A CASE HISTORY OF CART AND PROJECT-BASED LEARNING

CONTENT

INTRODUCTION

This project and case history of the Center for Advanced Research and Technology (CART) was inspired by an interest in the concept of innovation and the convergence of ideas from diverse fields about how we think and learn and ultimately, how innovation happens.

Our interest here, the goal of the IngenioMind Project, is to grab a piece of it, to understand it better, to help define it by exploring an occurrence, a case history that we believe will shed some light on how innovation happens.

A special note about our research and this report. This is not an academic report grounded in quantitative research. This is a case history of what we believe is a fascinating occurrence of an educational innovation, and perhaps more importantly, educational success.

This case revealed that the ideas and values that led to the school's success are also many of the same ideas and values that the school stressed with its students, in teaching them to problem solve and be creative and critical thinkers and to learn how to take responsibility and to be persistence in pursuing their goals.

Many of the methods that the school uses are known in the educational milieu as project-based learning. In the business world, we would call these same processes a form of design thinking, which is an approach to innovation and creative problem solving. The two fields matured alongside each other, with almost no overlap, over the last 20 or so years, like two dialects in neighboring villages might. Interestingly, some newer schools and programs are adopting design thinking methods and terminology in describing their programs. While those efforts might not be that different from project-based learning, certainly design thinking is en vogue in business communities and perhaps now getting interest from educators.

This case history attempts to understand how and why CART was and is special.

One thing that stood out to us after dozens of interviews and reviewing hundreds of pages of transcripts: Many of the ideas that are part of the DNA at CART and at some of the other schools we examined have been around since at least 1990 and perhaps much longer.

CART succeeded in part because it was left alone to try new ideas and to recover from early setbacks without politicians or newspaper columnists or bureaucrats interfering. New ideas and changes in direction need time to find their way. We live in a culture that is often too quick to judge.

A NOTE ON INNOVATION

We're not sure innovation can be planned. While organizations can learn to experiment and create cultures that support creativity and new ideas, those pieces alone won't guarantee that anything innovative will happen. Outcomes are about impossible to predict.

In the popular media and perhaps up and down Silicon Valley and in the venture capital communities, innovation is often a correlate to business acumen and business success. To us, this misses the essence of innovation.

We know successful entrepreneurs can come up with new products and identify new market opportunities. But innovation is more than this. It's not just being a first mover into a new market or creating a useful piece of technology that didn't previously exist. It's not just having a novel idea or product. It's more than that. It's about changing the way we think, changing the paradigm of culture, whether it's a mass culture or just an organizational culture.

It's turning away from convention and seeing the world in a new way and getting others to see it differently as well.

Change and the process of change is a key aspect of innovation. We're interested in paradigm shifts, where something significant happens to cause a change. Often, it's a confluence of events, a perfect storm that effects an unintended or unpredictable change. We don't see innovation happen, so much as we recognize it later. Or, as we create narratives of why things happen, innovation becomes a character attribute, a piece of the story in some meaningful way.

Innovation has become part of the American myth and the stories we tell of innovation often follow that script.

But here, we want to explore innovation at a deeper level. We'll try to look at how CART came into being and where some of the originating ideas came from. And in that story, we may find innovation.

CART HISTORY

CART is imagined as a new technology school

CART began in 1999 as a joint effort between the Clovis Unified and Fresno Unified school districts. The entire first year of operations was dedicated to creating a career-focused and technology curriculum called 'career-tech.'

Career tech didn't begin with CART and wasn't a new concept. At the time, Clovis Unified was operating three high schools, each of which had a career-tech program that included career-oriented labs. These were the basis for creating the CART program and were transferred over into CART when it launched, in some form or another.

Clovis had hired a new superintendent, Walt Buster, who had come from Tamalpais Unified School District in Marin. Buster had launched a project-based learning program at Sir Francis Drake in 1991, with help from project-based learning evangelist Joe Oakey and the Autodesk Foundation, which was started by Oakey to spread project-based learning initiatives.

Michelle Swanson, who had worked with Walt at Sir Francis Drake and had followed him to Clovis Unified to help create CART, said she and Walt wanted to bring some of the ideas around project-based learning they had implemented at Drake.

"The kids in the integrated program (at Drake) seemed to do very well," said Swanson. "Walt wanted to have that kind of a community engaged, experienced and he understood that having experiential at the core of the work for a great number of kids was a real lever to their success."

At the time, Clovis wanted a technology school. With the rise of the Internet in the mid 1990s, schools everywhere were focused on becoming networked. They sent some teachers around the country to look at technology schools. The district was in negotiations to purchase a pump factory and repurpose into a technology school.

Susan Fisher, who was CART's first Dean of Curriculum and had helped launch the school, said that the priority then changed. The district was growing and needed to build more schools.

