mechanisms, and so instead they find simple approaches to complete the tasks, such as using a tape measure to complete a measuring task, or using a balloon to complete a task in which they must extract a liquid sample. In the end, this ingenuity and simplicity are specifically cited as the things that earn the team the Design Elegance award in the competition. Even though it doesn't seem like Stinky belongs in the competition with the other robots, the things that make it unique are actually the things that allow it to excel—as is the case for the team as a whole.

QUOTES

Note: all page numbers for the quotes below refer to the Farrar, Straus and Giroux edition of *Spare Parts* published in 2014.

Introduction Quotes

There were teams from across the country, including students from MIT, who were sponsored by ExxonMobil, the world's largest publicly traded company. The Latino kids were from Carl Hayden Community High School in West Phoenix.

Related Characters: Luis Aranda, Lorenzo Santillan, Cristian Arcega, Oscar Vazquez

Related Themes:

Related Symbols:

Page Number: 3

Explanation and Analysis

At the beginning of the book, the four Carl Hayden students

are giving the technical presentation on their robot at the 2004 MATE Remotely Operated Vehicle Competition. Davis wastes no time in pointing out the large disparities between the students from Carl Hayden and the other students and teams with which they are competing, particularly regarding their race and their economic disparity. This quote begins the underdog narrative that Davis frames throughout, demonstrating the immense odds that the Carl Hayden students face in the competition. The way in which the two teams are described highlights the great amount of privilege afforded to the team from MIT, as it is given resources simply for being a prestigious institution. Additionally, as Davis will point out later, the MIT team is made up primarily of white students; the fact that the Carl Hayden students are Latino will also become a large part of the story as Davis demonstrates the additional challenges they face as a result of their background and their citizenship status. Framing the story in this way at such an early point makes it remarkable that the students are at the competition at all, and also makes their ultimate win in the competition even more moving.

He had lived in Phoenix for six years and thought of himself as an American, even though he'd been born in Mexico. His parents had snuck him into Arizona when he was twelve. No matter how many push-ups he did or how fast he ran, he couldn't outpace the fact that he was a fugitive, living in the country illegally, and therefore barred from enlisting.

Related Characters: Oscar Vazquez

Related Themes:

Page Number: 5

Explanation and Analysis

During the students' technical presentation, Davis intersperses their responses to the judges' questions with a bit of background about each one of them. In this quote, Davis describes Oscar's primary goal and motivation: becoming a soldier. However, by also describing the reasons why Oscar cannot enlist in the Army, Davis introduces the limitations and unfairness that these kids inherit simply because they had not been born in the United States, and because they were brought over at a young age by their parents. Oscar's story is particularly ironic, because the United States' immigration laws are preventing him from serving the country, despite the fact that he feels very much American. As many people note later, he is exactly the kind of person that the United States should want to come to the country, but the prejudices held by American citizens make it impossible for Oscar to find that path to legal citizenship and the Army.

As a NASA employee, she had become accustomed to working with engineers who conformed to a sort of industry standard: white, well educated, conservative clothes. These four teenagers standing in front of her signaled that the future looked different.

Related Characters: Luis Aranda, Lorenzo Santillan, Cristian Arcega, Oscar Vazquez, Tom Swean, Lisa Spence

Related Themes:

Related Symbols:

Page Number: 6

Explanation and Analysis

After the students have impressed the judges with their technical presentation, Davis gives readers a little bit of insight into one of the judge's thoughts. Lisa Spence, the flight lead at NASA's Neutral Buoyancy Laboratory, had gone to college at Arizona State University. Knowing the area in which the students live, Spence is surprised that such an impressive team has emerged from Carl Hayden Community High School. Spence's observation of the ways in which the Carl Hayden students break from the norm posits the students' differences as heralding a wave of the future, but the rest of Davis's book and particularly its final part complicate that assumption. For while the students' differences may make them more exceptional for overcoming an underprivileged background, for many people in the United States, their differences from the norm make them undesirable in American society and cause a lot of deep-seated prejudice.

One Quotes

The chief lesson Lorenzo learned was that it was important to be creative. Hugo wasn't running a normal mechanic's shop, with a wall full of tools and shelves filled with supplies. He had little money, a small set of hand tools, and his ingenuity. To survive, he had to come up with fresh ideas and adapt.

Related Characters: Hugo, Lorenzo Santillan

Related Themes:

Page Number: 14

Explanation and Analysis

Lorenzo has a hard time fitting in at school because he has an odd-shaped head, struggles at first to learn English, and wears his hair in a mullet. Because of this, instead of participating in extracurricular activities in middle school, Lorenzo watches his godfather Hugo in his makeshift auto repair shop. Though Hugo doesn't let Lorenzo do much more than clean the tools, Lorenzo learns a lot simply from watching. This quote illuminates two of the major themes in the book. First, Hugo's shop is what sparks some of Lorenzo's interest in building things, while he simultaneously learns how to think outside the box and find creative solutions to problems. This ability becomes crucial to the robotics team later, as Lorenzo is able to work out solutions to some of the hardest tasks that their robot must complete. Additionally, the quote demonstrates how Lorenzo's status as an outsider actually helps him; even though he doesn't fit in, Lorenzo turns to Hugo's shop, which ultimately allows the team to succeed in the competition.

❝ The music was part of his educational philosophy. Fredi had always focused on getting kids excited to learn.

Related Characters: Fredi Lajvardi

Related Themes:

Page Number: 30

Explanation and Analysis

Davis introduces Fredi, the Marine Science teacher at Carl Hayden. Fredi focuses on hands-on learning, often assigning kids to complete a task by the end of the period and playing loud electronic music while they work. Fredi's philosophy hones in on a key idea for students: that getting them excited to learn, and infusing a sense of adventure into what they are doing, is more important than encouraging grades or achievement because it instills a passion in the students that causes them to work hard. Employing this philosophy, Fredi becomes an exceptional mentor for the students in the robotics club because he always aims to make sure that they have fun with what they're doing. He finds competitions they can participate in that also play up a sense of adventure. He also encourages his students and gives them the tools to succeed by believing in them, knowing that sparking their curiosity and boosting their self-confidence allows them to achieve far more than they could have ever imagined.

❝ Woods wrote, "The issue raised by this type of treatment is not whether the arrest and deportation is legal, but whether human beings are entitled to some measure of dignity and safety even when they are suspected of being in the United States illegally."

Related Themes:

Page Number: 33

Explanation and Analysis

In the midst of providing the backstory for the students in the robotics club (particularly their stories of immigration to America), Davis also describes the political landscape in America surrounding immigration when the students are growing up. Davis lingers on one particularly brutal sweep by the police in a Phoenix suburb in 1997, in which 433 undocumented immigrants were caught and many were subjected to violence or inhumane conditions, prompting Woods's question. The dehumanization of Hispanic people in this instance goes beyond the question of whether they have committed a crime; it proves the prejudice against them and prompts Americans to believe that undocumented immigrants living in America do not deserve the same humane treatment that would be afforded to an American citizen—a completely discriminatory view. The reason that Davis brings up this incident is also to juxtapose it with the feelings that the reader may have already gained about the four students. This potentially highlights the reader's own prejudice in asking why someone might sympathize with individuals but not with a group of people as a whole.

❝ To Arpaio, Mexican immigrants were unlike any immigrants that had come before them. They were often disease-carrying criminals and didn't have the same values as American citizens.

Related Characters: Joe Arpaio

Related Themes:

Page Number: 35-36

Explanation and Analysis

In addition to relaying some of the U.S. Immigration policies as a whole and what those policies mean for kids like the Carl Hayden students, Davis also focuses on specific politicians and their concrete effects on how American citizens view immigrants. Sherriff Joe Arpaio runs the Maricopa County police department (Phoenix resides in Maricopa). Based on the ideas that Davis quotes here, Arpaio uses discriminatory policies to target Latino people in Maricopa County and encourages the police department to do the same. Perhaps even worse, Arpaio also inspires vigilantes to roam the county, some of which even murder immigrants without repercussions. Davis includes this rhetoric to demonstrate how dangerous falsehood can be. Not only is it prejudiced and based on harmful stereotypes, but it is also incredibly dehumanizing, and it is much easier for people to treat others as subhuman when they are encouraged to view others as subhuman.

> In his nineteen years as an ROTC commander, Goins had never met a finer student than Oscar. He embodied everything the military was looking for: leadership, intelligence, dependability, integrity, tact, selflessness, and perseverance. […] "Oscar had it all," Goins remembers. "His only drawback was that he wasn't a U.S. citizen."

Related Characters: Major Glenn Goins (speaker), Oscar Vazquez

Related Themes:

Page Number: 51

Explanation and Analysis

After Oscar and his mother join his father in the United States, Oscar struggles to find a community that provides him with a sense of purpose and belonging—that is, until he finds the ROTC and establishes himself as a leader in the group. But even then, Goins highlights the irony in the fact that Oscar is a model student and soldier—basically refuting all of the negative stereotypes that people have about immigrants. Later in the novel, even United States Senators will argue that Oscar is exactly the type of person that America should want to become a citizen, and yet he is barred from doing so. Yet, in a way, this adversity is what makes him an underdog and what leads him to the robotics club. Had he been a citizen, he would have enlisted in the army. Unable to do so, he instead joins the robotics club to find another community to lead. This is an example of a pattern that many of the students follow: even when they face an obstacle, those obstacles allow them to excel in other ways.

> I've got to create something that doesn't compete with other science centers; it's got to compete with the World Series and the Super Bowl. I've got to find a way to make science and technology cool.

Related Characters: Dean Kamen (speaker), Luis Aranda, Lorenzo Santillan, Cristian Arcega, Oscar Vazquez, Fredi Lajvardi

Related Themes:

Page Number: 64

Explanation and Analysis

Dean Kamen is a thirty-eight-year-old inventor who realizes that students have a hard time getting excited about the sciences when they have alternative entertainment like sporting events. He resolves to create an event that can garner the same amount of excitement. This keys into a question that runs throughout the book: how to get kids engaged in science and technology. In an attempt to ameliorate this situation, Kamen founds the For Inspiration and Recognition of Science and Technology (FIRST) competition in 1989, and the one that the Carl Hayden students attend in 2004 centers on building a robot that is able to play basketball. For the Carl Hayden students, many of them have an early curiosity about the sciences, but certainly putting math and science into a competition setting gives the kids a sense of adventure. This is why the FIRST competition catches Fredi's eye; he knows that the students will not only have fun, but gain some valuable experience and learn a lot as they gear up for their next competition.

> Lorenzo felt his father didn't have any respect for him, Hugo wouldn't let him use the tools in the driveway, and the kids around school mocked him for his strange looks. Now a teacher was entrusting him with the lives of a handful of fish. To most people, it might not seem like a lot, but to Lorenzo it was unprecedented.

Related Characters: Pablo Santillan, Lorenzo Santillan, Hugo, Fredi Lajvardi

Related Themes:  

Page Number: 72

Explanation and Analysis

Lorenzo walks into Fredi's Marine Science class as a sophomore, looking for a group to be a part of. When Fredi notices him lingering around the classroom, Fredi invites him to help take care of the fish, and Lorenzo is amazed that Fredi would trust him to help. Lorenzo and Fredi's meeting becomes in many ways the perfect student-teacher match. Lorenzo has up until this point been treated as an outsider, an oddball, and an easy target for bullying. However, this gives him a unique perspective and an ability to come up with creative solutions to problems, particularly from watching his godfather Hugo work in his auto shop. All he needs is a little direction and a little confidence. Fredi, on the other hand, is a kind mentor looking for passionate kids, and sees that Lorenzo is simply a little lost and needs an authority figure who trusts and believes in him. Their collaboration shows the potential of any kid who considers themselves an outsider—but also how easily that potential could be lost without a good teacher, or a person who is invested in giving them hope for their future.

❝ Nonetheless, the threat was clear: students who were living in the country illegally could be sought out and detained. A Border Patrol agent could find these kids anywhere and send them to a country they barely knew. Attempts to excel might be met with harsh punishment. Even a seemingly harmless summer science competition bore life-altering risks.

Related Themes: 

Page Number: 76

Explanation and Analysis

Davis describes an incident in 2002 in which kids from a Phoenix suburb take a school field trip to Buffalo, New York for a school competition. While visiting Niagara Falls, Border Patrol Agents become suspicious of the students when a teacher asks if the students need anything more than school IDs to cross over to Canada and back, resulting in a scare in which four students are detained and almost deported. This incident demonstrates the constant threat that Hispanic and undocumented students are under, even when crossing the Canadian border for only a few hours.

Additionally, even though this happens to kids from a different school, Oscar and Luis have a similar scare when a border patrol officer stops them on their way back from a field trip to California. These episodes illuminate the insidiousness of the prejudice against them, as not only are they discriminated against for their background, but they can also be easily targeted for deportation because of their appearance.

Two Quotes

❝ The whole point was to give the guys a chance to accomplish something beyond what they thought possible. But if they showed up at the event and failed utterly, it would only reinforce the impression that they didn't belong in the contest in the first place. That could leave a kid such as Lorenzo with a permanent sense of inferiority.

Related Characters: Cristian Arcega, Luis Aranda, Oscar Vazquez, Lorenzo Santillan, Allan Cameron, Fredi Lajvardi

Related Themes:   

Page Number: 91

Explanation and Analysis

When Fredi and Allan initially discover the MATE competition, there are two classes of competitors that the kids can participate in: the Explorer Class, made up mostly of teams from colleges, and the Ranger Class, made up primarily of teams from high schools. They realize that the competition will be difficult for the students regardless of which class they enter, and they want to take care that the students aren't completely devastated by the results. This highlights an underappreciated role of mentors: not only to give kids information or to make learning fun, but also to give the kids the confidence to know that they can be successful in their pursuits. In many ways, this is what makes the American Dream—or any dream—achievable, by a person having the confidence to pursue it. Even though Fredi and Allan enter the team into the Explorer class in order for the students to at least say they lost to MIT, their desire to give the kids the conviction that they can build a robot that could compete in the competition is what allows them to succeed in it.

> For Lorenzo, the robotics team was like a new family. In some respects, Fredi and Allan were surrogate parents, constantly advising him and pushing him to do better. [...] A team spirit had developed. Lorenzo wasn't the only one sitting in the front row of his classes.

Related Characters: Cristian Arcega, Oscar Vazquez, Luis Aranda, Lorenzo Santillan, Allan Cameron, Fredi Lajvardi

Related Themes:  

Page Number: 113

Explanation and Analysis

When Lorenzo first joins the robotics team, he is so excited about it that he devotes most of his time to the club and falls behind on his other schoolwork. Fredi threatens that if he doesn't get his grades up, he won't be able to be on the team, and so he starts to work harder and harder in his other classes. The rest of the boys quickly follow suit. These developments establish the power one feels when one belongs in a group. Lorenzo is completely motivated by the group of kids that he has found, and so he works hard in school in order to make sure not to lose that community. But what is interesting is that he then inspires the other students to do the same. Thus, the team gives them a singular sense of purpose in winning the competition, but also a motivation that extends to every aspect of their lives as they try to be the best students and competitors that they can be.

> To Fredi, this was a battle for the future of an unusual but talented kid. He appreciated Lorenzo's offbeat ideas and felt that the long-haired goofball had genuine talent. But Lorenzo was caught in the tractor-beam pull of poverty and low expectations.

Related Characters: Pablo Santillan, Lorenzo Santillan, Fredi Lajvardi

Related Themes:  

Page Number: 116

Explanation and Analysis

Even after Lorenzo has found a sense of belonging with the robotics club, he is teased more and more throughout his sophomore year, until he punches another student in the face. While Lorenzo's father offers to beat the student up for him, Fredi instead speaks to Lorenzo and advises him that if someone wants to fight him, he should pretend to have a seizure, lightening the tension. Fredi's observation about Lorenzo's need for someone to invest in him sums up some of the book's attitudes about underdogs and mentorship. Lorenzo's background means that he inherently has a lot of adversity to overcome (as Davis enumerates here, poverty and low expectations). Yet some of the things that make him an underdog also have to do with who he is as a person (his sweet demeanor, his unusual hairstyle), and these are the things that give him the unique and creative perspective that allows him to flourish on the robotics team. Additionally, his relationship with Fredi highlights how much kids, when faced with these kinds of societal obstacles, need a strong role model who can encourage them to believe in themselves, as Fredi does.

> Fredi was impressed. It was a practical, cheap, and ingenious solution. [...]
>
> "You did it," Fredi said, clapping Lorenzo on the shoulder.
>
> Lorenzo responded with a big smile. "I did it."

Related Characters: Lorenzo Santillan, Fredi Lajvardi (speaker), Cristian Arcega, Oscar Vazquez

Related Themes:   

Related Symbols: 

Page Number: 120

Explanation and Analysis

As the students start to build the parts of their robot that can complete the different assigned tasks, Oscar and Cristian tell Lorenzo that he should take on the task of extracting a liquid sample from a barrel underwater because they think it's going to be impossible. Lorenzo works tirelessly, testing out different methods with a balloon, a sump pump, copper tubing, and various plastic containers to keep the balloon from falling over. When he finally accomplishes the task, Fredi is impressed and also exceptionally proud. Lorenzo's creativity has paid off here, as he is able to discover cheap and easy solutions to a difficult assignment. In this way, the students' lack of resources actually becomes an advantage: while MIT and other teams try to use technically complex equipment, Lorenzo's cheap solution is effective *and* more practical. But perhaps most importantly, it is once again clear how valuable Fredi's mentorship has been in giving Lorenzo the

confidence to persist in finding these creative solutions—and Fredi, in turn, receives his own satisfaction from watching the kids achieve something they never thought they could.

"It needs a name," Lorenzo said.
Oscar remembered Lorenzo's choking on the glue fumes and suggested, "Why don't we call it Stinky?"

Related Characters: Lorenzo Santillan, Oscar Vazquez (speaker), Luis Aranda, Cristian Arcega

Related Themes:  

Related Symbols: 

Page Number: 138

Explanation and Analysis

Just a few weeks before the MATE competition, the four students glue their robot together. Though they had practiced multiple times, they quickly realize that they have an added difficulty because the robotics closet quickly fills with noxious fumes (which Lorenzo addresses by commenting that it's "stinky" in the closet) from the glue that they are using. They have to work quickly as a team, and once they finish building the robot, they christen it "Stinky." Stinky becomes a representation of two things: both their teamwork and their status as underdogs. It represents their teamwork because not only does it take all of them to assemble it in the closet, darting in and out and trying not to get high from the fumes, but it also takes all of them to contribute their own unique skills. Oscar and Luis worked on the motors, Cristian programs the robot's computer, Lorenzo takes the liquid sampling project, and so on. Each one of them brings their own unique traits to the job, and it takes all of them to complete it.