"The project ended up going down the list as not being something that was going to happen right away," said Fisher.

CART was about to die a quick death, even before it got off the ground.

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>
> -Michelle Swanson

LUNCH MEETING SAVES CART VISION

Then, the unexpected happened. Walt Buster and his Associate Sperintendent of Business Services Terry Bradley had lunch with the superintendent of the Fresno schools, Chuck McCully and his Chief Financial Officer, Ron Bennett.

"We had lunch at Helen's out by Fresno Street and Alluvial," said Bradley, "Neither Ron nor I had any clue what we were going to lunch for. These two superintendents were talking about how project-based learning can change the lives of kids."

Both of them fully understood that neither district had the resources to do something like this on their own. "So, they said let's just get these two business guys together and tell them what we're going to do," said Bradley.

"There weren't a whole lot of cell phones at the time," said Bradley, "but I got back to my office and I called Ron's office. And the line was busy because Ron was calling me. But we eventually got on the phone, and started going, 'How crazy are these two people about bringing these two school districts together to create this school?"

Bennett and Bradley continued to talk about how to work this crazy idea out.

Bradley, who later took over as superintendent in Clovis when Walt retired, said Walt and Chuck had just agreed this was the path they were going, and that they'd partner.

Since neither Chuck nor Walt was from the Fresno-Clovis area, perhaps they didn't realize what they envisioned could never happen there. One school district was possibly the poorest in California and the other was possibly the wealthiest in the Central Valley. They were polar opposites and almost no one believed they could work together

Fisher said this was a big deal. "This was a major happening in our area because these two school districts had been at odds for years and years. There's years of bad blood. And the two superintendents said, 'We're going to work together.' That was major news."

"Because of the relationship that Walt had with Chuck McCully, it just came together," said Bradley. "Chuck was interested. Walt was committed. It is a major financial commitment by both parties, but (less than) if either district took it on, on its own."

CART BOARD IS CREATED

A committee of educators from both districts started meeting and exploring the idea of a technology school and this led to the CART Board being formed, made up of three people from each district: a school board member, the superintendent and a business person. Neither district trusted the other, so they agreed that a seventh person would be appointed by the Fresno Business Council, which had members in both cities.

The Board hired teachers from both districts to spend a year developing a curriculum. It was highly unusual to pay teachers for a full school year to put together a program.

"We spent a lot of time talking about the culture of the school, the expectations for the students and what we wanted our big outcomes to be," said Fisher. "Basically, we had an opportunity to design the high school the way we thought high school should be for both students and for teachers. And we took that very seriously."

The focus of the school evolved.

"The more we did research about technology schools," said Fisher, "the more we decided that technology was a tool. The focus shifted to, 'How do you deliver content using technology as opposed to making technology the content?'"

SETBACKS AND HURDLES IN BEGINNING

The Board hired a non-education person, Pat Wright, as CART's first CEO. Wright came to the Fresno-Clovis area from Washington, D.C., and had a background in business.

"He was a marketing guy and he was all over, talking about this program and what it was going to be," said Fisher.

LEADERSHIP: WALT BUSTER'S DNA INFUSED INTO THE SCHOOL'S DNA

Many administrators and teachers credit Walt Buster with getting CART off the ground. He brought political acumen, an entrepreneurial vision and a determined-to-succeed mindset to CART. We think some of his DNA got infused into the CART DNA, as the school stresses many of the things that helped Buster succeed with the students.

"Walt did a lot of wrestling," said Swanson. "He was out and about. He was very active. Clovis wasn't quite sure why their kids needed this, so it was perceived as something more for the Fresno kids initially."

CART was never going to happen, as Clovis Unified had other priorities to build new schools to meet a burgeoning population. By turning to Fresno and proposing the unthinkable, Walt was able to bring the two districts together behind the collaborative effort.

"Financially, there was no way that Clovis could have done it on its own," said Steve Ward. "We had a very innovative superintendent at that time who really thought out of the box. I think a lot of the credit goes to him. He reached out to Chuck McCully, who was also an extraordinary superintendent. They believed in the program and they made it work."

Walt brought a vision for a technology high school to Clovis, redirected the career tech program from the high schools into CART and maneuvered a minefield of political and operational hurdles to get it off the ground and to survive the growing pains in the first few years.

- Brought a vision for CART to Clovis when he was hired as Superintendent

- Proposed a partnership with Fresno Unified when the school seemed on the verge of never happening due to funding difficulties

- Allowed the school to adapt during those early years as it found its way and overcame growing pains

- Helped guide the school in adapting after the initial franchise business model failed

- Found a way to keep the focus on delivering education, even as the school suffered from failed leadership in the first CEO and first principal

- Didn't focus on test scores but on changing the lives of kids

- Was determined to produce a great education for kids that would give them the tools to succeed, in college and career and life

"He was definitely ahead of his time. And I really appreciated him pushing for that," said Swanson.

"Walt and Michelle were very, very successful in putting together a project-based learning model (at Tamalpais)," said Susan Fisher. "(It) became sort of a design center school, where people were visiting from all over to see how this project-based learning was done. So I think he brought that to Clovis when he came."

"Relationships, as I think everyone learns the older they get, play such a huge role in how things eventually happen. If Walt hadn't been in Clovis and Chuck in Fresno, there might not have ever been a CART. If the issue of CART would have come up a year later or two years later, it probably wouldn't have happened with the superintendent who replaced Chuck."

"Walt was a great Superintendent in the Tamalpais Union High School District," said Swanson, "which is where I first worked for him. He always had vision and was progressive about instruction and fearless about going after what he thought would improve outcomes for kids. It was never about a test score. It was about producing great kids. Of course, the raw material there was pretty exceptional."

Bradley said the Board wanted a business person to lead CART. "They insisted upon a business person to lead this very, very unique program. I'm not saying it wasn't successful, but there were lots of issues related to that."

Bradley said that because he was gone so much, Wright didn't know the names of the 30 odd teachers that were working in his school.

About midway through the planning year, he decided the program could be franchised and spent much of his time traveling and trying to market the idea.

"(He believed) he could sell this concept, that he could make more money selling the concept than he could working at CART," said Fisher. "So he was mostly gone. He didn't even know the names of the teachers. I don't think he ever cared about that. He wanted to develop this concept and then he wanted to sell it."

"At the end of the day, you still were operating a high school," said Steve Ward, who later took over at CART. "The hope had been that they would be able to replicate CART, that you might be able to generate income because other school districts would want to emulate this. That was part of the business plan. So they built a business model to have X revenue generated by that. That was one of the ways they were going to raise money."

"The ideas were huge," said Bradley, "that eventually CART would be a self supporting operation, selling the curriculum, selling the idea. Pat Wright spent a tremendous amount of time trying to get other school districts throughout the country to commit and in some cases, he came very close. But it never really truly did get done. We were talking about copywriting our curriculum and it never really did get done."

"I think they also overestimated the amount of revenue from donations from businesses," said Ward. "It was real hard to get the dollars they had built the budget up on, either donations or selling the CART plan. Enrollment wasn't there to support the number of teachers. The business model that had been set up was not really correct. It was not working financially."

THE PRINCIPAL AND CEO FIRED

The CEO was traveling around the country trying to sell the CART concept to other school districts as a franchise model. He had no relationship with any of the teachers and he and the principal didn't speak. The school's leadership had gone from the sureness of Walt Buster's and Chuck McCully's vision to a dysfunctional family overnight.

The CEO and the principal didn't speak, said Fisher. "He (the CEO) was mostly gone, then she (the principal) was removed."

Half way through the first operating year, in January, the Board fired the principal, but really that meant she would just be reassigned back within Fresno Unified for the next school year. Fisher said the Board didn't realize at first that she didn't go anywhere.

"That's how education is, you have a contract for a year," said Fisher. "So they removed her in January and thought she went somewhere else, but she didn't. She was still there."

"She spent a lot of time trying to rally the Fresno Unified

CART ENROLLMENT NUMBERS BY DISTRICT[1]	FRESNO UNIFIED	CLOVIS UNIFIED	TOTAL
2003-04	402	615	1,018
2004-05	482	682	1,166
2005-06	309	639	954
2006-07	492	707	1,203
2007-08	592	710	1,310
2008-09	638	755	1,393
2009-10	636	764	1,400
2010-11	535	766	1,302
2011-12	608	843	1,451
2012-13	489	871	1,362
2013-14	424	815	1,239
2014-15	579	848	1,427

1. Numbers are as reported prior to the beginning of the school year in August.

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-Lisa Rodgers,
Mother of former CART student

teachers around her to be reinstated," said Fisher. "That was a huge distraction for the second part of our first year, while we were still trying to figure out what we were doing. I praise and thank those teachers for continuing to work when there was so much turmoil within the administration."

After the first year, the CEO Pat Wright resigned as well. Ward, who was at Clovis High, came over to run the school. The Board decided it needed an educator at the helm, not a business person.

CART could easily have shut down after the turmoil and failed leadership in that first year. But Walt Buster and the CART Board persevered. They decided the leadership needed to be focused on education first, not on getting caught up in start-up euphoria and trying franchise a tech-school business model.

Ward had a background in mathematics and also understood finance. He had to find a way to adjust the business model so the school could operate within a financially sound budget.