Additionally, the robot represents their underdog status. As its name suggests, Stinky doesn't quite appear to be in the same league as some of the robots it will compete against. It is cheaply made, gaudily painted, and constructed from spare parts. But at the same time, those factors make it both practical and a representation of the team's creativity, as they have been able to take their lack of resources and turn it into a championship-winning robot.

The group also offered some of the same benefits of being in a gang. Now that he hung out with Luis on campus, Lorenzo found that other students were less likely to make fun of him.

Related Characters: Luis Aranda, Cristian Arcega, Oscar Vazquez, Lorenzo Santillan

Related Themes: 

Page Number: 132

Explanation and Analysis

After the students participate in the FIRST competition in Atlanta, Davis describes the ways in which they had formed a closer team and a closer friendship. They had learned how to solder and how to use a robot controller from competing in the competition, but they had also developed a technical shorthand and grown as friends on the trip. To the boys, and particularly to Lorenzo, this sense of belonging and camaraderie is perhaps even more vital to him than pursuing his interests. Here, Luis helps him avoid bullying, and the club makes him feel like he is no longer an outsider. This is perhaps Lorenzo's greatest motivation in working hard for the team: he gains a sense of community as well. This is true not only of Lorenzo, as each one of the boys has gained a new team. Oscar had been looking for this specifically after the ROTC; Cristian wanted peers that enjoyed his interests and whom he considered smart; Luis wanted to find people that would not be intimidated by his size. And so, together, their mutual desire for friendship is what elevates the club as a whole as they are motivated by their desire to be on a team.

Three Quotes

It reminded them that they were doing something they had never done before. In Phoenix, they were called illegal aliens and pegged as criminals. They were alternately viewed as American, Mexican, or neither. Now, for a moment, they were simply teenagers at a robotics competition by the ocean.

Related Characters: Allan Cameron, Fredi Lajvardi, Luis Aranda, Cristian Arcega, Oscar Vazquez, Lorenzo Santillan

Related Themes:  

Related Symbols: 

Page Number: 158

Explanation and Analysis

Just before the students are about to give their technical presentation at the MATE competition, Fredi and Allan encourage them to stop people on the street and talk about their robot so they can practice speaking about it. But the phenomenon that Davis describes here demonstrates how the competition allows the boys to move away from the negative stereotypes that may be surrounding them in Phoenix, and across the country. The robotics club provides them with the opportunity to form a new identity—to have an interest that helps to define them in a positive way. This is what makes their story so interesting when Davis writes about it in *Wired*: readers become particularly excited to cheer for underdogs who may not always feel supported by American citizens across the country. While these interactions serves as a turning point for the group in giving them the confidence to excel, they also become somewhat tragic given the end of the book, because they are not able to continue defining themselves by their interests: they are still labelled as criminals or illegal immigrants, and the country will not allow them to move past that designation.

> But in this moment, Oscar realized that Lorenzo was intensely committed. Good engineering solutions had value. But, to Oscar, doing things that no one else wanted to do, toughing it out and being a soldier, that's what counted.

Related Characters: Lorenzo Santillan, Oscar Vazquez

Related Themes:

Related Symbols:

Page Number: 162

Explanation and Analysis

At the MATE competition, the students take their robot to the practice pool, but it quickly stops responding to the controls—the day before it is supposed to compete in the underwater portion of the competition. As a result, Oscar stays up all night re-soldering the connections between the controller and the joysticks, and Lorenzo offered to stay up with him to help. This exchange serves as a turning point both in Lorenzo's character and Oscar's relationship to him. Whereas earlier in the year, Lorenzo hadn't had enough commitment to make it on time to the actual competition, here he sees how vital it is to support his team member and put the extra effort in. Lorenzo's newfound friendship with the other boys has motivated him to be more dedicated to the competition so that the other boys like him even more. In Oscar's case, from his thoughts here, readers can see that in fact, Oscar does notice Lorenzo's motivation and gains a lot of respect for his team member.

> Stinky represented this low-tech approach to engineering. But that was exactly what had impressed the judges.

Related Characters: Lisa Spence, Luis Aranda, Cristian Arcega, Oscar Vazquez, Lorenzo Santillan

Related Themes:

Related Symbols:

Page Number: 176

Explanation and Analysis

At the MATE competition's awards ceremony, the judges announce that the Carl Hayden students have won the Design Elegance award. They are shocked, considering that other teams have much bigger budgets and robots made out of much more expensive and high-tech materials than their robot, Stinky. However, the judges point out that it was exactly this difference that had led them to award the boys with this honor. Thus, what had seemed like their greatest liability—their lack of resources and knowledge—had actually become their greatest asset, as they were forced to think creatively and come up with solutions that could be practical, cheap, and simple to execute (for example, Lorenzo's solution to the water extraction task or the boys' decision to use PVC pipes as their primary material). They also acknowledged that they didn't know everything, and in asking for advice, also gained a lot of resources from people who were willing to help with their robot.

Four Quotes

> "If the really long list of immigrant inventors who have made this country and the world a much better place is to stop here and now, we will also likely become the newest declining nation," one reader commented.

Related Characters: Luis Aranda, Cristian Arcega, Oscar Vazquez, Lorenzo Santillan, Joshua Davis

Related Themes:

Page Number: 186

Explanation and Analysis

The students win the MATE competition in 2004; in 2005, Joshua Davis publishes an article about their victory. As a result, many readers have an outpouring of support for the students and they raise $120,000 in scholarships for the students. Yet there is still a huge amount of tension between the two sides of the immigration debate. Even though many readers support the students, Davis points out that many Americans do not have the same reaction. This reader's comment highlights how the discrimination against immigrants from a specific background it is at odds with some of the values that Americans claim to uphold. America often prides itself on being a nation that is made up of immigrants; yet, whenever a new group of people of a specific race, ethnicity, or nationality becomes the predominant type of immigrant, that group is almost always stereotyped and belittled. Yet immigrants, as this reader points out, have a lot to add to any country and often particularly thrive in the United States because of the country's resources, and these students are no different. Even though they are young, given the right opportunity—given the American Dream—they could grow up to do great things.

> This extraordinary young man—a mechanical engineer who won a national competition, a person who can add something to America, who has a wife and family here, who is doing the right thing by going back to the country of his origin even though he has little connection with it anymore—is being told: America doesn't need you.

Related Characters: Dick Durbin (speaker), Karla Perez , Oscar Vazquez

Related Themes:

Page Number: 211

Explanation and Analysis

After Oscar graduates from ASU, he decides to deport himself and apply for residency so that he can follow a legal path to citizenship. Yet his application for permanent residency is denied, and so he remains in Mexico despite the fact that his wife and young daughter are American citizens. At that point, Senator Dick Durbin proposes the DREAM Act in the Senate and speaks about Oscar specifically, hoping to drum up support for the bill that would help kids like Oscar find an easier path to citizenship. The fact that Durbin's impassioned speech fails highlights how broken and arbitrary the immigration system is as it currently stands, and also how divided the country is on the issue. Oscar has so many reasons why he would be the perfect candidate to apply for citizenship, except for the fact that people have such negative stereotypes about people from his background. Additionally, many people argue that a bill like the DREAM Act inherently provides incentives for illegal activity. However, the government wouldn't have as much of an issue in dealing with kids in situations like Oscar's if it were to pass more comprehensive immigration reform. Thus, in many ways, Congress punishes the kids for its own inability to find solutions, resulting in a life spent in limbo.

> In reality, life is more complicated. The attention paid to the team as a result of their victory coincided with a backlash against immigrants in Arizona.

Related Characters: Luis Aranda, Cristian Arcega, Oscar Vazquez, Lorenzo Santillan

Related Themes:

Page Number: 219

Explanation and Analysis

At the end of the book, Davis describes how the movie adaptation of his *Wired* article ended with the awards ceremony at the 2004 MATE competition, effectively giving the characters in the movie a picture-perfect happy ending. But Davis points out here that the movie's ending is an ending that eludes the students that it depicts, and that it is important not to gloss over the fact that the boys all struggled and continue to struggle with jobs and stability because of their immigration status. The movie version, Davis argues, allows viewers to feel satisfied and untroubled about the immigration system as it stands. However, in finishing his book by pointing out the difference between the movie and what happened in real life, Davis implies that it is necessary to be upset about the way in which the boys could not capitalize on the potential they had in high school. Only by informing American citizens about the direct impact that their votes have on the lives of undocumented immigrant kids around the country is it possible to change their minds, and hopefully one day allow those students to participate in the American Dream.

SUMMARY AND ANALYSIS

The color-coded icons under each analysis entry make it easy to track where the themes occur most prominently throughout the work. Each icon corresponds to one of the themes explained in the Themes section of this LitChart.

INTRODUCTION

On June 25, 2004, Cristian Arcega, Lorenzo Santillan, Oscar Vazquez, and Luis Aranda stand in a classroom at the University of California, Santa Barbara, presenting their project for the third annual Marine Advanced Technology Education Remotely Operated Vehicle (ROV) competition. The MATE competition is an event sponsored by NASA and the Navy to identify the country's top engineering talent. Other teams in the competition come from colleges across the country, including MIT; these four students are from Carl Hayden Community High School in West Phoenix, Arizona.

In the introduction of the book, Davis explains the circumstances of the MATE competition to set up the underdog status of the four central characters: Cristian, Lorenzo, Oscar, and Luis. In pointing out that they are from a high school in Phoenix going up against schools like MIT, Davis immediately implies that these students will have serious odds to overcome in the competition.

One of the competitions judges, Tom Swean (who runs the Navy's Ocean Engineering and Marine Systems program), questions the four students about their **robot**, asking how they made the laser work. Cristian, the team's science wizard, answers the questions rapidly and impressively.

Though the students are underdogs, Davis also makes it immediately clear that they belong in the competition. Cristian's knowledge in particular reveals that there are clearly a number of factors that have made them successful up to this point.

Another judge, Lisa Spence (the flight lead at NASA's Neutral Buoyancy Laboratory), had majored in engineering at Arizona State University and knows the area where these kids lived. She's surprised that such an impressive underwater-robotics team has emerged from the neighborhood, considering that it is relatively poor—and there are no oceans nearby.

Davis hammers home the idea that the students are underdogs with these thoughts from Spence—not only are they from a poor neighborhood, but they don't even have a nearby ocean in which to practice.

While other teams had arrived with robots made with budgets of more than ten thousand dollars, these students have a plastic robot partially assembled from scrap parts, which they had dubbed **Stinky** because it smelled so bad when they glued it together. The students are first time competitors who had entered at the highest level, and their presence in the competition almost seems like a mistake. But Lorenzo, another team member, is proud of what they've built.

The team's robot, Stinky, itself becomes a symbol of their underdog status. It appears that it might not even belong in the competition, compared to the robots of other teams. Yet its simplistic, practical, and inexpensive design is exactly what impresses the judges.

Swean asks a question about signal interference, which Oscar answers as the team's de facto leader. Oscar is seventeen (two years older than Cristian and Lorenzo) and has been serving in Carl Hayden's Junior Reserve Officer Training Corps (ROTC) throughout high school, eventually becoming the group's executive officer. He dreams of being a soldier.

Davis starts to introduce some of the unique qualities of each of the boys, and to show how they each bring something different to the team. Oscar not only serves as the group's de facto leader, but he also serves as the others' primary motivator throughout the book.

Though Oscar wants to enlist in the Army and has been living in America for six years, his parents snuck him into Arizona when he was twelve; therefore, he cannot not enlist as a person living in the country illegally. When he realized this during his senior year, he searched for another field in which to distinguish himself.

In telling Oscar's story, Davis also sets up another important idea: these kids are undocumented immigrants, but they also clearly have a lot that they can contribute to the country. In Oscar's case, he wants to do so most directly in becoming a soldier.

Cristian answers most of Swean and Spence's questions, but Spence also notes that Lorenzo and Oscar are able to speak intelligently about their robot's mechanical and electronic components. About half of their overall score will come from this technical evaluation, and it is important that all members can answer questions.

In evaluating the entire team's ability to answer the questions, the judges highlight the importance of teamwork as a whole. The students have motivated each other to do well and to learn the science behind their project, and here that motivation pays off.

Spence then turns to Luis (who is seventeen, six feet tall, and 250 pounds), who hasn't said anything yet. The other boys had recruited Luis because they needed someone strong enough to lift the robot in and out of the pool. Spence asks Luis specifically about how they employed PWM. Luis explains that PWM means pulse-width modulation, and it is a technique that allows them to control the robot digitally. Cristian is amazed that Luis answered the question right.

Even though Luis had been recruited for his strength and size, the fact that he is able to answer the question right proves how, given the right circumstances, any child can learn and be successful. In a way, it serves as confirmation of the underlying concepts of the American Dream—that every person deserves equal opportunity for success.

Spence is also impressed. As a NASA employee, she has become accustomed to working with engineers who conform to a certain type: white, well-educated, conservative clothes. She is amazed to see the four students in front of her, signaling that the future might look different.

Even though Spence views the students hopefully, as Davis goes on to prove, the kids have a difficult time overcoming prejudice in their lives because they do not conform to the "certain type" that she describes.

ONE

Davis jumps to describing Lorenzo's early childhood. When he is a few months old, his mother Laura accidentally drops him on a curb in Zitácuaro, a town in the Mexican state of Michoacán. He already has an odd, pear-shaped head, and now he has a lump on his forehead on top of that. She decides that he needs better medical attention, and in 1988 she crosses through a tunnel under the U.S.-Mexican border with Lorenzo.

As Davis flashes back to each of the students' lives growing up, a few common threads emerge. One of the most common is that their parents simply want better opportunities for their children—a value that any parent, regardless of cultural background, shares.

Laura finds a doctor in Phoenix, who tells her that Lorenzo seems to be doing fine. The doctor could perform a cosmetic surgery, but it would be unnecessary. From that moment on, Laura tells Lorenzo that the bump on his head means he is smart.

Laura acknowledges the fact that the things that make someone different—and even ridiculed—are also the things that can be their greatest asset.

Laura and her husband Pablo decide they should stay in the United States, because they have barely been getting by in Mexico and there are a lot more opportunities in the United States. The family (Laura, Pablo, Lorenzo, and his older brother José) moves to a two-room apartment near downtown Phoenix. Laura gets work as a hotel maid, and Pablo works as a landscaper.

Laura and Pablo travel to the United States first to get better medical attention for their son, and then get job opportunities for themselves—a far cry from the stereotype of laziness that many Americans seem to have of Hispanic immigrants.

Once in the United States, Laura and Pablo have three more children: Pablo Jr., Yoliet, and Fernando. These three children will have significantly more opportunities to live and work in the U.S. than Lorenzo and José.

Davis also notes how the miniscule difference of being born on one side of a fence versus the other side can drastically alter the trajectory of a person's life, due to American immigration policies.

Laura tries to put Mexico behind them, but Pablo does not forget the solitude of the Mexican forest. He has a hard time adjusting to the urban desert with five children, and on weekends buys a twelve-pack of beer and works his way through it. Sometimes he is kind to Lorenzo; other times, he abuses him.

The lives of those who have immigrated are difficult for a number of reasons; not only because of the immigration policies, but also having to uproot their lives and their families.

At school, Lorenzo is often mocked for his odd-shaped head. Lorenzo embraces the fact that he is different and grows his hair long. Laura supports him, but kids continue to make fun of him. He yells back at them in response, saying that he doesn't want to be like everyone else.

Lorenzo's odd-shaped head will be the source of constant teasing throughout his school years. But his outsider status is also what will allow him to gain a creative and unique perspective on the world that adds to the students' success at the competition.

In seventh grade, a friend asks Lorenzo to carry marijuana for a local gang. He stashes it in his backpack and leaves it on school grounds as instructed, but he is terrified the whole time. He realizes he isn't cut out to be a criminal and refuses to do it again.

Lorenzo's brief foray into a gang, which he only does out of a desire for a sense of belonging to a group, emphasizes his need for friendship and schools' needs for clubs and groups that provide students with a sense of community.

Instead, Lorenzo tries to join the marching band. He learns piano pieces by ear, but the band has no piano, so the teacher gives him a xylophone instead. But Lorenzo does not read sheet music, and so when he marches along with the band at Christmas, he hits a few wrong notes before giving up.

Lorenzo's need for friendship throughout his middle school experience is what makes his later relationships with the other boys on the team so meaningful and important, particularly because this then allows him to pursue a passion as well.

Lorenzo returns the xylophone and does not return to band. He is desperate to find friends, but the heckling continues. He starts to pick fights at school until a counselor assigns him to anger-management classes. He learns a few techniques to cope with his anger, but it's hard to ignore all of the teasing.

Without those friendships and that motivation, it is easy to see how Lorenzo could be caught not only in poverty and low expectations, as Fredi implies later, but also in depression and loneliness.

After school, Lorenzo helps his godfather Hugo fix cars in the makeshift auto repair shop he has set up in his driveway. Hugo won't let Lorenzo do much more than clean the tools, but Lorenzo stands beside the cars and watches. Lorenzo learns the importance of creativity and ingenuity, as Hugo doesn't have much money, and to survive he has to come up with fresh ideas and adapt. Lorenzo takes this to heart: an unusual idea isn't necessarily bad. It might be the only solution.

In Hugo, Lorenzo gets a first mentor figure. Hugo's work sparks Lorenzo's creativity and also gives Lorenzo a model for coming up with ingenious and practical solutions. This skill will be invaluable when the team starts to build their robot later in the book.

Davis delves more deeply into Carl Hayden High School's and West Phoenix's history. In 1965, the students were nearly all white, and it had once been a well-regarded school. Now, the neighborhood has an abandoned feeling, the outside of the school looks patchy and drab, and the school is 92 percent Hispanic.

The backstory provided for Carl Hayden High School and West Phoenix illuminates some of the longstanding systematic inequality in Phoenix's history, and how it contributed both to the school becoming a magnet school and also to it becoming relatively impoverished.

The student body reflects Phoenix's transformation. Phoenix was founded in 1868 by Jack Swilling, who came to Arizona, fell in love with a Mexican woman, and then built a canal to irrigate the land. Before long, the rich soil drew other settlers, and the city was developed. Tax revenue was largely allocated to infrastructure in neighborhoods developed by white settlers (which became East Phoenix), while the Mexican immigrants' communities (West Phoenix) got almost nothing.

Davis wastes no time in demonstrating the inequality in Phoenix. Even though the town was born out of the union between a white man and a Mexican woman, the white settlers quickly collected power and wealth, while the Mexican communities in the area did not get the same kind of opportunity. This early inequality contributes to the prejudice and stereotypes that persist today.

World War II then brought a boom in manufacturing, factories sprung up in West Phoenix, and small villages were constructed near the factories to serve the working-class white community who worked there. But in the '60s and '70s, the factories expanded, pollution increased, leukemia outbreaks were reported, and those people largely moved out of the area and over to East Phoenix.

West Phoenix's narrative is interesting in the context of the American Dream: even though every person should have the same opportunity to be successful, it is clear that due to racial prejudice and the wealth that people are able to accumulate, even working-class white people were able to find better situations than their Mexican counterparts.