ATTRACTING STUDENTS

One of the core problems in getting the school on track was attracting students, said Ward. The school needed to justify the number of teachers and its budget. "I can't have three teachers in a lab that only has 30 kids in it," said Ward. "They were designed to have 80 to 100 kids per session to make it work financially."

Ward said everyone, all the teachers, administrators, and supporters had to pitch in to recruit kids.

"Kids were having to choose to get on a bus, ride across town and participate in your program," he said. "You better make it something that kids want to be here for and you better spend time recruiting kids. That was alien to them, so we had some heavy trials those first couple years."

CART teachers and administrators had to adjust their thinking, said Ward. He had known about recruiting kids, since he had been a cross-country track coach. Kids don't just show up. He had to go find them and tell them how great cross-country track would be.

"All the elective teachers, they have to actively recruit kids," said Ward. "Otherwise, they won't have a program."

All the teachers at CART had to take on that mindset, that in many ways, CART was an elective for kids.

HOME SCHOOLS FEARED LOSING GOOD STUDENTS

Clovis and Fresno were also extremely competitive with one another.

The two districts "had been at odds for years and years," said Fisher. "There's years of bad blood. There were a lot of people who said these two districts can't work together and there were a lot of people in both districts who didn't want to work with anybody in the other district."

Both districts had fears about how CART would take students away.

In Clovis, the fear was losing the sports stars.

"Don't laugh," said Fisher. "Sports are big. There's a lot of competition between the two districts. So (the Clovis people said) 'We (don't want) to lose any of our good kids on our teams.'"

Further, said Fisher, Clovis couldn't understand why any of its students would want to leave. "Clovis thinks that they're the best district ever invented," said Fisher. "Why would a kid leave a fabulous school like Clovis high or a fabulous school like Clovis West and go somewhere else? Those kids aren't gonna want to go. In their mind, every single kid at Clovis high school loves going to Clovis high school."

In Fresno, said Fisher, "their fear was all the smart kids were going to leave their schools and go somewhere else."

In reality, both districts were afraid of losing the smart kids.

One parent, whose kid was an "A-plus" student, said the teachers in Clovis told her that CART was remedial, not for the smart kids.

"I was told by two very well respected teachers in the Clovis Unified who are good friends of mine," said Lisa Rodgers, "that CART was for kids who couldn't do regular school, for kids struggling or kids who had gotten in trouble or flunking out perhaps. It really wasn't for students who were doing well."

Her daughter, Savannah, said she got the same message from teachers. "I had teachers just flat out tell me, 'I don't think you should go,' or they would say they didn't like the CART program. Coming from a teacher at my home school, I felt like they were just trying to keep me at my home school."

In fact, said Fisher, "In both districts, teachers thought the smart kids were going to leave."

Savannah said that this misperception was only among teachers and adults. "I didn't really get the feeling from students that there was a stigma to CART."

"For some reason, CART is well regarded outside of Fresno," said Fisher. "People travel literally from all over the world to visit this program, but you can't get teachers at either one of these districts to come and see what's going on."

So when students go back to their home schools after attending CART and tell their teachers how great CART is, Fisher said the response can be negative. "'I don't like that school. I don't know what they're doing.' It's a negative. So the rumors were, 'Those teachers get paid more than we do. They have fewer students than we do. They get everything they want, I mean everything, everything they ask for, they get it.'"

"WE LOVE THESE KIDS"

So, in the beginning, the districts sent their low-end students.

"What happened was we did all these dog and pony shows to get kids to sign up, but the bottom line was their counselor set the schedule," said Fisher. "So a counselor would say to kids, 'you know, you're a really good student and I don't think good students are going to CART. You'd be better off staying here.' So we ended up with a lot kids that were problems, that didn't fit in, that they were looking for a place to put them. And we said, 'Great!' We love these kids. We'll keep them. Many people had not loved these kids, so they responded to that."

Over the years, the school's academic diversity grew. "You have kids at the top end who want to be doctors, so they're intrigued by the biomedicine program," said Fisher. "And then you have kids at the bottom end who just don't like where they are and will try anything."

The school also became a Mecca of sorts for Special Ed kids. "We had a higher percentage than they had back at their schools because (special ed) kids were being successful here," said Ward. "Our teachers were very good in working with those kids."

The same was true of the success of its English learners. "When we looked at their CST scores, especially in the area of English language arts, there were significant improvements for (English learners) over their prior years," said Ward. "We attributed that to the fact that if you were an English learner in that environment, you were forced to used the language. You worked with teams of kids. You were constantly having to interact. You were having to do presentations."

TECHNOLOGY

One of the early mistakes was the heavy focus on technology.