As East Phoenix's population expanded to almost one million people, wealthier residents needed a variety of services. This demand for labor was met by immigrants who came across the border illegally and settled in West Phoenix.

It is also ironic that immigrants are criticized for being lazy and taking jobs, as Davis notes later, when often they come to meet the demand, preventing labor shortages.

These changing demographics posed a challenge for schools, as in 1985 a federal judge ordered the district to desegregate. Administrators tried to entice white students back to West Phoenix by making Carl Hayden a magnet school specializing in marine science and computer programming. The attempt failed, and most of the white families had created suburbs surrounding Phoenix anyway, so there was no more diversity to balance. By 2004, Carl Hayden was 98% Hispanic, and so was West Phoenix. White people rarely ventured into the town at all, with one professor at Arizona State University commenting that "there's nothing worthwhile there."

Though the school administrators added programs in marine science and computer programming in an attempt to retain white students, these programs are taken advantage of by everyone. The fact that these programs exist at Carl Hayden is what allows the robotics team to flourish, and in a way the situation implies that any kid, given the opportunity, can make the most of added resources.

Davis then turns to Cristian's childhood, growing up in Mexicali, Mexico. He is a small, skinny boy who prefers to play inside, away from people who could make fun of him or push him around due to his diminutive size. When he is four years old, he disassembles the family radio and plugs it back in, shorting the power in the house. Cristian's mother Leticia yells at him, but he is excited by his experiment. Cristian continues to take all of his toys apart, and he announces that he wants to build robots. No one knows where he had gotten the idea, but it quickly becomes an obsession.

Like Lorenzo, Cristian's childhood sheds some light on how some of his disadvantages actually become advantages. As a child on the smaller side and with allergies (as Davis explains later), Cristian spends a lot of time indoors, which leads him to his love of electronics, technology, and robots. Cristian's passion for science and math, coupled with his intelligence, becomes one of the team's greatest assets.

In 1994, when Cristian is four, his father Juan travels to the United States and finds work in Arizona. He makes more money than he did in Mexicali, but he misses his family. In November 1995, Cristian's family drives him across the border; he sleeps most of the way there. The town that Cristian moves to has a population of six hundred and feels like a ghost town. He and his family live in a three-room house with another family.

Cristian's father continues the pattern that Davis points out, in which these boys' families move to the United States because they are looking for more job opportunities and for a better life for their children.

In December, Cristian starts elementary school. His biggest obstacle is that he doesn't speak any English. He doesn't understand the instructions on his worksheet, and he gets on the wrong bus going home. As the school year progresses, Cristian continues to have trouble, getting on the wrong bus again and again.

Davis also relays how the students who come from Mexico have to deal with extra obstacles in their lives, such as having to go to a school in which lessons are taught in a language that they are simply expected to pick up.

Cristian is in an English-learner program but continues to struggle. He receives straight Fs that year. His teachers sometimes yell at him or ridicule him; on the bus, kids call him names. Still, Cristian is convinced that he is smarter than most of them.

Cristian's thoughts here show his perseverance in the face of prejudice. Despite the ridicule he experiences, he is able to retain confidence in his intelligence. It is easy to imagine that another kid might not have been able to retain that confidence, squandering their potential.

That summer, the family moves to a trailer on the outskirts of town. Cristian has allergies and so he decides to stay indoors most of the time, watching TV. That's when he's introduced to Bob Vila's show *Home Again*, which is the first of a series of "fix-up-your-home" shows he hosts. Vila himself was a Cuban immigrant, and he becomes a symbol of hope for Cristian, who loves watching him work with power tools.

Again, Cristian's allergies lead him to an interest in science and math, showing how obstacles can become opportunities. Bob Vila's show also serves as a way of making the sciences even more appealing to Cristian, as his curiosity and sense of excitement surrounding construction are both sparked by the TV show.

When Cristian is nine years old, the family moves to a trailer park in West Phoenix. Juan has gotten a job as a welder; ironically, one of the company's clients includes the Border Patrol, and he is dispatched to work at their facilities.

Even though the Border Patrol is meant to keep people like Juan out of the country, the fact that he is building for them ironically proves the company's need for labor that the immigrants provide.

The trailer park that Cristian and his family move to feels like a huge step up, primarily because there isn't dirt everywhere. Cristian is also just a block away from his school, so he doesn't have to deal with finding the right bus anymore.

Again, it is striking that even the simplest improvements constitute big steps up for these immigrants, as they merely seek to escape the poverty and lack of opportunity that they faced in Mexico.

Over the next few years, Cristian finds that watching Bob Vila has improved his English. By fourth grade he is fluent; by fifth grade, he is getting straight As and wondering why everyone else is so slow. He spends most of his time in the library, reading the most challenging books he can find.

Vila's show not only sparks Cristian's creativity and interest in math and science, but it also provides him with a way of learning English and becoming successful in other subjects in school.

In eighth grade, Cristian meets Ms. Hildebrandt, the chemistry teacher. She encourages him to choose an independent project that interests him. Cristian decides to explore the effect of different fin designs on a rocket. He recruits a couple of other students and scrapes together a few dollars to buy a model rocket. Cristian conducts his experiment next to the soccer field. He runs fishing line between two fences, affixes the rocket to the string, and figures he'll ignite the rocket and measure how far it goes with each set of fins.

Mrs. Hildebrandt serves as an early mentor for Cristian, and her encouragement is similar to Fredi's. She focuses on getting Cristian excited about a project that he can design and test, which gives him a feeling of confidence and accomplishment when he is able to design his rocket experiment.

Cristian lights the rocket's engine. It immediately melts the fishing line and shoots across the soccer field, before pivoting straight up and emitting a huge boom above the field. Everyone ducks for cover as the rocket floats to the ground under a parachute. A teacher runs out, scolding him, but privately Cristian wonders what his next experiment might be.

Even though the rocket experiment isn't very successful, the excitement that it brings to Cristian is what spurs him on to more and more experiments and projects.

At the end of eighth grade, Cristian starts to think about high school. He visits North High School, which has an international baccalaureate program, but is told that there are no open spaces. Cristian then decides that his local high school, Carl Hayden, would be fine—he is attracted by the computer science and marine science programs.

It is ironic that the computer science and marine programs—which had been created to lure white students back to the school—become appealing to a very talented Latino student, as Cristian proves that those resources can be valuable to anyone.

When Cristian starts at Carl Hayden, he signs up for all honors courses. He skips freshman science and takes sophomore biology. He tries to supplement his learning by researching at home, but the Internet access is lost anytime a family member uses the phone. Cristian continues to excel in school, but he's also very bored.

Davis also points out repeatedly how drastically different the lives of these students are, versus the students from MIT whom they beat at the MATE competition. In spite of Cristian's not having reliable internet access, he is still able to excel.

Cristian then meets Fredi Lajvardi, the program manager of the marine science program. At the beginning of every class, Fredi convenes the students and assigns individual missions for them to complete over the period. He plays loud, energetic techno music of his own making while doling out constant advice for the kids as they complete their projects.

Fredi's mentorship is invaluable to the students. He encourages them in their projects but does not give away all of the answers; additionally, he makes his classroom fun with hands-on learning and music, revealing how good teachers need not be overly strict or dry in their classrooms.

Fredi focuses on getting kids excited to learn, caring less about covering the required curriculum. When he began teaching at Carl Hayden in 1987, he started a class called Science Seminar, in which Fredi simply told students to find something fun to build or an idea to test. Cristian hears about Fredi from a fellow freshman named Michael Hanck, who is building robots in the class. It is what Cristian has been waiting his whole life to hear.

Fredi and Cristian's meeting is a remarkable bout of luck, as Fredi becomes exactly the type of mentor that can help Cristian excel. This implies that with the right teacher, many students could enjoy the same success regardless of their background. But it also implies that it is too easy for kids in poverty to not experience that success if they do not have a teacher as passionate, encouraging, and hopeful as Fredi.

About six years prior, on July 27, 1997, police in a Phoenix suburb named Chandler were alerted by residents that there were immigrants bathing naked in the orange groves; others said there were Mexicans loitering around the Circle K grocery story. INS agents are dispatched and quickly identify targets: one officer stops a woman arguing with her five-year-old in Spanish. He asks for proof of her citizenship. She shows him her driver's license, but that isn't enough. Luckily, she has her birth certificate in her car.

Davis, who has spoken about immigration on an individual level with Cristian and Lorenzo's stories at this point, now expands his narrative to set the scene for the atmosphere in Arizona surrounding immigration. This scene helps establish that the way in which Latino people are treated in Phoenix is deeply rooted in prejudice.

That sweep catches 432 other people, with the goal of "build[ing] stronger neighborhoods." Police chase down thirteen "aliens" at Hamilton High School. At a Little Caesars, a sixteen-year-old and his friend are stopped and asked if they are "legal." They're loaded into a squad car; the teenager's mother arrives in the nick of time with his social security card, but his friend isn't so lucky, and is deported.

The guise of "building stronger neighborhoods," coupled with the unsubstantiated and racist claims that prompted the sweep, demonstrates the underlying bias many people have in Phoenix and the resulting danger for the Carl Hayden students around the time that they are growing up.

Officers are required to fill out a form when they detain someone and indicate probable cause. Such causes include "clothing consistent with that of illegal entrant aliens" or "a strong body odor common to illegal aliens."

Davis notes that in addition to the average citizens in Phoenix, the police also share this deep prejudice and use both innocuous and racist reasons to detain and deport people.

The next evening, the police do a sweep of a trailer park, having convinced a park manager to notate a map with Xs for every trailer that might contain illegal immigrants. The officers bang on the door of a sleeping family at 11:00 pm that night. A father, his brother-in-law, and four children have their papers checked. The brother-in-law has an expired visa and the officers cart him away in his pajamas.

This incident demonstrates some of the irony in the U.S.'s policies. While the police claim to want to build stronger neighborhoods, they are in fact unjustly targeting citizens who appear to be Hispanic, as well as separating them from family members. They are, then, actually tearing neighborhoods apart.

Arizona attorney general Grant Woods reviews the roundup, finding that a pregnant woman had been loaded into a van with no windows or water on a 101-degree day. In another incident, one individual was bitten by a dog; in a third, police had used "physical force beyond what appeared appropriate for the arrest." Woods notes that most of the deportees have no criminal record. Woods writes in his report that people should be treated with dignity even when they are suspected of being in the United States illegally.

Woods's comments here can be seen as in conversation with Major Goins's teachings later. Woods seems to imply that under America's laws every person deserves a certain baseline of respect, dignity, and humanity. This echoes Goins's arguments later that under the American Constitution everyone deserves life, liberty, and the pursuit of happiness, even if they are not American citizens.

The Chandler raid is one of the largest in Phoenix history, but it is not an isolated event. In addition to the police raids, various vigilante groups are formed. They hold "Hispanic-looking" people at gunpoint while patrolling the state. In 2003, south of Phoenix, twelve migrants are sleeping beside a pond when two men dressed in camouflage appear. The men open fire, killing two of the migrants. The police later arrive, but no one is apprehended for the crime.

The vigilante groups are even worse than the police in some ways and evidence how racist policing may inflame and embolden community-wide prejudice. The fact that they carry out unpunished murders against harmless people looking for a better life is not in line with the values and principles that American citizens claim to hold.

By 2004, vigilante organizations continue to scour the state. Presidential hopeful Patrick J. Buchanan argues that what Mexico is doing to America is colonization, and that migrants are coming to reclaim the land. Buchanan says that families come to the U.S. to leech off government services, draining resources from long-standing citizens. He believes it is better to turn them away because they are being "inculcated with the values of a subculture of gangs, crime, drugs, and violence."

Though Buchanan spoke these words in 2004 (and even though this book was published in 2014), there are clear echoes between his words and the words of many more recent candidates for political office, demonstrating how this issue continues to be a source of heated debate in America.

Joe Arpaio, the sheriff of Maricopa County (which includes Phoenix), agrees with Buchanan. To Arpaio, Mexican immigrants are "disease-carrying criminals" who "didn't have the same values as American citizens." He feels that the federal government isn't doing enough to turn back Mexicans. And so, for kids like Cristian and Lorenzo, getting good grades might have been the least of their problems.

Davis reveals the broader political atmosphere to again underscore the difficulties faced by these students on an individual level, as they try to succeed against a backdrop of immense societal prejudice against them. This makes what the students eventually accomplish all the more impressive.

In 1996, nine-year-old Oscar Vazquez wakes up to a big fire outside. His father, Ramiro, is going to butcher one of the family pigs—a sure sign of a party. Oscar's father had once been a police officer, but the government gave him a broken pistol; now he farms corn. Oscar holds the pig in place as his dad kills the animal, which he has never done before. When the animal stops moving, Oscar releases the rope, a little shaken.

Oscar's life growing up in Mexico again reiterates some of the struggles that he and other families face: poverty, the lack of opportunity for social mobility, and the idea that he has to grow up fast and make sacrifices to help support the family.

Ramiro says that the pig isn't for a party; it's going to be sold to finance Ramiro's journey to the United States. A week later, he leaves. Oscar's mother, Manuela, quickly falls into a depression. Oscar's older brother Pedro doesn't help out much; his sister, Luz, helps with the cooking, but Oscar effectively becomes the man of the house and takes care of the animals and the farm.

Oscar is certainly forced to deal with adult situations faster than many children his age due to his family's poverty, but this also gives him the opportunity to be a strong leader early on, as he helps take care of his mother and sister. For Oscar, as for Cristian, obstacles become a source of opportunity.

Ramiro works on a potato farm in Idaho and sends $100 a month back to Mexico. Oscar misses his dad. He is in fourth grade and a standout student, even winning a second-place trophy in a state academic competition. But his father is not there to witness his son's success.

Again, like the other boys, Oscar's narrative fits into the pattern of a hard-working parent who goes to the United States in search of opportunity and eventually is able to support the family's immigration as well.

A few weeks after Oscar's eleventh birthday, Ramiro calls and says he's being deported. Oscar is excited to have his father back, and Manuela is happier as well. His dad has saved a thousand dollars, and life returns to normal.

Even though Ramiro's deportation is not good news, the fact that Oscar is happy highlights the difficult situations that immigrants face when having to leave their families in order to support them.

Ramiro quickly grows unhappy, as he could make more in an hour in the U.S. than in a whole day in Mexico. After two weeks, he announces that he is going back to the United States—and that he plans to save everything he can to bring the whole family with him.

Ramiro's decision to then return to the United States emphasizes the difficulty of these journeys, because often immigration to the U.S. serves as a choice between more opportunity and a united family.

In January 1998, Oscar boards a bus with Manuela. Luz insists on staying behind with a local boy with whom she has fallen in love. Pedro will come later. The bus travels north to Agua Prieta, a border town across from Arizona.

For Ramiro, Oscar, and particularly Manuela, being separated from the rest of the family will ultimately come at too much of a cost for all of them to remain in the U.S., even though they can find better work and education.

The next day, an older relative meets Oscar and Manuela and introduces them to two women, who hand them green cards. A few hours later, the ladies drive them to the crossing station. They are stopped by a border patrol agent; Oscar shows the man his green card, and he and his mother are waved through.

Oscar and Manuela's first trip across the border is easier than their second will be, but still comes with the nerve-wracking possibility that they could be separated or jailed (as the women who ferry them over eventually are).

Oscar, Manuela, and the two women stop at a Circle K store next to a freeway overpass that amazes Oscar. He marvels at the concrete on-ramps and thinks that America is a land where anything is possible.

Oscar's marveling at the concrete on-ramps demonstrates how destitute their situation had been back in Mexico, and how he will make use of that opportunity he gains in the future.

Ramiro arrives and hands the ladies an envelope with two thousand dollars. Then he drives Oscar and Manuela home to a one-bedroom apartment with peeling paint, a dirt yard, and neighbors who blast music. They also share the home with another family.

Like the other students, even in America Oscar and his family deal with less than ideal living conditions, all for the sake of giving Oscar a good education and keeping the family together.

Oscar attends Isaac Middle School, but he doesn't speak English. Within a few weeks, he gets to the right classrooms on time, but soon trouble strikes. Luz refuses to join the family in Phoenix and Manuela becomes increasingly anxious and depressed. One day after school, Ramiro tells Oscar that he plans on staying in the United States, but that Oscar and his mother are going to return to Mexico.

The back and forth becomes particularly difficult for Oscar as he struggles to learn English and then is forced to go back to Mexico. Yet even with this seesawing, Oscar is eventually able to return to the United States and push himself to do well on his schoolwork instead of simply giving up.

Oscar cries all the way to the border. Back in Mexico, he readapts to his life, but he is still riveted by the overpass. He begins to work odd jobs around town for a few pesos. He wins a government scholarship to return to middle school.

Again, Oscar develops an early sense of dedication and resilience in returning to Mexico and picking up odd jobs to support his family.

Eight months after they return, Luz elopes with her boyfriend. Manuela sobs for a week, until Luz returns with her new husband, beaming. Manuela starts to shift her focus to Oscar. She is hesitant to return to the United States but knows that there is more opportunity for him there. The schools are free, and the coursework is more demanding. Oscar, however, doesn't want to go back. She puts her foot down and tells him to pack a bag of clothes.

The details that Davis brings up as to why Manuela wants to return to the United States make it clear that she is thinking primarily of Oscar's future and education. He also illuminates why immigrating is so appealing to poorer families: education is free in the United States, unlike in Mexico.

In December 1998, Oscar and Manuela return to Agua Prieta. The ladies who had helped them cross before have now been arrested, so they need new "coyotes." They meet three of Ramiro's friends with green cards, who agree to help coordinate the crossing.

Davis demonstrates the danger not only in being an undocumented immigrant and crossing the border, but also in helping anyone cross the border.

Sitting in the plaza, waiting for Ramiro's friends, Oscar tells Manuela that he doesn't want to go back. She points to a child with a remote-controlled car and tells him that she will buy him one if he is strong. To Oscar, the car is like magic.

The remote-controlled car sparks an early sense of curiosity in Oscar, which he later returns to when he is looking to find a new sense of purpose and a new team outside of ROTC.

Ramiro's friends help Manuela and Oscar find two men claiming to be coyotes. They look more like addicts to Oscar, and he is afraid that the men will attack them. As they walk towards a hole in the border fence, Oscar scans the ground for rocks to fight them with.

Oscar's thoughts remind readers how dangerous the trip can be for the immigrants, particularly as they must trust people they do not know to help them get across—once again, Davis emphasizes that many of these kids have a heavy responsibility in supporting or protecting their parents.

Oscar, Manuela, and the two coyotes climb through the hole in the chain link fence. They start to jog, and Oscar sticks by his mother, afraid of getting caught and going to jail, or of his mother getting caught and being left alone.

Oscar's fear that he and his mother could be separated and/or jailed simply for walking into the United States again demonstrates the difficult cost/benefit calculations that immigrants must make about crossing the border.

As the sun sets, Oscar grows more and more afraid. The temperature starts to plummet. After what feels like hours, the group nears a road when a Border Patrol truck drives right towards them. They dive to the ground. As the truck drives past, the agent looks right at them but keeps going. They figure that the truck must be full, but the agent probably called for backup. They run the rest of the way to the buildings.

Oscar's border crossing illuminates how, like the immigration system itself, their ability to come to and live in the United States comes down to luck. The arbitrariness with which people are deported makes the policies even messier once they enter the United States, as Oscar is then doomed to a life of instability in the country.

Manuela and Oscar walk around to the front of the building, which they discover is a Walmart. They wait inside the store. Oscar comments that they must have been running for hours. Manuela laughs and says that they left Mexico twenty minutes ago. She then hushes him so that no one will hear them speaking Spanish. Ramiro's friends arrive within an hour and take Oscar and Manuela home. They arrive at a house with a big front yard with grass.

When Manuela tells Oscar to stop speaking, it demonstrates her fear that they could be deported simply because they are speaking Spanish; even their language makes them easily targeted by immigration officials. This moment suggests the immediate pain and silencing—that is, the sacrifice—that the pursuit of a new life can entail.

Oscar returns to Isaac Middle School. He doesn't make many friends, but he does start to pick up English. He participates in a science fair: because he grew up in a bean-growing region, he conducts an experiment on how light and humidity affect the germination of beans. He meticulously documents his results in English, impressing and surprising his teachers. Oscar wins $200 at the county science fair. He starts to dream about going to college.

Oscar continues to capitalize on his initial curiosity about science and technology in conducting his experiment. He also demonstrates one of the key ways in which science can become exciting to kids, in making his project interesting and relevant to himself.

Oscar graduates from Isaac Middle School to Carl Hayden. He tries out for the football team but is cut for not knowing the rules. He tries out for soccer but plays too rough. Then one day, he sees a group of students jogging across the field; they belong to the Junior Reserve Officers' Training Corps (ROTC). He is impressed by their discipline and their tirelessness.

Oscar, like Lorenzo and Cristian, has a difficult time finding a team to which he can belong. However, ROTC becomes his first opportunity to find a group, and also provides him with a deeper love of America.


Oscar signs up for the ROTC, and Major Glenn Goins, the group's instructor, welcomes him into the group. The mission of the program is to "inspire young people to become better American citizens." Oscar transforms from a skinny kid into a muscled machine. By his junior year, he becomes the commander of the Adventure Training Team. With Oscar's leadership, they begin to beat ROTC programs from much larger schools in competitions.

Goins becomes an early mentor for Oscar, as he encourages him to follow his passions and gives him the tools to succeed in it. This discipline and motivation is what gives Oscar the leadership tools that he brings to the robotics club.

Goins teaches his students that the Declaration of Independence gave all people "unalienable Rights," not just American citizens. But he also knows that many of his charges can't enter the military because they are not American citizens. Oscar doesn't know this, however. He views himself as American and wants to give back to the country that gave him so much, particularly after 9/11.

Again, there is an irony in Oscar's interest in the ROTC and the military. The path for him to become a "better American citizen" is a long and hard one, despite the fact that he primarily views himself as an American; much as he embraces his new country, it's clear that it does not readily embrace him in return.

At fourteen, Oscar asks Major Goins if he can enlist. Goins asks if Oscar has a green card; when Oscar says he doesn't, Goins admits that he cannot join the Army unless he is a U.S. citizen or permanent resident. Oscar is shocked. He walks away thinking that maybe if he was good enough, something would change.

Despite the fact that Goins can give Oscar the tools to succeed in the ROTC, he still cannot change Oscar's primary obstacle to becoming an American soldier: the fact that he is not a citizen.

When Oscar is a junior, he and his battalion go to an Army base to run an obstacle course. Oscar's dedication while running the course leads Goins to promote him to cadet major, making him the battalion's executive officer. Oscar rallies his squad to do long training exercises. Goins also teaches a civics class, in which Oscar memorizes the Preamble to the Constitution.

Oscar becomes a model American soldier, except for the fact that he is not a citizen. His background in the ROTC is one of the things that is later pointed out, even by U.S. Senators, as a reason that there should be an easier path to citizenship for kids like Oscar.

At the end of Oscar's junior year, Goins awards him the Officer of the Year trophy—but it isn't enough to change his immigration status. Two other cadets enlist, while Oscar stays at home. By the start of his senior year, he realizes that he needs to find something else to do with himself. So, he signs up for Fredi's marine science class.

Even though Oscar is unable to continue his career in the military, it is precisely this obstacle which then leads him to his next great success: leading the robotics club to its national championship just one year later.

Davis describes Fredi's own journey to the United States. Fredi is born in Tehran, Iran, in 1965. His parents, Reza and Tooran, are both doctors, and they move to Cleveland, Ohio, when Fredi is just a year old. His brother Alladin is born in Cleveland and automatically gains U.S. citizenship, something that Fredi won't receive until he is nineteen years old.

Fredi and his parents experience their own version of prejudice and the American Dream. Even though Fredi is able to gain citizenship at nineteen, the fact that his brother automatically becomes a citizen by being born on U.S. soil highlights some of the arbitrariness and luck of what it takes to be a U.S. citizen.

Reza and Tooran follow jobs to Phoenix in 1969. Fredi starts elementary school and speaks English both there and at home—his parents want him and his brother to assimilate. But when Fredi turns eight, his parents announce that they are going to return to Tehran. Fredi doesn't speak Farsi, and so he has a hard time adjusting to life in Iran. For Fredi, Iran feels like a place he should know but doesn't. After only a year in Iran, the family decides to return to Phoenix.

Fredi's story serves as another example of how, like Oscar and many of the boys, even though he isn't technically an American citizen, he feels like he belongs in America much more than he belongs in Iran.

Back in Phoenix, Fredi feels at home, until revolution erupts in Iran and hostages are taken at the American embassy. Across the country, Iranians are targeted and attacked. One day during Fredi's sophomore year, he is heading home on a bike after cross country practice when a truck full of teenagers veers him off the road. They jump out of the car and surround him, kicking him until members of his team start to run over.

Fredi's high school experiences also highlight how Americans' prejudices have always informed the way in which immigrants are treated. Even though Fredi is essentially American, the other students treat him as though he shares blame in the Iranian revolution and the American hostage crisis.

Fredi doesn't tell his parents what had happened, instead focusing on running and his other outlet, building things. In eighth grade, he constructs a hovercraft out of notebook paper and balsa wood for a science fair. He catches the eye of Ann Justus, a science teacher at Camelback, who signs him up for her seminar.

Fredi's early love of science and interest in construction are then capitalized on by a teacher. Justus becomes Fredi's own crucial early mentor as she helps him develop his passion both for building and for teaching.


Justus's seminar is structured much like Fredi's will come to be: with an emphasis on hands-on learning and building things. With Justus's encouragement, Fredi designs more ambitious hovercrafts, winning first place each year at the Central Arizona Regional Science and Engineering Fair. His final hovercraft is a six-hundred-pound, sit-on-top, gasoline-powered hovercraft that can reach speeds of twenty-five miles per hour.

Justus becomes a model for the kind of mentor that Fredi will eventually seek to be: encouraging, hands-on, and trying to make science and technology more and more fun as she challenges him to create larger hovercrafts.


To Fredi's parents, the hovercraft represents a distraction from his schoolwork. They want him to get a medical degree. He attends college at Arizona State University, but he finds himself dropping in frequently on Justus's seminar, helping younger students. Justus watches him and pulls him aside one day, telling him that he is wasting his time in pre-med. He's meant to be a teacher.

Fredi starts to show himself to be a good mentor as he takes other younger students under his wing, much like he will later take Oscar, Cristian, Luis, and particularly Lorenzo under his wing in order to help them fulfill their potential.

Fredi laughs off Justus's statement, but by his sophomore year he finds that he can't focus on his classes anymore. He drops out of pre-med and applies to the architecture program, hoping it will be more hands-on. When his application is rejected, he is blindsided. The rejection is especially painful because his younger brother Ali has just graduated, is bound for the pre-med track at the University of California at San Diego, and will go on to get his medical degree at Johns Hopkins.

To Fredi's parents, it seems like he is not fulfilling the American Dream in abandoning premed. But the American Dream truly represents the opportunity to build whatever life one chooses. And so, in this vein, following one's passion is the ultimate distillation of the American Dream.

Justus advises Fredi again that he should be a teacher. Fredi tries to argue why he shouldn't be a teacher: people don't respect teachers and they don't make a lot of money. Justus tells him he'd be making a difference in people's lives—and more than that, he already *is* a teacher. Fredi returns to ASU and starts taking education courses. Fredi's parents are extremely disappointed in his decision.

Justus is an important mentor for Fredi not only because she encourages his love of science and his inquisitive spirit, but also because she gives him the confidence and the permission to pursue the dream that will really make him happy in becoming a teacher.

In 1996, Fredi marries Pam Nuñez, the school psychologist. He coaches cross-country at the school and starts an electric car racing program. A year later, they have their first child, Bijan, and two years after Bijan they have Alex. Pam takes some time off to raise the kids. When Alex is two, he is diagnosed with pronounced autism. At the same time, Pam and Fredi see that Bijan is also having trouble in social settings, and he is diagnosed with Asperger's syndrome.

Fredi then becomes a mentor in his own right, as he starts different programs in the school to get other kids passionate about science and math. He is particularly selfless in doing these things because he has two children who need special attention and also because he runs those programs for so little money.

Soon after the diagnosis, Fredi's parents move out of the state, their relationship more strained than ever. Fredi has his kids to focus on, however. In 2002, he stops coaching and shuts down the electric car program. In 2003, Cristian, Oscar, and Lorenzo walk into his science classroom.

Even though Fredi is just about ready to let go of his extracurricular programs, the students get him excited about his work, showing some of the mutual benefits of mentorship as it allows Fredi to feel fulfilled through his students' success.

In 1989, thirty-eight-year-old inventor Dean Kamen had already had a lucrative career. In his twenties, he invented a self-regulating syringe that was safer and more reliable than a human-administered shot. At thirty, he sold his company and used the money to create a private research facility in Manchester, New Hampshire. On the bottom floor of the facility, he constructed a science museum. He didn't charge admission and built the exhibits himself, to give back to the community.

Dean Kamen's story serves primarily to ask the question of how to get kids interested in math and science. At first, he builds a museum in order to give kids a series of attractions and ways to interact with a variety of experiments. But he will quickly realize that he may need something even more engaging.

One morning, a rainy Saturday, Kamen sees a big group of children visiting the museum. Kamen stops one of them and asks if there are other science experiments that the kid would like to see in the museum. The kid doesn't know, and when Kamen asks if he knows any scientists or inventors, he doesn't. Kamen asks more kids if they could name any living scientists or inventors. When he gets more negative responses, he asks the parents, who also cannot think of any.

Kamen's inquiries point to the fading interest in math and science, which is particularly remarkable in this example because he is asking kids who have self-selected into going to a science museum. Regardless of their lack of broader knowledge, it seems clear to Kamen that these kids do have a serious interest in the experiments that he has around the museum.

Kamen returns to his office and realizes that children don't need access to more information; they need more interest and excitement in the sciences. He decides to start a robot contest. The initial contest, which he names FIRST (For Inspiration and Recognition of Science and Technology) is held in February 1992; by 2001, it has expanded to 13 regional competitions with 25,000 teens competing on 520 teams.

Kamen then tries to rectify this situation of fading interest in science by creating the FIRST competition. He believes that that hands-on experiments and a competitive setting might make students more inspired to pursue math and science. Indeed, FIRST will go on to inspire the teens at the heart of Davis's book—again pointing to the power of mentorship and role models when it comes to keeping students engaged.

Fredi sees a flyer about FIRST in 1999 and starts a small team at Carl Hayden in 2000. He realizes he has a problem, though: he doesn't know computer science, and the robots need to be programmed. He decides to find some help.

Even though students may not know individually about the FIRST competition, when coupled with a teacher like Fredi who sees the value in making science fun, it can begin an entire lineage of students interested in robotics and other sciences. This again underscores the power of having even one adult invest energy in leadership and mentorship for the students in his or her life.

Allan Cameron grew up a mischievous kid in the fifties, setting up telephone wires between his and other kids' houses. He has the shaggy appearance of a hippie, a look he cultivates after serving in the Navy during the Vietnam War. After his tour, he decides he no longer wants to take part in the military and works as an assistant to a philosophy professor at a community college in Arizona. The professor suggests he become a teacher.

Allan becomes another mentor to the Carl Hayden students, though his own journey mirrors theirs a little less than Fredi's does. But like Fredi, his upbringing is unique, and he gains an interest in technology and radios early on—evidenced by his running telephone wires between houses. All of these background stories point to the power of childlike wonder and curiosity when it comes to encouraging interest in science.


Allan then gets a job in South Scottsdale, a pocket of poverty in an otherwise wealthy area of Phoenix. The fifth graders he teaches are unruly and disrespectful, and it seems that everyone has given up on them. Allan begins trying to discipline them with threats, but the class only gets rowdier. When he tries to explain the importance of education, one of the kids tells him that they are the worst kids in the school, almost with pride.

In this story, Allan also develops skills in dealing with kids from tougher backgrounds. This scene establishes the challenged his is up against, and underscores how the kids seem to take pride in behaving badly. By believing in them and caring about them, however, he will ultimately give them the confidence to be something other than "the worst kids in the school."


The next day Allan says that everyone thinks that they're jerks, and that they have to change that perception. He offers to teach them what he knows about war. Not to fight, but to march. The kids start to march around the school in perfect lockstep during lunch and recess. They establish a new reputation for themselves: having the most discipline.

This story also serves as an early example of how the friendships and bonds within a group can become a kind of mutual motivation, as these students encourage each other and spur each other to do the best that they can, in the same way the Carl Hayden students do.

In 1982, Allan starts a Ph.D. in elementary education, and is four years into the program when he hears about Carl Hayden becoming a magnet school. Allan's Ph.D. opens up new and more prestigious possibilities for him, but he can't stop thinking about the school, and how the students needed more help than those already in college.

Allan sees the value in making sure that every kid, regardless of their background, can get a quality education, and sees how he could really make a difference in the life of a kid who may not realize that they have an enormous amount of potential.

In 1987, Allan accepts a full-time teaching job in computer science at Carl Hayden and completes his Ph.D. in 1990. He starts programming and ham-radio clubs in the nineties and then signs on to start a robotics team with Fredi in 2000. He doesn't speak Spanish, but most of the kids he meets at Carl Hayden are hungry to learn and willing to work hard, and he can't imagine leaving them.

Like Fredi, Allan gets his own fulfillment from mentoring these students as it allows him to get kids interested in his own passions. He provides them with the knowledge and the opportunity to succeed that they might never have had before, again reflecting the book's emphasis on the power of mentorship.

The Carl Hayden robotics team gets off to a slow start, but the kids who show up are thrilled to be a part of it—including Michael Hanck, who had taken Fredi's marine science class as a freshman and joined the team the same year. Michael suggests that Cristian speak to Fredi about joining.

The robotics team becomes one of the ways that students get excited about math and science, as they have full control over what they build, but also maintain the guidance and support of Allan and Fredi.

Cristian steps into Fredi's classroom in May 2003, after the FIRST competition has already taken place that year. But Fredi doesn't want to disappoint Cristian, and so he tells him about the club's next project: building a catapult to fire pumpkins on Halloween. Cristian is extremely excited and starts to hang around the science lab. Fredi is impressed both by Cristian's book smarts and his ability to build things on the fly.

Fredi, just like Dean Kamen, sees how imperative it is to capture some of the innate curiosity and the creativity that the students have. School and science, it's implied, should be as fun and exciting as those childhood projects—not just stuffy lessons in a classroom.

Cristian sees Lorenzo hanging around the lab and assumes he's just another loud jokester. But Fredi sees that Lorenzo is simply a lost kid looking for a way to define himself. When Fredi notices Lorenzo lingering after class, watching Fredi feed the fish in the tanks around the classroom, Fredi asks if he wants to learn. Lorenzo is honored to be entrusted with any responsibility and learns how to feed the fish.

Fredi becomes a particularly good mentor to Lorenzo because Lorenzo, up until this point, doesn't feel truly valued or valuable to any part of his life. By putting trust in Lorenzo, Fredi helps him start to gain confidence in the idea that he is capable of doing things.

Fredi then invites Lorenzo to McDonald's. Lorenzo is speechless: no one has ever taken him to a restaurant before. At McDonald's, Lorenzo stands nervously near Fredi and says he'll have what Fredi is getting, unsure of what to order. When they sit down, Fredi tells Lorenzo about the robotics team, and the tools they get to use. Lorenzo is immediately captivated by Fredi's description and joins the team.

Again, Fredi's trip to McDonald's with Lorenzo has a huge impact on him, because it makes him feel like someone believes in him, cares about him, and wants him to be a part of a group. The gift that Fredi gives him, and that his teammates also eventually give him, is that of self-worth.

A year earlier, in the summer of 2002, a group of Phoenix high school students from Wilson Charter High School visited Niagara Falls. They had converted a rowboat into a solar-powered dinghy, won a regional competition, and were sent to a national competition.

As will soon become clear, Davis brings up a story about students from Wilson Charter High School here to again highlight the dangers faced by undocumented students and also Hispanic students more generally, regardless of where they are and what they're doing.

Niagara Falls was on the students' list of sight-seeing places, and to get a full view they would need to go to Canada. A teacher, not wanting to take any risks, found an immigration agent and asked if kids with U.S. school IDs would be allowed to cross. The immigration agent then marched over to the kids and began quizzing them on their citizenship. Four of the kids had been brought across the border as children, and the agent detained them.

Even though the students are in the U.S., potentially going over to Canada, and even though they have achieved a major technical accomplishment and are simply on a school field trip, they are still discriminated against in the country they call home. This episode reminds the reader of the broader societal prejudices and tensions happening in the backdrop of the Carl Hayden students' story.

The agents phoned the principal of the school and asked her to fax birth certificates for the four detained students. When she could not, proceedings began to deport the four students to Mexico. The legal wrangling dragged on for three years before a judge ruled that the students were unfairly targeted. The students were allowed to stay, but the threat was clear. Even a seemingly harmless summer science competition could bear life-altering risks.

Davis's points highlight once again the ever-present dangers of being an undocumented kid in the U.S. They experience a particularly unjust fear because they have been brought to the U.S. as children and feel that the U.S. is their home, yet still worry that they could be ripped from it at any moment.

In the fall of 2003, Lorenzo and Cristian both sign up for the 7:00 a.m. robotics club class. Together with Michael Hanck, they begin to construct a massive catapult. As their designs grow outlandish, Fredi sees that the young students might need some leadership. He mentions to Oscar, who is in Fredi's senior Marine Science Seminar, that there are students building a catapult in the club. Oscar agrees to check it out; he is looking for a new team to lead.