"The first CEO pushed technology to the extreme, to state of the art, doing things that were edgy," said Ward. "Not that they were bad, but schools cannot afford to be on the cutting edge of technology."

The technology was extremely expensive, said Ward, "and realistically, we could never get it to work."

They used the original Citrix software platform where all the applications were kept on the server. Students would use laptop computers that would connect to the server, where the applications ran. Because connection speeds were slow at the time and platform software hadn't been really tested for this level of usage, it never really worked properly.

The school had a thousand laptop computers. If a kid took a laptop home, she couldn't work on any applications without having to log into CART's servers over a dial-up modem. It simply never worked properly.

"The first CEO pushed technology to the extreme, to state of the art, doing things that were edgy."

-Steve Ward,
former CART COO

"It was someone's dream. Someone sold someone a bill of goods that this was the greatest and that we had to do it this way. And we did. It took us a while to get out of that. It was a nightmare."

-Steve Ward

"Further, we had 300 dial-up lines that was costing us a phenomenal amount of money," said Ward. "It was like, 'Why? Why are we doing this?'"

"There's no way that you're going to get the first integration of any kind of new software or hardware concept and be able to afford it in school districts," said Ward. "Nor did you need it."

"It was someone's dream," said Ward. "Someone sold someone a bill of goods that this was the greatest and that we had to do it this way. And we did. It took us a while to get out of that. It was a nightmare."

Even Apple Computer co-founder Steve Jobs, in an interview in 1995 with the Smithsonian, said technology is secondary in education to good teachers. (See Jobs sidebar on page 48.)

"There were a lot of technology issues," Fisher said. "A lot of promises were made about what was going to happen and it didn't happen. For many people, it was frustrating, but the teachers kept the kids coming back. The teachers would (say), 'Okay, the technology is not working. Let's see what we can do with this.' There was a lot of adjusting."

There was an almost drunken obsession with technology between 1997 and 2001. Many people thought technology was a "silver bullet" that could solve any sort of problem, business or otherwise.

In hindsight, Ward's interpretation is spot on. The problem faced by Pat Wright and CART was that the country was enamored with technology. New tech was being implemented in every industry at a blistering pace. In education, tech schools were popping up across the country.

About this time, the Gates Foundation had been newly formed and was making huge donations to school models that used technology and delivered education through small learning communities. The funding was geared toward replicating these models.

Bob Pearlman, who led the Autodesk Foundation and carried its project-based learning message in the late 1990s, said the Gates money, while it lasted, helped a lot of those early PBL programs get started.

"I was working a little bit at that time with High Tech High (a school in San Diego with a similar philosophy to CART)," said Pearlman. "We got one of those grants. I told the people, my friends up in Napa (at New Tech High, which was also getting started), you could get one of these grants."

Pearlman said the head of New Tech High called the Gates Foundation. A week later, the Gates people visited, then a week following the visit, Gates gives New Tech High $4 million to replicate its model.

"That was the atmosphere," said Pearlman.

Someone from Gates Foundation visited CART that first year, said Fisher. "We were very excited about it because we needed money to pay for all this and we thought, 'Gee, maybe we're gonna get some kind of grant.'"

Unfortunately, said Fisher, "None of the technology worked that day. Safe to say, they were not impressed. They never came back."

But the teachers kept on.

THE CHALLENGES OF CLOVIS AND FRESNO

Clovis and Fresno are in the middle of Calfornia's central valley. Agriculture is the primary industry and drives the area's economy. There's also a large Hispanic population.

Fresno is more urban and poorer, in general, while Clovis is more rural and wealthier. Fresno, with a population around half a million, is mostly Hispanic. Clovis, with a population just under 100,000, is mostly white.

Like many ethnically segregated urban and suburban areas that are tied together, economic imbalances tend to mirror the racial division. The median household income in Fresno is about $38,000, while the median income in Clovis is $20,000 more, at roughly $59,000. The average home price in Fresno is $159,000, while in Clovis, it's $225,000.

2. 2012 figures from city-data.com
3. For individuals 25 years and older.

FRESNO AND CLOVIS DEMOGRAPHICS	CITY OF FRESNO	CITY OF CLOVIS
POPULATION	505,882	98,632
MEDIAN INCOME	$38,386	$59,627
AVERAGE HOME PRICE	$159,000	$225,000
ETHNICITY		
WHITE	28.40%	56.60%
HISPANIC	46.90%	30.90%
ASIAN	13.30%	8.70%
BLACK	8.30%	1.20%
MIXED RACE (2 OR MORE)	2.50%	1.70%
AMERICAN INDIAN	0.50%	0.50%
HAWAIIAN PACIFIC ISLANDER	0.20%	0.30%
OTHER	0.08%	0.20%
EDUCATION LEVEL AND EMPLOYMENT[3]		
HIGH SCHOOL DIPLOMA	74.80%	89.70%
BACHELOR'S DEGREE	19.40%	27.10%
GRADUATE DEGREE	5.60%	8.20%
UNEMPLOYED	16.80%	10.80%

Race

Racial tensions in Fresno are not unlike other urban areas. Fresno police initiated a three-week crackdown on gang violence in December 2014, but many community leaders equated the crackdown on gangs to a crackdown on people of color, mainly Hispanics. They also claimed the crackdown is a short-term response to a chronic epidemic.