It is notable that instead of hampering their ideas, Fredi finds another student to help guide Cristian, Lorenzo, and Michael to slightly more practical inventions. That way they still maintain their sense of creativity, but they have a peer spurring them to make their ideas even better. This reiterates the power of teamwork.

Oscar is impressed with their designs but sees that the catapult they want to build is so big that it would require pulling a 120-pound weight back into firing position. They would need some extra muscle in order to fire it.

Oscar, knowing the importance of remaining optimistic and supportive, compliments them on their designs but also contributes to the team by making sure that their ideas are feasible.

The catapult is meant for the annual pumpkin hurling contest hosted by the local pumpkin patch. The day before the contest, Fredi tells the group that they will leave at six the next morning. Lorenzo accidentally sleeps in and misses the van by just two minutes. He's furious with himself and his lack of discipline.

Lorenzo's lack of discipline becomes a sore subject for Oscar in particular. But gradually, Lorenzo is able to prove that he has the same discipline as his teammates, and that they have made him a more dedicated member.

At the pumpkin field, neither Cristian nor Oscar miss Lorenzo much. Both of them think that there's no excuse for being late. When the competition starts, it takes all three of them—Cristian, Oscar, and Michael—to arm the trebuchet. On their first try, the pumpkin flies about 100 feet. They add more weight and reach up to 150 feet, placing them in second. Everyone has a lot of fun, but they realize that it might be helpful to have someone a little bigger on the team.

The team's need for a little bit more muscle is what leads them to Luis, but what is remarkable is that even though Luis isn't necessarily there because of the same enthusiasm about science, he still learns the information and understands the technology just like the rest of the students do.

Luis Aranda is born a perfectly normal-sized six-pound baby in a shack in the city of Cuernavaca. His father, Pedro, had left to find work in the United States. His mother, Maria Garcia, works as a housecleaner for a Japanese woman, and takes Luis to work with her. Luis grows bigger and bigger, and the Japanese woman takes a liking to him. She knows that the family is struggling, and she asks to adopt Luis so that he might have a better life.

Luis's life echoes that of the other students, and again illustrates the painful realities that often face immigrant families—who are forced to separate in the pursuit of a better life.

Maria Garcia can't part with Luis, but she does consider how she might be able to give him a better life. Taking him to the United States seems like the only option. She, Luis, his grandfather, aunt, and two cousins all set off by bus. They walk through a hole in a chain-link fence on the border and take a taxi to Phoenix, where Pedro is. Eventually, Pedro is able to obtain permanent residency in the United States and get green cards for Maria Garcia and Luis.

Like many of the other mothers, Maria Garcia is spurred to take her son to the United States because she sees how limited Luis's education would be in Mexico, and wants to be able to provide him with the chance for a better life. It is also worth noting that Luis's green card makes him a lot safer in America than the other students, but it is unclear why or how his father is able to get one—highlighting once again some of the arbitrariness of the U.S. immigration system.

By sixteen, Luis is 205 pounds, six feet tall, and a quiet kid. He's not particularly interested in school, but he goes because he understands the sacrifices that his parents have made for him to be there. To help support the family, he starts washing dishes at an Italian restaurant while he is in middle school.

Luis's size and stature is what makes it hard for Luis to find many friends in school, but it is exactly what leads the other students to want him to join their team—an obstacle once again leading to opportunity.

The kitchen fascinates Luis, and he starts cooking at home as well. By high school, he is working as a short-order cook at a restaurant next to a bowling alley. In his senior year, he finds a better restaurant job in a Phoenix suburb. He is initially hired as a dishwasher, but one morning when the kitchen is overwhelmed he offers to help out with the cooking. His boss, Harold, is impressed with what he is able to cook and promotes him.

Luis holds jobs all through high school, and even though he may not have the same talents that the other boys possess, he is clearly a hard worker. This is one of the quintessential requisites of achieving the American Dream, but for Luis that dream will remain out of reach.

At the beginning of senior year, Luis enrolls in Fredi's Marine Science Seminar, which is meant to be an opportunity for seniors to work independently on a yearlong project. He hopes it will be an easy class, and Fredi offers up the chance of working on robotics for his project. Luis thinks that it is nice that the team seems to want his help. He doesn't know Cristian or Lorenzo, but he does know Oscar, who is friendly to him despite his intimidating size and silence. When Oscar tells him that the team is going to build something great, Luis agrees to join.

Unlike the other boys, Luis's desire to join the robotics team is not spurred by an innate interest in science. But it does appear that Luis is searching for a group of friends, and the robotics team becomes just that as they build each other up and inspire each other to be better students, scientists, and people.

In the summer of 2003, just before the start of the catapult project, Fredi and Allan travel to Monterey, California to learn more about a new robotics competition hosted by the MATE Center there. The competition is centered on remotely operated vehicles (ROVs), which will have to complete tasks underwater. The trip fosters a new friendship between them, and afterward they call each other often. They tell each other how ridiculous it would be to start an underwater-robotics competition in a poor school in the middle of the desert. But, they agree to do it anyway.

In the same way that the robotics team allows Cristian, Lorenzo, Luis, and Oscar to forge a friendship, the team also sparks the friendship between Fredi and Allan as they find a common goal in giving the kids a fun way to learn. And despite the fact that they have so few resources, Fredi and Allan's simple belief that the students might get something out of the competition is what ultimately enables the team to win the championship.

TWO

The concept for the 2004 MATE robotics competition centers on the demise of a fictional U-boat that was supposedly torpedoed in the Caribbean in 1942. The background story for the submarine is that it was engulfed by a mysterious explosion off the coast of Florida, and then the captain was rescued by a Spanish-speaking fisherman named Pedro Sanchez—which captures Lorenzo's attention.

Like the FIRST competition, the MATE competition strives to get the kids excited about science and imbue the discipline with a sense of adventure. It is also not a surprise that Lorenzo is struck by Pedro Sanchez's name, as the students have so few positive images of figures of their background because of society's prejudice against them.

During the contest, students explore a mock-up of the submarine in a swimming pool at the University of California, Santa Barbara. There are seven tasks: students have to build an ROV that measures the submarine's length and calculates its depth, can navigate inside the submarine, and retrieve the captain's bell. The ROV also has to recover two "lost" pieces of research equipment, sample liquid out of cargo barrels, and determine the temperature of water seeping from a cold-water spring.

Even though the U-Boat concept is meant to simulate adventure, the tasks that the ROV must complete are very daunting. The list makes it clear just how difficult the competition would be for anyone, let alone kids who have a small amount of knowledge and even less money to contribute to building this ROV.

The group is daunted, but Oscar tries to be optimistic and motivational. Still, even Fredi and Allan are privately nervous: the tasks are difficult. They want to give the kids a chance to accomplish something beyond what they think they can do. If they fail completely, however, it will only reinforce the impression that they don't belong in the competition at all.

Fredi's educational philosophy focuses primarily on making learning fun, but also on giving students the confidence to know that they can learn and succeed. Here, he wants to make sure that their confidence isn't completely shattered by participating in a tough competition.

The competition is split into two classes: Ranger (which is geared toward high school teams) and Explorer (geared toward college students). Both classes sound challenging; there is even a college competing at the high school level. On the other hand, the Explorer class has teams like MIT competing. Fredi reasons that if they're going to lose either way, they should be beat by college teams. That way, the kids can say that they lost to MIT.

Fredi's solution to giving the students confidence is by making sure that if they lose, they can still be proud of what they've accomplished—while also trying to give them the assurance that they can compete with the top teams in the country.

Fredi and Allan tell the kids of their plan. Oscar wonders why they want to go up against the best school in the country; Fredi says the main goal is for them to have a good time and learn. Oscar responds that he doesn't want to enter something to lose, and Allan chimes in that they will work hard and build a great robot. Fredi says they can aim not to finish last, trying to be realistic. Lorenzo giggles, saying that should be their motto: "Don't finish last."

It seems everyone goes into the competition with both excitement and trepidation; confident as he is in his students' skills, even Fredi realizes the immensity of the odds they are up against. This will make their final success all the more impressive.

Oscar takes charge, determined to do better than not finishing last. Their first task is to figure out how to pay for everything. MATE covers meals and housing and provides $100 for building supplies, but the team is going to need a lot more than that. Fredi prints up brochures asking people to donate to the club. Lorenzo asks a cousin to donate to his underwater-robotics competition, but she thinks that he's joking and refuses. Cristian phones aunts and uncles in California, who say they'll think about it but never send anything in.

Even though Fredi still has his doubts about how well they might be able to do in the competition, he still works to give the students the tools to succeed on their own, without doing the work for them. It is notable, as well, that the students' even face stereotypes with their own family and friends, who are in disbelief that they might be able to participate in a competition like this.

Luis makes some progress, approaching his boss at the restaurant, Harold. Harold is astonished to learn that he is competing in a NASA-sponsored underwater-robotics contest and writes a check for $100. Oscar stops by the mattress factory at which his father works. Oscar spent his summers there and knew the owner. He gives his pitch, and the owner writes a check for $400, while another employee matches the donation, giving them a budget of about $900. It isn't much, but to them it seems like an extravagant amount to spend on a robot.

The students' underdog status creates its own reward, in a way. Some of the people around them are so impressed by the simple fact of their participation in the competition that they donate to their efforts. This happens after the competition as well, when Davis publishes his article in Wired: readers are so impressed with the students' potential that they donate more money to send them to college.

Now that they have some funding, the students begin to make models to see how big their ROV needs to be to accommodate propellers, sensors, and controls. They then talk through the first tasks they have to complete: measuring the depth and length of the submarine.

Building the ROV becomes the ultimate test of collaboration for the students. They clearly are thinking logically and methodically about the next steps that they need to take.

Lorenzo thinks of the simplest approach: a length of string. He and Cristian go back and forth about how to make sure that the string can reach the bottom of the pool, and how they could measure its length. Lorenzo then comes up with a tape measure, which could hook onto the submarine, and then the robot could drive backward to measure it. They could point a camera at the tape measure and read the length from a video monitor.

The students are forced to come up with simple ideas from a practical standpoint, because they don't have a ton of resources to carry out something more complicated. Yet whe obstacles of their situation—like those in their broader lives—again become a source of opportunity. What's more, it is simple ideas like Lorenzo's that will be rewarded by the judges at the competition.

Oscar agrees that this could work; Lorenzo beams with pride. Cristian points out that it won't work for depth, though, because there's nothing at the bottom of the pool to hook to the tape measure. Oscar pitches using a laser tape measure. Cristian asks if it would work underwater; Fredi suggests that they should call someone to find out.

Early on in the robot-building process, the students one up each other, trying to prove their own intelligence and why their own ideas are the best. But gradually they realize that their ideas inspire one another to come up with the best possible solutions, like a true team.

Oscar takes charge in making the calls. He googles laser tape measures and comes across a company called Distagage in Florida that sells lasers that can read distance as far as 330 feet. They sell for $375 to $725 each. Fredi encourages Oscar to call anyway, just to ask for advice.

Fredi again gives the team support and guidance but won't do the work for them. Without Fredi, Oscar may not have called Distagage at all, but Fredi still encourages Oscar to call the company himself.

When Oscar calls, he speaks with Greg De Tray, who has formed Distagage recently. He had never intended to get into the laser range finder business; he is an insurance adjuster and he bought one to avoid having to physically measure the mold-filled rooms he often inspected. The device's manufacturer only sold them in bulk, however, and so he bought fifty devices and now sells them to anyone interested. Still, De Trey is surprised to get a call from Oscar.

De Tray's reason for starting his company Distagage is not dissimilar to the students' reasons for searching for a laser range finder: it is a creative solution to a problem. This also seems to be why he respects their efforts in the competition.

Oscar asks De Tray if his range finders work underwater. De Tray doesn't know, but he's interested in finding out. He tests it and calls Oscar and the team back to explain that it doesn't work. The reading is always off by 30 percent. But Cristian, listening in, realizes that that's due to the index of refraction: it takes the laser longer to travel through water than air, so the reading is off. If they simply take thirty percent off of the readings, they'll get the right measurement.

These flashes of problem solving, like Cristian's inspiration about the index of refraction, are what make the students feel like they're flexing their creativity when it comes to building the robot. The sense of accomplishment also makes them feel closer as a team and as friends.


De Tray is impressed with the kids' ingenuity and excitement. He offers to let them borrow one of his devices. Lorenzo is speechless: no one has ever given him anything of significant value before. He never thought that random strangers would be interested in helping him. Oscar is simply grateful and tells De Tray how much they appreciate the offer.

This episode underscores that though the students may lack the resources of other teams, they make up for it in enthusiasm and creativity. This is what appeals to De Tray, who is also impressed with their taking the initiative to ask for help and sees the value in lending the students his expertise and equipment.


While working on the project, Lorenzo rarely does his homework, as it seems meaningless to him. As a result, he receives mostly Cs and Ds. He doesn't mind; he is having more fun in the robotics closet than doing his regular schoolwork. But Fredi minds. He explains to Lorenzo that if he doesn't pass all of his classes by the end of the semester, he'll have to kick him off of the team.

While Fredi has already inspired Lorenzo and the other students to want to learn and participate in the robot competition, he also sees the importance of making sure that the students are able to learn and succeed in school as a whole.

Spurred by Fredi's rule, Lorenzo starts studying. He sits in the front row during class and does all his homework. When he can't figure a question out, he asks Cristian to explain the theory. Cristian isn't a great teacher—he doesn't have a ton of patience—but Lorenzo is a perceptive student. Lorenzo starts getting As and his GPA begins to climb.

Fredi's motivational techniques work, as he sees that Lorenzo's desire to be in the group and part of a team can push him to succeed in other aspects of his life.


To complete the temperature-reading task, Oscar tracks down a thermometer supplier in Connecticut. He speaks with Frank Swankoski, a temperature engineer at the company. This is the second call Swankoski has received in a month from amateur roboticists. But unlike the earlier call, in which college students merely ordered what they wanted, Oscar asks for Swankoski's advice and puts him on speakerphone.

Swankoski, like De Tray, is impressed with the kids' excitement and creativity—but he is equally impressed that they have the initiative to ask him for help, unlike the other students who felt that they knew all of the information they needed.


Swankoski explains that they want a "thermocouple with a cold junction compensator." He says that this device is made of two different metals placed side by side. The voltage conducted between the metals will allow the students to measure the temperature. Swankoski offers to donate a device to them, saying that he believes they can beat MIT. When Swankoski hangs up, Oscar looks at the rest of the group and says that they have to believe in themselves, because now they have other people believing in them.

The students' creativity and initiative again pay off. This moment further underscores the importance of encouragement and support for these kids—once they realize others believe in them, they are more apt to start believing in themselves as well.

In November, Fredi takes some of his marine science students, including Oscar and Luis, to see the ocean. On the drive, Oscar and Luis bond talking about cars. Oscar is surprised to find that even though Luis is quiet, he isn't shy—it just seems like no one has ever asked him a question before.

The team also brings together some unlikely friendships, as Oscar and Luis deepen their conversations on this field trip. Thus, the team not only represents a fun activity, but also a means for the students to find a sense of belonging.

The ocean is mind-boggling to Oscar and Luis. They have seen it only briefly and have never been in it before. On the same trip, Fredi takes the students to SeaBotix, a San Diego-based ROV manufacturer, with the company president, Donald Rodocker. Rodocker takes the students into the laboratory to show off some of his latest vehicles.

Little details like this one remind readers just how isolated the kids are—especially considering the fact that they are designing a robot that is meant to navigate the ocean. As Allan and Fredi pointed out earlier, they are at a serious disadvantage, as most of the other teams reside on the coasts.

Rodocker shows them a robot called the LBV (little benthic vehicle), which is amazingly compact. Still, it has to contend with the ROV's biggest problem: its tether. The tether is a bundle of cables that allows the robot's operator to control propellers, sensors, and manipulators. The cables also carry video signals and usually supply the robot's power. One of the biggest engineering challenges is how to minimize the size of those cables.

Davis's early explanation of one of the ROV's biggest issues here makes Cristian's suggestion about putting the battery on board (and thus reducing its tether) even more remarkable later, as that kind of ingenuity and pioneering strategy is what gives the team a leg up.

Rodocker talks about some of the prototypes they've built of one feature of the LBV: its pincer, which is capable of grabbing a variety of objects, and would be the perfect tool to complete the mission's tasks requiring them to retrieve a variety of objects. Emboldened by the experiences of talking to De Tray and Swankoski, Oscar asks if Rodocker would consider lending them one of his prototypes. Rodocker easily agrees.

This encounter with Rodocker illuminates some of the privilege that the other teams might have. Whereas other teams might automatically be able to ask for things or simply be given money, the Carl Hayden students come to the slow realization that there are people out there who may want to help them. If they had not had the early experiences with De Tray and Swankoski, they might not then have gotten this additional pincer. Success in many ways begets success, which is what makes it particularly hard for students from poorer backgrounds to get started in the first place; yet, as this story makes clear, even small moments of success can put kids on the right path.

Back in the car, Oscar and Luis marvel at their good fortune. They have seen the ocean, become friends, and gotten a state-of-the art pincer on loan. But then, as they return to Arizona, the car is stopped by Immigration and Customs Enforcement. Luis has a green card, but Oscar is in the country illegally. Fredi asks for their school IDs and instructs them not to speak. An officer asks for their identification, and Oscar imagines the worst. After the officer scrutinizes their IDs, he lets them pass and tells them to have a good trip. Fredi speeds away.

The book is structured so that just as readers begin to forget about the students' immigration status, Davis reminds readers that the students could be in danger even on a simple school field trip to California. The incident foreshadows the fact that even amidst their success in the competition, the students experience severe barriers afterwards as a result of being undocumented.

Oscar returns to the robotics closet and resolves to put the checkpoint incident behind him. He doesn't want to let his fear control him. Oscar positions the thermocouple, the range finder, and the pincer in their model. Then, he, Cristian, and Lorenzo strategize about how to build the real ROV. Metal will be more compact, but expensive. Cristian proposes glass syntactic flotation foam, which saw in a documentary, but which would also be very expensive. They settle on PVC (thick white plastic) instead. They can run the wires inside the pipe, and the air in the pipes will help the robot float.

Again, the students' lack of resources becomes in some way an asset because it forces them to think more creatively and more practically about their robot's material. Yet again, this obstacle actually turns into opportunity: when they settle on PVC pipes, they are inadvertently giving their robot a sleeker design, and avoiding issues that other teams have to solve like how to make their robot more buoyant.

Luis drives to Home Depot and buys twenty dollars' worth of PVC pipe. Luis, Cristian, Oscar, and Lorenzo gather in the robotics closet. Cristian sketches out the ROV and calculates the amount of air that will be trapped in the PVC pipes. He concludes that they'll need something heavy to weigh the machine down. They consider putting weights on the ROV, but that would clutter the machine. Cristian suggests putting the battery on board.