"The crackdown will remove some folks who have been committing crimes in our neighborhoods, but it does nothing to bring a solution to the conditions that bring and breed this type of activity," said the Rev. Bryson White in the Fresno Bee newspaper.[4] "Inevitably, it's a shortsighted solution, but that's the nature of law enforcement."

During the crackdown, 15 people were hit by gunfire in 26 shootings. Three people were killed. The Fresno police made 949 felony arrest, 486 were called "gang-related."

In 2010, a local task force report estimated there were 17,000 gang members in Fresno. As a footnote, this could equate to about one in ten 15- to 35-year olds, if we exclude very young and older people.[5] The report concluded that gang sweeps had no impact on long-term gang activity and that there should be more emphasis placed on prevention and intervention.[6]

We should point out that it's unclear what "gang-related" means. The term "gang" is loaded with a baggage of fear, violence, racial difference, racial war, organized crime, murder, rape, guns, and stabbings, to name a few. The terms are reinforced by an uncritical media, which over time can fail to question the very nature of what the term "gang" means and

whether it even exists. There's a cultural acceptance to the term and existence of gang violence, which can desensitize the issue for people. The media perpetuates this idea, not just prime-time cop shows or investigative shows like 20/20, but newspapers like the Fresno Bee.

When we read an article on a "gang-related" shooting, we don't see a smart, young person with a whole life of potential in front of her. We don't see a devastated family. We see a context of crime and violence that is encapsulated in statistics that elevate fear. This leads to attempts to contain the problem, draw a circle around it, cut it out like a cancer. Of course, these attempts fully and completely misdiagnose the sickness. Thus, it's no surprise that "gang-sweeps" have no impact and offer no cure. They just make for good headlines and actually feed the problem further. The reality is that our vision is skewed and there's no focal epicenter to the problem. It's as much driven by fear and separation in the suburbs and through the media as it is by anything else. Any diagnosis and prescription to cure the problem needs to focus on the things that separate us from one another and tear down those barriers, bring us closer to each other, so we can see the humanity we all share.

Many, if not most, urban areas struggle with this problem.

Too often, people from different racial, economic, religious, social and cultural communities cling to their differences and a narrow mindset of Us versus Them emerges. So often, we segregate ourselves into neighborhoods of people who make as much money as us and who look and think like us. Then we don't even realize it when our limited perspective on the world (and other communities) feeds our many prejudices and starts to impact our decisions.

The institutions of society can learn from examples like

CART and from young people, whose minds might be more open to diversity and equality and our common humanity than adults, who migrate as they grow older into clusters and communities made up of people who not only share the same beliefs, but the same prejudices.

CART BRINGS PEOPLE AND COMMUNITIES TOGETHER

One of the biggest values in the CART program is that it brings students from a wide array of backgrounds together and in this environment, those students learn to work with one another on project teams and make friends that transcend cultural differences.

The project team aspect of those relationships is critical. It's one thing to sit among others from different cultures in rows and listen to a teacher lecture. It's on an entirely different level for those students to work with one another on teams. This aspect alone breaks down the barriers that divide us.

"In addition to education," said Terry Bradley, "when you go over to CART and when you see how these kids work together, coming from totally different environments, from kids who are probably homeless in Fresno Unified, working with kids that live in a very expensive, million-dollar home. So socially, it's been great for the kids that go to CART. Educationally, I think it's also been really good, but socially, kids from low socioeconomic backgrounds have to work with kids from high socioeconomic backgrounds and somehow and some way, they are able to pull it off. Maybe it's because kids are being kids. They don't see the color barrier and they don't see the clothing barriers that a lot of adults see. I think that's just been one of the things that no one really talks about."

4. Fresno Bee, Dec. 29, 2014
5. Figure based on age demographic 15-35 makes up 31.8% of the population, roughly 160,870 people. If 90% of the 17,000 gang members in Fresno are in this age bracket (assumption), then the percent of people who are 15-35 and in gangs would be: 90% x 17,000 / 160,870 = 9.5%. This is an estimate.
6. Fresno Bee, Dec. 29, 2014

BROWN V. BOARD OF EDUCATION

In many ways, CART is a modern, organic solution to the issue of socioeconomic and racial divide that the 1954 landmark Supreme Court decision on Brown v. Board of Education (Topeka, 1954) addressed.

Segregation of white and colored children in public schools has a detrimental effect upon the colored children. The impact is greater when it has the sanction of the law; for the policy of separating the races is usually interpreted as denoting the inferiority of the Negro group. A sense of inferiority affects the motivation of a child to learn. Segregation with the sanction of law, therefore, has a tendency to (retard) the educational and mental development of Negro children and to deprive them of some of the benefits they would receive in a racially integrated school system."

We conclude that in the field of public education the doctrine of "separate but equal" has no place. Separate educational facilities are inherently unequal.

*— Opinion of the Court, written by
Supreme Court Chief Justice Earl Warren, May 17, 1954*

Even though we live in a different era today, children still find themselves separated racially and socioeconomically. Segregation is no longer a legal distinction, but it lingers as a consequence of our cultural fears and feelings of separateness.

The effects of a divided society, split between the wealthy and the non-wealthy, often parallels other cultural, racial, and religious divisions, as we discussed earlier.

Laurie Hayes, who teaches at CART, shared a firsthand experience that echoes the concerns of Chief Justice Warren's landmark ruling:

"Twice I've had, especially girls say to me, "I can be smart here and not be called 'white.'" And I thought, "Really, in this year, that's still a problem?!"

The barriers that separate some communities aren't just socioeconomic and racial and cultural. They carry a psychological basis and impact the people in those communities in sometimes devastating ways, in terms of identity and potential. As Chief Justice Warren noted, a psychological inferiority (or superiority) can affect a child's motivation to learn. Although Warren doesn't use modern or clinical terms to describe the psychological impact, the point he makes is clear and rings true today.

CART bridges some of that divide by bringing together students from a diverse range of racial and socioeconomic backgrounds and parts of town, where they can break away from the identities that are expected of them in their separate communities and each of them can strive to become a person that's only held back by their ability to imagine.

While CART isn't a solution to the entire economic or racial divide in Fresno and Clovis, it shows that people are people no matter where they come from and that if we give them an opportunity to work together and get to know one another, the barriers that divide them will disappear.

IngenioMind would agree with the conclusions of the Fresno task force on violence and gangs: Money would be better spent on prevention and intervention, for example on programs like CART that bring people with diverse backgrounds together. Though, if we're to use medical terms to describe the problem or solution, we would go beyond "prevention" and "intervention." We believe it can be treated. The cure for this illness depends first upon understanding that it's not a cancerous like growth in a localized area that can be isolated and treated. It's a whole-body illness that needs a whole-body treatment and cure.

Programs like CART demonstrate that a cure isn't unimaginable or unattainable. It may take some magic, but at CART, that's one of the things they've discovered.

Sam Geil, who sits on the CART Board, said, "Part of the magic of CART is the two school districts comingling their students."

"Part of the magic of CART is the two school districts comingling their students."

*-Sam Geil,
CART Board Member*

THE TWO SCHOOL DISTRICTS

Like the cities of Fresno and Clovis, the two school districts, Fresno Unified and Clovis Unified[7], represent a broad socioeconomic, cultural and racial range.

The most noticeable differences between the two school districts are the number of English Learners. Fresno has a much larger English Learner population. As percentages, in Clovis Unified, 5.7 percent are English learners and in Fresno, 23.7 percent are English learners. This can affect the entire approach to education, as Fresno would be heavily focused on just getting those English Learners comfortable using English every day.

The English Learner populations in the two districts are also very different. In Clovis, 44 percent of the English learners are Spanish speaking and 28 percent are Hmong speaking. In Fresno, 78 percent are Spanish speaking and 16 percent are Hmong.

The next most noticeable difference between the two districts is the budget and amount spent on each student. Even though Fresno Unified is about 1.75 times larger than Clovis Unified, its budget is 3 times as large. So the amount spent on each student in Fresno comes out to about twice as much as spent on each student in Clovis.

The reality is that classroom sizes are not that different. Fresno has about 20.1 students per teacher and Clovis has 24.8 students per teacher. So, the difference in amount spent on each student in the two districts isn't necessarily seen in the classroom.

Fresno has a much larger payroll, almost three times bigger, than Clovis. This more or less mirrors the two district budgets.

Fresno may put more funding into programs outside of the classroom that perhaps don't require a credentialed teacher, but are still paying for front-line employees that work directly with students.

We're not sure if courses dedicated to English Learners would fall into this category or not. This report doesn't analyze in detail, beyond what is presented here, how those two districts spend their money.