Cristian's solution is not only novel, but it is a practical way of solving two issues at once. This kind of creativity and ingenuity as they work to put their robot together like a puzzle is what gives them a major advantage in the competition.

The idea is novel: most teams don't put the battery on the ROV, because a leak would take down the whole system. But putting it at the bottom of the ROV would allow them to have a thinner cable tether to their controls, stabilize the robot, and limit voltage loss. Lorenzo says that the idea is "badass." Oscar is nervous, but when Cristian says that if they can't waterproof a case to hold the battery they shouldn't be in an underwater contest, Luis agrees, and Oscar relents.

Even though Oscar has his doubts about Cristian's plan, the boys begin to be motivated by each other's ideas and excited by the plans that they're able to come up with. Lorenzo in particular—with his unique descriptors—makes clear when he thinks an idea is particularly bold, adding to their sense of adventure.

For Lorenzo, the robotics team feels like family, with Fredi and Allan as surrogate parents. A team spirit has developed, and the rest of the team has adopted his motivation and discipline in making sure that they are getting good grades and sitting at the front of their classes.

Davis describes how the motivation Fredi instilled in Lorenzo has also spread to the other students, as they work hard to make sure that they can remain good students and support each other. This reiterates the value of teamwork and having a strong support network.

Even though Lorenzo has now found a family, the rest of the school still taunts him. One day in health class, a kid starts teasing him about his long hair and flicks gum into it. It takes three days for Lorenzo's mother Laura to loosen the gum, as Lorenzo is insistent on not cutting his hair. When another student follows him home and insults his mother, Lorenzo snaps and punches him. The kid returns the favor, bruising Lorenzo's eye socket.

Even though Lorenzo has a new group of friends, the old dynamics with other students have not disappeared. The things that make him suited for the robotics team—his unique perspective, his good nature—do not protect him against being bullied, and he continues to face a lot of obstacles in his life.

At home, Lorenzo's dad Pablo notices his swollen eye and offers to beat the kid up. Lorenzo is happy that his dad is expressing concern—his dad never cared about his interest in robotics. The next day, Lorenzo is called into the principal's office. He could be expelled, but instead he is assigned to take another round of anger management courses.

Lorenzo's relationship with his father Pablo continues to be an obstacle for him, as it also threatens to ruin the good standing that he has in school when he sees that fighting catches his father's attention.

Fredi tracks Lorenzo down and tells him to stop fighting. He explains that he was beat up in high school too, and that getting angry means that the other kids have won, because that's what they want. Fredi sees that he is battling for the future of an unusual but talented kid, and that it would be so easy for Lorenzo to get caught in "the tractor-beam pull of poverty and low expectations."

This "tractor-beam pull" that Fredi describes emphasizes how many extra difficulties kids from poorer neighborhoods and more troubled backgrounds have to face in their lives.

Fredi tells Lorenzo that the next time someone wants to fight him, he should pretend to have a seizure instead. When Fredi simulates having a seizure, Lorenzo laughs at his teacher's goofiness and earnestness. The humor takes a little bit of weight off of him, and he realizes that he could never be a brawler. He can only be what he is: a sweet kid with an unusual perspective.

Fredi steps in as a kind of surrogate parent to alleviate the anxiety that Lorenzo feels and to reward his behavior as a good student. This interaction emphasizes how crucial good mentors can be, particularly for kids who simply need to see that someone cares about them.

The third ROV task is the hardest: extracting a liquid sample from inside a barrel while hovering. Oscar and Cristian are pretty sure the task will be impossible, so they assign it to Lorenzo. Other Explorer class teams consider using techniques like vacuum-sealed containers and screw-activated syringes, or a dual pump system. Lorenzo decides to use a balloon.

Comparing Lorenzo's strategy to the strategy of other teams, it is easy to see how Lorenzo's lack of knowledge becomes an advantage. Instead of focusing on high-tech gadgets and then being forced to solve other issues presented by those gadgets, Lorenzo comes up with the simplest solution he can.

The balloon does not have air when deflated and so it won't add buoyancy. It expands and contracts easily and costs almost nothing. Fredi suggests using a sump pump to suction the fluid into the balloon. They find a small pump and copper tubing at Home Depot for a total of $37.

The simplest solution also ends up being the cheapest solution, and the combination of these two factors is something that the judges at the MATE competition highlight as the reason that they grant the students the Design Elegance award.

Back in the robotics closet, Lorenzo experiments, gluing PVC fittings to the pump and affixing the copper pipe so that it juts out. He pulls a balloon over the other end of the pump. When he tests it, the system's only flaw is that when the ROV is pulled out of the water to retrieve the sample, the balloon falls over and the liquid spills out.

Lorenzo's invention is not perfected without trial and error, but Lorenzo gets excited about testing different solutions—evidencing his growing belief in his own ability to find answers to problems.

Lorenzo tries affixing the balloon in a variety of ways, but each time the balloon falls over. Fredi encourages him, and Lorenzo then tries to put the balloon inside the top half of a liter soda bottle to catch it. The liter bottle is too restricting, and so Lorenzo uses a milk container instead. It works beautifully. Fredi is amazed at the "practical, cheap, and ingenious solution." Fredi is hit by a wave of emotion, and says, "You did it." Lorenzo smiles, responding, "I did it."

Fredi's encouragement rewards Lorenzo's creativity, as he is able to come up with a creative solution to the task at hand. The confidence and sense of accomplishment is exactly what Fredi had hoped to give to Lorenzo, and he becomes equally proud of what the teenager is able to do under his guidance.

Lorenzo's mother Laura asks him to read a letter that arrived for them in English. Lorenzo explains that it's a foreclosure notice. They're going to lose the house, because they haven't been paying the mortgage. Lorenzo finds a letter from a realtor who advertises his ability to prevent evictions. He calls the man and the guy agrees to talk to the bank and negotiate a deal. Lorenzo hopes that he isn't a fraud.

Meanwhile, Davis continues to elaborate on some of the additional obstacles that the students face, like Lorenzo's imminent eviction. Like the immigration issue, this serves to underscore how impressive it is that these students are able to accomplish so much, even while worrying about severe issues back at home.

Oscar and Luis take on the problem of propellers. At first, they reason that they need three—two horizontal and one vertical—but then they realize that they may need to tilt forward to pick something up, and sideways when maneuvering inside the submarine. They conclude that they'll need five motors.

In divvying up the work, the students create both a sense of individual accomplishment as well as a communal motivation in that they are all working towards the same goal.

Fredi suggests that Oscar and Luis consider trolling motors, which are used for fishing boats. They are efficient and small enough to fit inside the PVC framework. Oscar dials a trolling motor company and speaks with Kevin Luebke. Luebke is quickly charmed by them and agrees to sell them five motors, which would normally be $500, at a 25% discounted price of $375. It's a big part of the budget, but they need reliable movement.

Again, like De Tray, Swankoski, and Rodocker, Luebke is impressed by the students' dedication to their work and the fact that they are able to transcend stereotypes and a lack of resources in order to compete in the MATE competition.

Oscar and Luis then push around a piece of wood in a sink to figure out the ideal placement. They discover that it is easier to turn the wood with propellers placed at 45-degree angles rather than simply directly from behind: essentially discovering the principles of torque.

Like Lorenzo with the balloon, Oscar and Luis take Fredi's advice in doing hands-on work in order to experiment and learn more about the best motor placements for their robot.

Oscar and Luis find one final piece: a plastic briefcase that claims to be waterproof up to fifty feet to hold their battery. They buy the case at a discounted price of $120, drill a hole in the side for the wires, plug it, and submerge it in one of the classroom's big sinks. It is able to protect the battery.

Even though the battery works the first time they test it, it eventually becomes an issue later. Still, the fact that they are able to think on the fly in order to save the battery proves that in addition to the knowledge and resources they have accumulated, these students also have the smarts to win.

The PVC pipe that they have bought needs to be cut, and so the team buys a pipe cutter. Cristian, Lorenzo, and Oscar discover that they're not strong enough to cut the pipe. They have to cut eighty pieces. Everyone looks at Luis. He goes over to the cutter and feeds a piece of pipe into it. He then clamps down, cutting it in one smooth movement. Everyone looks at him in awe. It takes Luis two days to cut all eighty pieces. They connect the pieces and look back at their creation. It is slightly lopsided, but Fredi and Allan assure them it looks really good.

This anecdote highlights how each member of the team has different strengths. For Luis, his strength is literal, and he comes through in helping the team gain the necessary muscle to cut the pipe. In addition to that, it is clear that Luis has also been taking part in the team in other ways, demonstrating how it has made each of the students better on the whole.

A month after the students begin the ROV project, Dean Kamen releases his annual FIRST challenge. Cristian, Oscar, Lorenzo, and Luis are part of a larger team participating in the FIRST challenge at Carl Hayden. Kamen challenges students to build a machine that can move across a basketball court and retrieve balls. The goal is to place balls in a tall hamper, and the machines are all meant to complete the task at the same time in a free-for-all. At the end of the game, teams can earn bonus points if their robot can suspend itself on a pull-up bar.

As Davis previously described, Kamen feels that he has to find ways to make science compete with entertainment and sports in order for kids to get excited about it. And so, in designing this FIRST competition, he does exactly that—he uses kids' love of basketball in order to get them excited about robotics.

Kamen's organization sends teams a box of supplies to jump-start their building, including a robot controller. The students learn how to solder wires together and then start working to figure out how to build and program their robot. Lorenzo suggests that they build a robot that only does the final task. At first the others are skeptical, but they see that it's a clever approach: doing a pull-up is the equivalent of collecting ten small balls.

Once again, Lorenzo proves to be the creative and unique thinker on the team. His idea to build a robot that only does a pull-up allows the team to focus its energy on that task rather than trying to complete something harder for fewer points.

The team constructs a frame and affixes four wheels to it. They then attach a clip and a rope to the top of a broom handle and connect it to a motor that moves the handle ten feet in the air. When the pole clips onto something, they activate a winch that drags the robot up into the air.

The team's pull-up robot is again a lesson in minimalism, as they use the simplest materials that they can find—presumably things that are laying around the school.

The team arrives at the Arizona regionals on March 11, 2004. They have problems from the start. In the opening round, their robot's chain slips off and falls onto the arena floor. When the round ends, they have to get the bot back to their "pit" and fix it in only forty-eight minutes. Seven team members work together to repair the chain.

The competition atmosphere not only provides a sense of adventure, but also allows the students to work quickly as a team to fix the chain, which will come in handy when they are piloting their ROV later in the book.

When the next round begins, the robot rolls straight to the pull-up bar. Lorenzo flips the switch to activate the broom. The robot clips on, and soon dangles off the ground. They end up winning three out of nine rounds and tying two: good enough for twenty-first place out of thirty-six teams. The judges are impressed, and award them the Engineering Inspiration Award. The award also qualifies them to travel to Atlanta for the national championship.

Even though the Carl Hayden team builds a robot that doesn't really complete the main task, its ability to complete the harder task is rewarde—not only with an actual award, but also with the chance to travel across the country, showing that creativity and practical thinking is often the most crucial skill in a competition like this.

When Cristian tells his mother Leticia about the trip, she is not thrilled, worrying about what happened to the Wilson High kids at Niagara Falls. She tells him he can't go. Cristian is furious. Fredi calls Leticia, arguing that competing at the championship is a good way to lay the groundwork for an engineering job. Leticia reluctantly gives her approval.

Again, Davis is sure to remind readers of the near-constant threat of deportation, even while going on a school trip. There is extra irony here in that while the competition should provide Cristian with the opportunity to get an engineering job, his immigration status prevents him throughout the book from doing so.

Five weeks after the regional event, the teens fly to Atlanta. When the competition begins, the Carl Hayden team's robot freezes in the middle of an early match. Cristian suspects that the most likely issue is that the battery is not sitting right in the robot and asks another team to ram them. The other driver smashes into their robot, and surprisingly, it works. The robot starts rolling toward the pull-up bar. Lorenzo claps Cristian on the back and tells him that that was "frictastic."

The competition in Atlanta provides the boys with a sense of adventure as they have to come up with quick and creative solutions on the fly. It also gives them practice working as a team for the MATE competition later on that year.

The team ends up placing thirty-ninth out of seventy-three—not bad for a new team, and far from last. Perhaps most importantly, they have a lot of fun. They pose for pictures in downtown Atlanta, and Oscar organizes the team in a human pyramid in the middle of a public square. He did this exercise in ROTC; now he's building a new team.

The students' success in the FIRST competition eases some of Fredi's initial concerns. Now they have proven that they can compete in these kinds of competitions with other teams, and the fun they have while doing it spurs them to want to succeed more and more.

After Atlanta, the kids have ten weeks until the ROV championship. Their experience with FIRST proves invaluable. They use the controller from that robot in their ROV, soldering the wires to connect the propellers and cameras to the controller. They also had developed a short-hand language for certain tools and pieces. Lorenzo sees this shorthand as a new kind of gang slang and sees how the team has some of the same benefits as a gang. Hanging out with Luis, for example, Lorenzo finds that students are less likely to tease him.

Davis describes here how the FIRST competition not only gives them some of the necessary experience and equipment to move on to the MATE competition, but it also makes their team bond stronger. Here they are able to lift each other up and make each other's lives better: Luis protects Lorenzo from bullies, and Lorenzo provides Luis with friendship.

Outside of robotics, Lorenzo loves watching his mother Laura cook, and he wants to learn more about cooking. Another school in West Phoenix offers a more robust cooking program, and Lorenzo tells Fredi that he's thinking about transferring. Fredi suggests that he go to cooking school over the summer instead, worried that if Lorenzo leaves, he will lose the foundation of being a good student that he has built for himself. Lorenzo tells Fredi that the cooking school will cost four hundred dollars. A week later, Fredi and Allan offer to cover the cost. Lorenzo is amazed at their level of generosity.

Fredi and Allan's generosity as mentors really knows no bounds here, especially considering they themselves are not paid very much. Fredi encourages Lorenzo's other passions and wants to make sure that he is able to go to cooking school, but he also wants to make sure that this opportunity will not come at the expense of his other improvements in school (much like his participation in robotics club).

It is time to glue the PVC pipes in place, but once they do that, it will be difficult to make changes. They only have one chance. Oscar drills the team with practice runs of putting the robot together quickly, as the glue dries fast. They disassemble it and rebuild it repeatedly. Eventually, they're able to do it in twenty minutes without mistakes.

Oscar again serves as a leader and motivator for the team, making sure that they are ready to put together their robot with skill and precision—taking a page from his old ROTC training.

The school year is coming to an end and Oscar and Luis are graduating just before the MATE competition in Santa Barbara. Each has to figure out what to do afterwards: Luis could keep working as a cook, but he's been doing that for years. Oscar doesn't have a green card and the best he can hope for is to turn a day laborer job into something steadier. Still, their accomplishments mean a lot to both families. It is a sign that the boys can achieve what the previous generation had not.

Even though the opportunities for Luis and, particularly, for Oscar once they have graduated are limited due to immigration policies, Davis still makes it clear that these boys are achieving the American Dream. They have worked hard for their graduation, and they have completed more education and received more opportunities than their parents.

With only a few weeks to go, the students prepare to glue the robot. They lay the pieces out on a table in the robotics closet and open the container of glue. It smells like heavy-duty paint thinner and immediately fills the closet with intoxicating fumes. They decide to take turns going into the closet because they are getting high from the fumes, racing to glue the pieces because the glue dries quickly. As they are gluing, Lorenzo says, "Damn, that's *stinky*."

The race to glue the robot together gives the boys an early sense of adventure as they dash in and out of the closet. They again prove the benefit of working together as a team as they take turns using the glue.


It takes two hours to put the whole structure together. At the end, they lower the waterproof briefcase into position, but there's a problem: the pipes leading to the briefcase don't line up. Oscar is frustrated with himself; they hadn't tried to fit the briefcase when doing their dry runs. Everyone is disappointed. Cristian says that they have to start over.

This marks a bit of a turning point for the team. Oscar, who is normally optimistic, becomes frustrated because he views what happened as his own failure. Lorenzo subsequently takes up the mantle of motivator to show the team how they can fix the problem at hand, demonstrating how much they have learned from each other.

Lorenzo has an idea. They're not off by much—they could bend the pipe using the electric heat gun. Lorenzo plugs it in and blasts the pipe, while Luis puts pressure on it. The PVC starts to bend, and Luis angles it into position. When Lorenzo turns the heat gun off, the PVC hardens into place exactly where it needs to be. Oscar compliments Lorenzo on the idea. Lorenzo says that their robot needs a name. Oscar remembers what Lorenzo said in the closet and suggests calling it **Stinky**.

Lorenzo again serves as the team's creative problem solver, using the electric heat gun (which is normally used to dry paint) in order to bend the pipes. Dubbing the robot "Stinky" is also symbolic of their underdog status as a whole: it may not look like it belongs with the other robots, but it is precisely what makes Stinky unique that allows the robot to win.


The students take **Stinky** to a nearby scuba facility called Scuba Sciences, thanking the woman who works there, Tina Lowe, for letting them use the pool. She tells them it's not a problem and marvels at the unusual crew filing into her facility: Cristian, Luis, Lorenzo, Oscar, Fredi, Allan, and Michael Hanck, who is there to help pilot the robot.

In noting Lowe's reaction to the "unusual crew," Davis again provides a reminder that these kids have already accomplished something quite remarkable for students of their background (or of any background) in even assembling an ROV.

It takes them an hour to lay out their gear. They have scavenged two battered monitors and four video game joysticks. When they plug everything in, the two monitors light up and **Stinky** starts coming to life. Cristian is in charge of the robot's up and down movements, while Michael is in charge of moving it left, right, forward, and backward.

While teams like MIT presumably would have state of the art equipment with their $10,000 grant to monitor their machine, the students make do—and win—with scavenged monitors and video game pieces.

The team hasn't seen much of Michael lately. He struggled in school and enrolled in summer classes. Fredi and Allan told him that if he couldn't get his grades above a B average, he couldn't be on the team. Lorenzo mans the sensor controls: the claw, the cameras, and the water-sampling pump.

While Lorenzo had been inspired and motivated by Fredi's ultimatum, Michael has had a more difficult time. This demonstrates that success doesn't come easy to any of these students: they all have to work extremely hard.

Luis sets **Stinky** in the water, but it floats too well. The team removes some extra pipes that they have attached so that it will float until it becomes neutrally buoyant. But it still tilts forward too much—they need something to keep its nose up. Lorenzo pulls an empty bottle of sunscreen out of a nearby trash can. They tie it to the front of the robot and it hovers perfectly upright.

Rather than focusing on the aesthetic appeal of the robot, Lorenzo continues to come up with quick and practical solutions in order to make sure that their robot functions in the best possible way.

The students practice driving **Stinky** through a hula hoop, but it's harder to get it back out because the tether is threaded through the hoop. Cristian and Michael try to drive it back, but Stinky begins to spin erratically before slamming into the pool wall. Cristian explains that it's hard to see on the monitor. Fredi warns them to be careful: if they hit it too hard, they'll crack the PVC.

The difficulty that the students' initially face not only reinforces the difficulty of the tasks ahead, but also how much they will be thrown for a loop when Michael ends up not being able to go to the competition, and they have to work quickly to get Oscar up to speed on controlling the robot.

Cristian and Michael try piloting the robot through the hoop again, but it veers off a second time and collides with the wall. **Stinky** floats to the surface, and its electronics stop responding. Oscar tries to put a positive spin on the situation, saying that once they figure out how to drive it, they'll be the fastest team in the competition.

Oscar again fulfills his role as the team's leader, taking a page from Fredi and trying to boost their confidence about the things that the ROV is already able to do, rather than focusing on what isn't working. This becomes crucial at the competition.

Back in the robotics closet, Cristian reexamines every connection in the briefcase. Some of the cables have been damaged, causing the **robot** to behave erratically. They replace the wires, and the joysticks seem to work fine. Cristian and Allan also reprogram the software so that it doesn't accelerate as quickly.

Cristian also continues to play his part as the brains of the operation, putting his early curiosity about the internal workings of technology in order to fix the robot's cables and programming.

Lorenzo, meanwhile, tries to fix some of the **robot**'s aesthetics. The blue glue has dripped onto the pipe, leaving blue streaks across the white frame. He decides to solve two problems at once. He applies red paint to any section that Luis shouldn't grab onto or lift from, like the tubes leading into the briefcase; he paints the corners yellow so that they can see its outline better in the water; and he colors the rest blue. He tells Luis to grab only the blue parts.

Lorenzo, like Cristian, works to make sure that the robot can be as functional as possible, and solving two problems at once seems to be his specialty as he finds creative ways to make the robot both look nicer and to help Luis know the safest places to grab the robot.


A week later, they return to Scuba Sciences, with the competition one week away. Their second session is much more successful. **Stinky** steers clear of the walls and responds better to the joysticks. It also takes accurate depth measurements, retrieves a piece of pipe, and deploys the tape measurer. Oscar makes a list of tasks and ranks them based on importance and feasibility. At the bottom of the list is retrieving the liquid sample, the task they are having the most difficulty with.

As they practice in the pool at Scuba Sciences, Davis shows how their progress has accumulated over time. Somehow, a team that didn't even know what an ROV was nine months earlier is now able to complete most of the tasks in the competition. It demonstrates how they may still be underdogs, but certainly they will be underestimated by their competitors.

The team starts to get more hopeful about their chances. But the day before their departure, Fredi and Allan announce that Michael will not be joining them, since he hasn't gotten his grades up in summer school. The team has less than twenty-four hours until their departure, and they have just lost one of their drivers. The team decides that Oscar has to be the other driver, as Lorenzo is operating the sensors and Luis is needed by the edge of the pool to manage the tether and lift the **robot**.

Losing Michael just before the competition is a tough blow, but it is a fair consequence of Michael's inability to get his grades up, as Fredi and Allan had warned. If it did not seem like they would follow through on their threats, Lorenzo and the rest of the boys would not have been nearly as motivated to be good students.

Fredi calls Lowe and asks if the pool is available that day. She tells them that she can give them as much time as she can between classes. They race over and start practicing, given forty-five minutes between two classes. Oscar starts to try, but quickly crashes into a wall. He puts too much force on the joystick and **Stinky** nearly somersaults. They then just try to cruise around, and Oscar starts to get the hang of it—but Lowe tells them that that's all the time she can give them.

Michael's absence deals the underdogs another setback. Oscar has a learning curve to overcome in controlling the robot, but the friendship that the boys have developed also makes it easier for them to work as a team, and Oscar is eventually able to synchronize his movements with Cristian's steering.

On Thursday, June 24, 2004, the team assembles at 4:00 a.m. at Carl Hayden to drive to Santa Barbara. Lorenzo jogs up last, assuring everyone that he's coming and on time. They start hauling everything they need into the car and pile into the truck. They take two cars and communicate via radio between them, quizzing each other for their engineering presentation, making sure that anyone can answer any question that could be asked of them—and one of them just happens to be about the PWM.

The car ride to Santa Barbara is another demonstration of how the boys' friendship contributes to their success as a team. They get excited using the ham radios to talk to each other, and eventually it turns into a quizzing game. One of their questions ends up being the question that Lisa Spence asks Luis—which he may not have been able to answer had it not been for their car quizzes.

When they cross the border to California, Lorenzo sees laborers picking watermelons in fields and falls silent. The realtor helped pay off their mortgage payments in exchange for the deed to the property. Lorenzo worries that he could come back home to find out he is homeless. This four-day trip could be his last chance to experience what it might be like to have a job other than manual labor.

Davis foreshadows the fact that even with success in the competition, Lorenzo would have a hard time finding a job in engineering or a science-related field, due to America's immigration policies. In the final chapter, Davis will elaborate on how he feels the potential of these boys has been squandered.

THREE

The team rolls into Santa Barbara and unloads everything into the dorm that they have been assigned. They spend the night making sure that everything still works, but when they turn the power on, the **robot**'s thrusters refuse to reverse. After an hour, the controls mysteriously start working again. The boys grow more and more nervous and decide to go to sleep early to get ready for the competition.

Even with their extensive testing, the adventure of the competition gets the students both excited and nervous about their trip. They have prepared well, but the teams against which they are competing could blow them out of the water.

At nine the next morning, the team brings **Stinky** to a practice pool. The other teams' robots look like works of art, with machined metal and elaborate control panels. But the other teams have struggled to build their robots, too. MIT had a team of twelve undergraduates and a ten-thousand-dollar grant from ExxonMobil, but two weeks before the competition, their control system overheated and melted. Their team has then rebuilt the controls in a week.

Here Davis also makes the argument for why some of the other schools' seeming advantages are actually disadvantages. The complex machined metal and control panels actually make their systems more prone to issues like overheating.

When Lorenzo sees MIT's expensive robot, predominantly white team, and matching shirts, they look like the embodiment of power. Oscar tells him to focus as they practice. Their presentation is later in the afternoon and the underwater portion is the next day. When they turn on the controls, **Stinky** starts turning involuntarily, and Luis quickly pulls the robot out. They open up the briefcase and find water in the bottom. It's fortunate that it didn't short, but now the cables need to be re-soldered and there's a leak.

The students' trial run in the pool exposes some of the reasons that they are underdogs—not only because of the issues with their equipment, but also because of the inherent inequality between them and the other teams, and the obstacles and prejudice they have already faced in getting to the competition.


Back in the dorm room, morale is low. Fredi tells them they should get ready for their presentation and then they will have all night to fix **Stinky**. Allan takes them out to a bridge and instructs them to talk to anyone who walks by about their robot.

Fredi and Allan again try to place an emphasis on boosting the students' confidence as they work to take their mind off of the leaky robot and instead make sure that they can lead their presentation.

The kids are shy at first, but then Lorenzo approaches a man who looks like a professor, asking if he would like to hear about their **robot**. He describes what it can do, and the man is impressed. He wishes them luck and says he'll be rooting for them. Other people they stop are also in awe of what their robot is able to do. It reminds the students that they are doing something that they've never done before.

As the students chat with average bystanders, they start to be reminded of why they are in the competition in the first place, including their excitement and enthusiasm about the impressive ROV that they have created.

While the students complete their technical presentation, Allan and Fredi wait outside. Other students are in for at least forty-five minutes, and so when they come out after only twenty-five, Allan and Fredi see it as a bad sign. But Oscar tells them that they did great, answering the judges' questions perfectly. Allan and Fredi assume that they're simply being overconfident. Either way, now the team has to repair the robot.

Davis then provides the opposite perspective from his introduction: that of Allan and Fredi, waiting outside as the students give their presentation. This signals a shift, as the students become even more confident than their teachers about their abilities, and paves the way for what they're able to accomplish throughout the competition.


Before they start their repairs, the team grabs some dinner. On the way to dinner, Oscar leads a brainstorming session. They need something that's small and superabsorbent to soak up the moisture. Lorenzo thinks about possible options and suggests a tampon. Fredi says it's a perfect idea.

After the presentation, Oscar once again steps in to motivate the team, as they work together to come up with more creative, practical solutions on how to improve their robot's design.


After dinner, Oscar pushes Lorenzo into a grocery store to buy the tampons. He approaches a woman, who at first seems apprehensive that he is talking to her. But when he explains that he's building an underwater robot and needs tampons to soak up water, she laughs and directs him toward the best ones to buy.

Lorenzo's interaction with the woman in the store serves as a small example of the kind of everyday prejudice that he and the others face. Even though he is simply asking her where to buy the tampons, her apprehensions reveal her negative stereotypes of kids like him.

Back in the dorm room, the students need to pull all of the joystick wires and reconnect them, which will take hours. Oscar volunteers to stay up and do it, and Lorenzo offers to join him. Oscar feels real respect for Lorenzo. They have to take the sixty-four hair-sized wires and meticulously solder them into small holes. It is delicate, nerve-wracking work. If Oscar hits the wire with the soldering iron, the wire will melt and disappear, and they'll have to start over.

Lorenzo's offer to join Oscar signals a turning point in their friendship, as the support that Lorenzo provides him becomes crucial in helping Oscar to stay up and complete the re-soldering work.

By the time Oscar and Lorenzo have completed fifty wires, it is two in the morning. They take a quick break, and Oscar thanks Lorenzo for staying up with him. Lorenzo smiles and jokes that Oscar would probably screw it up if he weren't watching. Lorenzo positions the final set of wires, and they finish at 2:30 a.m. They turn the power on and test it. **Stinky** works.

After he missed the pumpkin hurling contest, Lorenzo has slowly had to regain the trust of his teammates. This offer reassures Oscar of Lorenzo's dedication as he gains a lot of respect for his friend.

The next morning, at the underwater portion of the competition, Monterey Peninsula College has three ROVs working together and a fifteen-person team. Still, they only get 30 out of 110 points in their 30-minute run. Cape Fear Community College has a slightly more successful run: their robot garners forty points.

Davis then sets up the odds that the Carl Hayden students are facing: even with far more resources, teams still struggle to get a majority of the points in the competition.

There are eleven teams in the Explorer class, and all of them post at least five points. Still, some experience early catastrophic failures and sink to the bottom, unresponsive. This worries the Carl Hayden students, but also provides them with a glimmer of hope: if they can complete a single task, they won't finish last.

This passage recalls the students' earlier motto, "don't finish last." In a way, these low expectations actually free the students to do as well as they can without added pressure.

MIT's robot piles up points quickly during its run, speeding around the pool. But it isn't able to complete the fluid sampling task: their sampling tube is too large for the opening in the barrel. Still, MIT amasses 48 points, putting them in first place.

These daunting odds make the eventual success of the team even more remarkable, as they go on to complete tasks that MIT cannot and eventually win the overall competition.

When Carl Hayden's turn arrives, they have five minutes to set up inside their shack and complete a safety check. They burst into action, coordinating their setup and plugging everything in. **Stinky** is operational. Lisa Herbert, one of the judges, checks a box on the score sheet that says *Team is ready for the mission*. Their thirty minutes in the pool begin.

Oscar's ROTC training comes in handy in this portion of the competition, and so does the team's discipline and coordination as they work together to set up for their run.

Luis stays by the pool while Cristian, Oscar and Lorenzo monitor **Stinky** on their video screens from the control tent. Cristian notes a mockup of a piece of equipment. Seeing it is worth five points: they are now tied with last. They try to retrieve it, but Cristian and Oscar have trouble coordinating. They decide to come back to it, not wanting to waste too much time.

Oscar and Cristian feel their loss of a team member—Michael Hanck—most strongly here, but they are still able to sync up and coordinate their movements after getting over these early nerves—emphasizing the strength of their bond as teammates.

Oscar and Cristian move on to measuring the submarine. They are able to hook the tape measure onto the submarine and spool it out, but the screen showing the measurement is pure white. They had set the camera's exposure based on the day before, which had been hazy. Now the sun is shining, and the light is too much for the camera. Still, they get five points for measuring. The same thing happens with the depth measurement. They get five points for taking it but can't report it.

Over the early part of their run, the students start to become excited as they gain more and more points, exceeding their expectations and giving them confidence. Even though they have camera issues, their simple solutions to solve the tasks have begun to work.

Most of the remaining tasks involve entering the submarine, and so Oscar suggests they check the barrel for the liquid sample, even though he had suggested doing it last. They steer **Stinky** over to the "barrel"—a one-gallon paint can—and Oscar and Cristian are able to get their sampling pipe into the can. Lorenzo can't believe it, and he flips the switch to pump the liquid out. They pilot Stinky back to the surface and Luis pulls it out of the pool.

Armed with a new confidence and the assurance that they will not finish last—and perhaps because of Oscar's regained trust in Lorenzo's capabilities—Oscar decides to go for the liquid sample. It takes coordination from Oscar, Lorenzo, and Cristian, but they are able to work together as a team to extract the sample.

The balloon is sitting in the milk carton, full of liquid. Oscar removes it and they measure the fluid. Their sample is slightly diluted, but they receive a massive twelve points for collecting it. That brings them to 27 points, more than most of the other teams. They give a short cheer before returning to the mission. They have ten more minutes.

Lorenzo's creativity is rewarded, as his unique method of problem solving pays off. The adventure from the competition sets in, and the students let their excitement fuel the final minutes of their underwater run.

With **Stinky** back in the water, they move into the interior of the submarine. They steer inside and, in the last minute, are able to find the captain's bell for five points, giving them a total of 32 points: third place behind MIT and Cape Fear Community College. Now, everything will be determined by the scores they receive on their engineering review. Fredi and Allan can't believe it, and they rush over to the kids, congratulating them.

The success that the students are able to achieve in the underwater portion comes from a large number of factors: people rooting for them as underdogs, the bond they have built as a team, and mentors who care about them and have encouraged their accomplishments.

The awards ceremony takes place over dinner, and is hosted by Bryce Merrill, a recruiting manager for an industrial ROV firm. Fredi and Allan try to temper the boys' expectations. They expect that they'll be in the middle of the pack, or lucky to get fourth or fifth. They each hope privately that the team will hold on to third. No matter what, the whole team is proud of what they have accomplished.

Even though Fredi and Allan try not to keep the students' hopes up, the students' joint sense of accomplishment proves how much they have already exceeded expectations and proven themselves capable of achieving more as a team than they ever thought possible.

The first award is a surprise: a special award not listed in the program. The judges have created the award to honor special achievement, and they announce that the award is going to Carl Hayden. The kids head up to the stage, forcing smiles. They think that this award had been given to them as a consolation prize—an award "considering where they came from." It signals to them that they did not get third. Fredi and Allan congratulate them, trying to look on the bright side.

The students at first view this award as a way of pitying them—in consideration of the odds that they have already overcome simply by taking part in the competition. But they soon come to realize that it is actually in extra recognition of their achievement—not less.

A few small prizes are handed out, and then Merrill moves on to the final awards: Design Elegance, Technical Report, and Overall Winner. MIT, Cape Fear, and Monterey Peninsula (who had gotten fourth behind Carl Hayden in the underwater trials) eagerly await the results. It will all come down to how the judges graded the teams' oral and written presentations.

Even the anticipation of the awards at this moment demonstrates an inequality amongst the teams. While the Carl Hayden students had hoped that they might hold onto third, the other teams seem almost entitled to winning the awards.

Just as the Carl Hayden kids wonder whether they can get more cake before the ceremony finishes, Merrill announces that **Stinky** has captured the design award. They're stunned. It turns out that Stinky's low-tech approach is what impressed the judges. Lisa Spence, the NASA judge, says she believes that there is no reason to come up with a complex solution when a simple one will work. She feels that Carl Hayden's robot is "conceptually similar" to machines she works with at NASA.

Spence's explanation for why the students have won the award makes it clear that their lack of resources—but also their innovations as a result of that lack—in fact made their design simpler, sleeker, and more cost-effective, all of which would give them a leg up not only in the competition but also if they were designing for a real ROV company.

The boys are in shock, realizing now that the special prize wasn't a consolation. They are actually being given real recognition. After thanking Merrill and collecting their award, they start to leave the stage. But Merrill stops them: they have also won the Technical Writing Award. Even Cristian is surprised. In his mind, there was no possibility that a bunch of ESL students could have produced a better written report than kids from MIT.

Their winning the Technical Writing Award also proves their dedication as a team to the competition. None of them learned English as a first language, and yet their motivation and hard work allowed them to surpass even top engineering colleges in explaining their ideas and designs.

Merrill then starts to announce the top three finishers. Third place goes to Cape Fear. The Carl Hayden kids are surprised; they had assumed that Cape Fear would get second. But they are really shocked when Merrill announces that MIT got second place. Fredi realizes that something amazing is about to happen. Merrill then announces that Carl Hayden has won first place.

Carl Hayden's triumph in the competition proves that the students had been able to overcome tremendous odds—not in spite of the obstacles they had to overcome, but because those obstacles led them to work harder and come up with more creative solutions in designing their robot.

By the time the Carl Hayden team gets to the podium, the entire room is on its feet. Nine months earlier the students didn't know what an ROV was. Now they have won the 2004 Marine Advanced Technology and Education Explorer class ROV championship. The audience roars in support of the kids from the desert.

The fact that they are cheered on without hesitation by the other teams in the competition also demonstrates that the other teams acknowledge the odds and obstacles that those students have had to overcome to win.

After the ceremony, the kids hike a mile down the beach. They yell out into the ocean that they beat MIT. Allan tells them how proud he is. Fredi says that they are true "badasses." The boys have never been happier. They take pictures on the beach together.

It is easy to see how the adventure and thrill of the competition might have spurred the students to follow their passions for science in college and beyond, were it not for their limited education and job prospects.

The moment is bittersweet for Oscar. His eighteenth birthday is days away, whereupon his legal status in the United States will change. If he is caught and deported after he turns eighteen and a half, he will be barred from returning to the U.S. for three years. If he is nineteen and a half or older, the ban will be ten years. The law is meant to incentivize immigrant teens to return to the country in which they were born. But Oscar has little to go back to, and fundamentally he views himself as an American. The boys take a final picture.

Davis notes that the film version of Spare Parts ends at the awards ceremony, but he makes it clear that there is more to the story. Even though the boys have accomplished something truly great and would unquestionably make strong contributions to the country and the sciences, they still have to contend with the fact that the United States policies make it nearly impossible for them to follow that potential.

FOUR

Five months after the competition, Arizona State Representative Russell Pearce gives a talk in Washington, D.C., stating that current immigration policies in the U.S. are too nice to immigrants, and that they aren't good for the country or for the immigrants themselves. Many voters in Arizona seem to believe that immigrants have come to the country to leech off the government, looking for welfare and free education—not for work.

Instead of finishing with the ceremony, Davis returns to the issue of immigration. As he has shown through the story of the four Carl Hayden students and their families, the fear he describes here is unfounded and based on harmful stereotypes.

A month before Pearce's speech, voters in Arizona passed Proposition 200, a bill that barred illegal immigrants from receiving public benefits like welfare and education. Sheriff Joe Arpaio continues to form civilian posses made up of more than three hundred civilians to hunt for illegal immigrants and scare them out of the country.

The harmful stereotypes are pervasive, however, and Proposition 200 attempts to prevent undocumented immigrants who were not born on American soil from achieving the American Dream.

The debate over immigration only gets more heated as time goes on. In 2006, President Bush orders 6,000 members of the National Guard to patrol the U.S.-Mexican border in the hopes of preventing migrants from crossing. But New York mayor Michael Bloomberg tells Congress that these patrols will not defeat market forces of supply and demand, nor human desire for freedom and opportunity.

Bloomberg's statement to Congress affirms that immigrants are not only simply looking for jobs that are available in the United States, but they are also working for the freedom and opportunity that Americans often claim should be available globally.

Eight months after the ROV competition, Oscar is working on a construction site as a day laborer. He feels stuck. He has thought about college, but he doesn't know how to afford it. Cristian has a similar problem. He dreamed of going to college, but when the air conditioning unit in his family's trailer broke, the three thousand dollars of family savings he had hoped to use were spent on a new one. After graduation, Luis works two jobs and tries not to think about changing his life.

At first, the boys become victims of their immigration status and also of their economic status. Even though these boys have been fortunate enough to excel and have good teachers, they still lack the resources to further their education and capitalize on the potential that they have shown.

In April 2005, Davis publishes an article in *Wired* detailing the championship. Many readers write to express their support for Carl Hayden, and eventually individuals contribute $120,000 to a scholarship fund set up by the school district.

The readers' contributions demonstrate just how divided Americans are on this issue: many Americans will contribute to a campaign to help the students succeed, while others vote to make it more difficult.

The article also makes the four students the face of a generation of undocumented immigrant kids who were born elsewhere and grew up in the United States. In 2004, there are an estimated 1.4 million children who fit this description. Despite this large amount, they are largely invisible: no one wants to risk deportation by being in the public eye.

Davis highlights the particularly difficult situation of undocumented immigrants: that it is very difficult to advocate for themselves and bring about change, because they could then be targeted for their immigration status.

The Carl Hayden kids don't think that their story will attract much attention, but immediately additional media requests pour in. ABC's *Nightline* asks to broadcast their story and focus on their immigration status. Despite their worries, they agree it is important to speak out.

The students realize that it is important to speak out because they understand that they can help to change the negative stereotypes that people have about undocumented immigrants.

In 2005 and 2006, the Carl Hayden robotics team wins the top prize at Dean Kamen's FIRST competition in Arizona. They are a top competitor both years at the national championships. They place third at MATE in 2005 and second in 2006, beating MIT both times. In 2007, the event is in Canada, effectively preventing undocumented students from attending. To compensate, Fredi and Allan start their own underwater-robotics competition.

The Carl Hayden team's continued success shows the importance of good teachers, and also implies how many kids can have the same potential as the students who participated in the 2004 MATE competition if they put in the same time and dedication to their work.

The win in 2004 inspires the kids that come after them at Carl Hayden. The team swells to more than fifty members, and year after year, they dominate in competitions. They also try to get younger kids excited about robotics, going to local elementary schools and showing off their robots.

The competition thus not only gets the students who won excited about science, but it also energizes the students who come afterward, making them curious about robotics and giving them the confidence that they might have the same potential.

The team's rising profile brings in new supporters: in 2005, a group of businessmen in Oregon and Washington decide to help, forming a foundation that provides scholarships for the robotics team. Between 2005 and 2010, the foundation spends $720,000 and sends twenty-three kids to college. Still, Fredi worries that many of the kids will have difficult lives even if they do graduate from college.

Fredi's worries are well-founded, as even Oscar and Cristian—who are able to get to college—still have a difficult time. Though they may have been able to overcome odds in the competition, overcoming institutional prejudice and laws is a much bigger hurdle to surmount.

Allan and Fredi urge Cristian to apply to MIT, but his family wants to keep him close and the school seems too expensive. Arizona State University is a safer choice, as he will qualify for in-state tuition and can pay the rest with the scholarships. Still, ASU is difficult. Cristian finds the lectures and the work mind-numbing. He fumes to Allan and Fredi that it's a waste of time.

Even without the added difficulty of Cristian's immigration status, the financial burden of going to a school like MIT makes it an impossibility for Cristian and students from similar backgrounds, showing the inequality that prevents many from achieving the American Dream.

When the *Nightline* segment airs, Russell Pearce explains in response that voters shouldn't focus on a small group of students, because one has to take the emotion out of it and look at "the damage to America overall."

Pearce statements show how he and many others disconnect the issue of immigration from the individuals affected by the policies. But, as Davis has shown with the continued success of the Carl Hayden team, the students may not necessarily be exceptions to the rule.

Midway through Cristian's freshman year, an Arizona state senator sponsors Proposition 300. The law seeks to prevent state colleges and universities from offering reduced in-state tuition to undocumented residents who grew up in Arizona. The state senator argues that it isn't fair for citizens from other states to pay the full cost, while undocumented immigrants are given subsidized tuition.

Just like Proposition 200, Proposition 300 seems to be based on the idea that undocumented immigrants aren't really "Americans" living in Arizona, when for many of them (including Cristian), it's the only place they have ever really called home.

Proposition 300 passes in November 2006 with 71% support. Cristian's tuition quadruples as a result. Unable to pay it, he decides to drop out. He takes classes at Gateway Community College and finds work at Home Depot. At home, he sets up a small laboratory and invents new machines at night from scavenged parts.

Cristian's trajectory is probably the most disappointing, because of all the students he seemed to have the most talent for the work, yet the policies that Arizona passes make it impossible for him to take advantage of that talent.

In May 2006, Lorenzo graduates from high school, but his father Pablo doesn't show up to the ceremony. He then enrolls in Phoenix College's Culinary Studies program. Luis also goes to cooking school. Together they form a catering company and find odd jobs to add to their income. Even then, Lorenzo isn't able to save his home, and in 2009 his family is evicted. Meanwhile, Davis notes, the MIT students from the 2004 MATE competition excel in prestigious engineering jobs and research institutions.

As Davis continues to chronicle the students' lives after the competition, his comparison between them and the MIT students is significant. He points out the unfairness in the fact that the Carl Hayden students show just as much promise as the students from MIT, and yet they are not met with the same opportunity.

In February 2005—before the *Wired* story breaks—Oscar falls in love with Karla Perez, a junior at Dysart High School and the cousin of a friend of his. They make constant excuses to see each other. When Karla asks Oscar if he can take her to her prom, he says he cannot—he doesn't have the money. Karla goes to her prom alone but meets up with Oscar later in the night. They kiss for the first time, and seven months later, they are married.

Karla and Oscar's marriage eventually deals an additional injustice to him: both Karla and their daughter Sam are American citizens, and yet Oscar can still be deported at any moment and separated from them; he also does not receive an easier path to citizenship.

The money sent in by *Wired* readers allows Oscar to enroll full-time at Arizona State University. He majors in mechanical engineering but finds it to be detached from the work he had done previously. He asks for a grant to start a robotics team at the school and establishes himself as a leader—but nothing can change the fact that he does not have a visa or residency, even though he is married to a U.S. citizen, with a daughter on the way who would also be a U.S. citizen.

Again, Davis makes clear the disconnect between the policies being enacted by the U.S. at this time and the promise and hard work exhibited by kids like Oscar, who cannot become a U.S. citizen even though he considers himself to be wholly American.

Proposition 300 drives Cristian out of college, but Oscar had already distinguished himself at the university, and a variety of groups within the school rally to fund his education. Luis even gives him the remainder of his own scholarship money to help fund his final two years.

It seems particularly confounding that groups within the school itself have to rally money to save its own student from dropping out of school because of a government policy. This points to the disconnect between these policies and actual realities on the ground.

In May 2009, when Oscar graduates, President Obama gives the graduation speech for ASU's fiftieth commencement. Christine Wilkinson, the university's vice president, singles Oscar out onstage, asking him to stand in front of 70,000 people and President Obama, and then describing his achievements.

Oscar's graduation adds to the irony of his situation, as he is singled out in front of President Obama as an exemplary student, but even this exemplariness cannot ease his path to citizenship.

Obama tells the class of 2009 not to give up the endeavor to "find the greatness that lies within each of us." Oscar listens intently. He realizes how upset he would be to lose everything he loved if he were deported and barred from the U.S. Thus, he resolves to deport himself.

Despite the fact that it will be difficult to return to Mexico, Oscar decides to do the honorable thing—yet he is still ripped from his wife and his newborn daughter in the process, demonstrating again the damage the policies render on undocumented immigrants.

On September 1, 2009, Oscar walks back into Mexico for the first time in ten years. He and Karla go to the U.S. consulate and he applies for residency. When the clerk asks him if he's ever lived illegally in the United States, Oscar refuses to lie, and says yes. The man tells him that his application will be denied. He could apply for a waiver in eleven weeks and present his case. In the meantime, he must stay in Mexico.

Oscar continues to be punished for circumstances he cannot control: not only is he not a U.S. citizen, but he is also prevented from becoming one because of the fact that his parents had chosen to bring the family to the United States.

Oscar returns to his childhood home. He finds a job picking beans for $3.80 a day. It's hard work, and he starts the morning in freezing weather and ends it soaked in sweat. Eleven weeks later, Karla returns to Mexico. She helps him get cleaned up to present his case to the consulate. They wait in line for six hours and he presents all of his documents, including a copy of his ASU diploma and letters of support from Karla, Allan, and Fredi. He will get a decision back in seven to ten days.

Contrasting the opportunity Oscar has in Mexico with what he has in America, it's not difficult to see why people come to the United States. Oscar would appear to be the ideal candidate—family in the U.S. who are citizens, a history of success in college, leadership in the ROTC—and yet, as will soon become clear, he is denied.

A week later, Oscar receives the official word. He has been found ineligible for a visa and is banned from the United States for a decade. Karla returns to Phoenix, sobbing on the bus. Oscar leaves his childhood home and boards a bus for a factory town where Karla's uncle lives. He no longer dreams of doing important work or building robots; he only wants a job.

It is particularly devastating that when Oscar decides to deport himself, even after doing the honorable thing, he still cannot return to the United States, demonstrating how arbitrary the policies are when one might think that he would be a prime candidate for approval.

Oscar is hired to supervise a portion of an assembly line at a car parts factory for $22 a day. After a month, he starts to look for opportunities in other countries—maybe he could move the family to Europe. He tries to sound chipper on the phone with Karla, but he's also depressed by the violence outside his home.

Davis reminds readers how little Oscar makes in Mexico, in effect demonstrating that increased opportunity is such a crucial part of why people choose to come to America—especially because, unlike Europe, it does not cost nearly as much money to get there.

Allan calls Oscar, who tries to get him not to worry. But Allan's wife Debbie quizzes Oscar on his living conditions, and he has to admit that he has no furniture. She promptly loads their car and drives down with a bed, sheets, towels, a TV, dishes, pans, chairs, and a couch. Oscar is overwhelmed with emotion when they arrive. Debbie tells him he's not alone.

Allan becomes not only a lifelong mentor for Oscar, but also a friend, providing his former student with the ability to restart his life in the midst of what seems like a hopeless situation.

Oscar's supporters start a letter-writing campaign to convince the government to reverse his decision. CNN picks up the story. In Washington D.C., the story catches the attention of Senators Dick Durbin and Orrin Hatch, who believe that America is squandering a resource by overlooking the talents of people like Oscar.

American citizens remain deeply divided on the issue, highlighting again the importance of representation. Because people can see Oscar as an individual rather than a broad stereotype of an undocumented immigrant, it is easier to sympathize with his situation.

In 2001, Durbin had introduced legislation that would provide a pathway to citizenship for young immigrants who had been in the United States for at least five years and were attending college—it was called the DREAM Act. The bill had failed to even make it to a vote. In 2010, Durbin reintroduces the bill and talks about Oscar on the floor of the U.S. Senate.

Oscar once again is depicted as an underdog, as Durbin hopes that his story can help overcome the odds of mass division over the immigration debate, particularly because Oscar has such a strong background with the ROTC and excelling in the robotics club and ASU.

Senate Republicans block the vote. Alabama Senator Jeff Sessions states that the DREAM Act is a reward for illegal activity, and the legislation is tabled again. Durbin feels that it is unfair to punish students whose parents brought them as children. Even if he can't change their fates as a whole, he contacts the U.S. Citizen and Immigration Services and asks them to reconsider their stance on Oscar's application.

The DREAM Act comes to prove how little has changed about the immigration debate, even after nine years and a new president has been elected.

In July 2010, Karla checks the mailbox as she leaves to visit Oscar for three days. Amid a stack of bills is an envelope from Immigration. When she arrives in Mexico she tells him that his residency application has been approved. Oscar is speechless.

Oscar is able to overcome the odds of navigating a vast and often ambiguous immigration system, but many people—including Lorenzo and Cristian—are not so lucky.


Oscar returns to the U.S. in August 2010, after a year in Mexico. Allan and Debbie throw him a big welcome-home party in their backyard. Lorenzo and Luis bring the food. Oscar's return has also drawn a lot of media attention, and he has a job offer from a company that designs lifesaving medical devises.

It is easy to see how, were it not for the media attention garnered from the MATE competition, Oscar may not have had the good fortune of a Senator intervening on his behalf.


Two months after his return, Oscar realizes that he can now join the Army. With a college degree, he can even apply for Officer Candidate School, but he wants to serve as a soldier. He enlists, starting out at the bottom of the military hierarchy. Oscar doesn't mind: he wants to work hard and doesn't believe in shortcuts.

Armed with his permanent residency, Oscar is finally able to fulfill his version of the American Dream—the opportunity to work hard in order to achieve success.

In May 2011, Oscar is training to be a cavalry scout when he becomes a U.S. citizen. He swells with pride at the ceremony and takes the citizenship oath: to renounce loyalty to any foreign state and to support and defend the Constitution and laws of the United States.

Oscar's citizenship oath is very literal when he vows to "support and defend the Constitution," because he will soon do so in the Army—proving how much he loves and wants to fight for the United States.

On November 29, 2011 Oscar boards a plane for Afghanistan and is deployed to a remote outpost at the base of a mountain. Every morning he is greeted by rockets from the Taliban. One day, he is sent into the mountains on a search-and-destroy mission. It is Oscar's first combat experience, and he feels an immense sense of accomplishment.

Oscar's version of the American Dream has also meant giving back to the country to which he had always felt he belonged, and which he loved so much. The army serves as a way to do that, and his accomplishments are well-earned.

In the fall of 2013, Hollywood begins filming a movie about the Carl Hayden robotics team. The film ends when the awards for the 2004 MATE competition are announced. In reality, Davis writes, life is more complicated. The attention paid to their victory had coincided with a backlash against immigrants in Arizona. Propositions 200 and 300 had a direct impact on Oscar and Cristian. Oscar ultimately graduated from college; Cristian did not.

In pointing out the differences between the film and his book, Davis notes that life is not, in fact, like a movie. The kids may have accomplished something extraordinary, but they still face discrimination not only from other citizens but from the laws of the country itself, which have a huge and direct impact on their lives.


The atmosphere in Phoenix is polarized after 2004. Joe Arpaio orders officers into predominantly Latino neighborhoods and tells them to enforce all traffic laws, so they can pull locals over for minor offenses and then deport anyone who is there illegally.

Arpaio continues to enforce discriminatory policies, targeting undocumented immigrants and other Latinos by overly enforcing minor crimes in order to deport people.

Arpaio's actions draw the attention of the Justice Department, which determines that the Sheriff's office is discriminatory. In 2011, the government revokes his authority to detain immigrants. However, that authority is granted to other law enforcement officials in Arizona State Bill 1070. This law provides penalties to people who shelter, hire, or transport unregistered immigrants and requires law enforcement officers to question individuals suspected of being in the country illegally.

Even though Arpaio is condemned for these practices, other law enforcement officials still enforce discriminatory and unjust policies. It is also worth noting that Arpaio was convicted of contempt of court in 2017 because he continued these discriminatory practices, but was then pardoned by President Trump.

Many immigration reform bills have failed in Congress, and the DREAM Act has stalled on arguments that allowing children to achieve legal residency creates an incentive for families to enter the country illegally. In June 2012, President Obama issues an executive order deferring the deportation of immigrants who would have qualified for the DREAM Act. Lorenzo and Cristian apply for protection under the order, which buys them temporary safety. But, as Davis writes, "the next president could quickly end the program."

The DREAM Act is another example of how immigration policies change between various administrations. President Obama's executive order (DACA) was believed to be unconstitutional by President Trump and as of 2018, stands in limbo in several state courts, which continues to cause upheaval and uncertainty in the lives of many people and particularly children.

There are signs that the anti-immigrant movement has driven away migrants, as shown by declining public school enrollment in Arizona and construction projects that have slowed in Phoenix due to lack of labor. To some people, Davis writes, these are positive developments.

Davis points out some of the actual fallout from slowing immigration, but also demonstrates that this actually causes labor shortages. This implies that immigrants aren't taking jobs that American citizens want or hold, contrary to what many people argue.

The movie provides a happy ending. It even shows Lorenzo's father Pablo arriving at the MATE awards ceremony, hugging Lorenzo and crying with joy. Davis describes how he had stood next to the real Lorenzo during the filming of the scene. When the director yelled cut, Lorenzo stared at his feet and said to Davis, "My father would never do that."

Davis finishes the book by implying that glamorizing the lives of these students, such as the way the film does, actually prevents them from achieving success because American citizens do not understand the difficulties they continue to face due to immigration policies.

Ten years after beating MIT, Lorenzo works as a cook at an upscale restaurant in Phoenix. Oscar completed his tour in Afghanistan and left the Army in 2014. He works as a foreman in the locomotive shop at a train company. Luis empties trash cans at the federal courthouse during the week; on the weekends he caters events with Lorenzo. Cristian lives at home and continues to invent things in his room.

While in some ways, Lorenzo, Oscar, Cristian, and Luis are able to make good on their parents' desire to give them a better life with more opportunity, the book has made a compelling argument that if they were simply allowed to become citizens in their own country, they could do so much more.

Fredi still teaches at Carl Hayden and coaches the robotics team. The team continues to collect top honors at regional, national, and international competition. Fredi started receiving three-fifths of a coaching stipend ($240 a month) in 2008, six years after starting the program. Allan retired in 2006 and now volunteers his time to help the robotics team.

Davis finishes by noting one final injustice: that the two people who have provided many classes of students with so much time and energy, still remain largely unrecognized and uncompensated for their inspiring work.

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