Fresno may also have a larger number of administrative (middle manager) employees who don't work on the front lines with students. Again, this is speculative as to the reasons why their budgets are so different and doesn't bear on our conclusions.

FRESNO AND CLOVIS SCHOOL DISTRICTS BY THE NUMBERS	FRESNO UNIFIED	CLOVIS UNIFIED
STUDENTS	71,190	40,694
BUDGET	$1 billion[8]	$300 million[9]
AMOUNT PER STUDENT	$14,046	$7,365
TEACHERS	3,538[10]	1,643[11]
STUDENTS PER TEACHER	20.1	24.8
ADMINISTRATORS AND MANAGEMENT	523	530
CLASSIFIED PERSONNEL (NON-TEACHERS)	3603	1988
TOTAL EMPLOYEES	11,554[12]	4,300[13]
STUDENTS PER SCHOOL DISTRICT EMPLOYEE	6.2	9.5
STUDENTS WHO ENROLL IN POST-SECONDARY EDUCATION[14]	59.1%	72.2%
ENGLISH LEARNERS[15]	16,838	2,326
TEACHERS W/MASTER'S DEGREES[16]	23.5%	31.3%

7. It should be noted that Clovis Unified school district overlaps and takes students from the city of Fresno. The School District boundaries aren't the same as the city boundaries. We haven't analyzed the demographic overlap, but it's possible that Clovis Unified takes students at the upper socioeconomic end of the City of Fresno, causing a larger socioeconomic range in the school districts than is seen in the two cities.
8. Self reported by Fresno Unified School District on its website
9. Based on 2013-14 audited financial statement. The actual budget is $299,751,611, with a deficit of $582,241. This number represents the actual expenditures for the year, not an estimated budget.
10-13. California Department of Education
14. Percentage of graduates of the school district who enrolled in postsecondary education (e.g. college) within 16 months of graduation.
15-16. 2012-2013 numbers. California Department of Education

"One district is a union district. One district is not a union district. Different expectations. Different requirements.
How would we combine all these people together and deliver a program?"

Susan Fisher,
Former CART COO

SAT TESTING AND SCORES

The Clovis college entrance SAT scores are much higher than Fresno. This report does not try to interpret the reasons for this difference, though other research may consider the number of English Learners, the racial makeup, the socioeconomic differences, the pedagogical approaches, the size of the districts, the role of teacher and employee unions, the crime rates, the family structure, and other factors as perhaps playing a role. As with the interpretation of any set of statistical data, it's almost impossible to draw cut and dry conclusions.

What's clear is that Fresno is faced with any number of obstacles and that larger funding levels alone hasn't translated into educational equality between Fresno and Clovis, at least in terms of some of these tests.

We should note that we don't put much weight on these sort of tests as representative of economic (career) or academic potential. In general, we believe standardized tests, including college entrance exams, are a weak metric of an educational system. They don't measure long-term outcomes or long-term success. We'll come back to this point in the section on metrics (page 18) and also discuss "potential" in the sidebar on Growth versus Fixed Mindsets on page 20.

STAFF DIFFERENCES IN CLOVIS AND FRESNO SCHOOL DISTRICTS

Since CART is a collaborative between Fresno and Clovis unified school districts, its teachers come from very different working cultures. Fresno Unified teachers are represented by a union and Clovis Unified is one of the few school districts in California that isn't unionized.

Susan Fisher said it took some open minds and time to adjust in an environment where union and non-union teachers worked together.

"One district is a union district," said Fisher. "One district is not a union district. Different expectations. Different requirements. How would we combine all these people together and deliver a program?"

CART seems to operate in its own ecosystem, so these differences aren't immediately apparent and don't seem to be an overt issue for anyone.

Though, in the beginning during those first couple years, the teachers seemed to segregate naturally into labs with fellow teachers from Clovis or fellow teachers from Fresno. This may have been driven by a preexisting level of distrust or that "Us/Them" mindset that we also discussed in relation to the socioeconomic and racial differences in Fresno and Clovis.

FRESNO AND CLOVIS SCHOOL DISTRICT SAT SCORES	FRESNO UNIFIED	CLOVIS UNIFIED
GRADE 12 ENROLLMENT	5,512	3,103
NUMBER TESTED	1,839	1,512
PERCENT TESTED	33.36	48.73
CRITICAL READING AVERAGE	443	502
MATH AVERAGE	451	518
WRITING AVERAGE	437	437
TOTAL >= 1,500 NUMBER	478	771
TOTAL >= 1,500 PERCENT	25.99%	50.99%

No one knew how these two districts would get along, especially with the teachers down in the trenches in collaborative and combined classrooms, having to work together. It was unprecedented.

The leadership, which underwent a crisis in CART's first year, also determined how values were manifested in the organization.

The first principal at CART tried to get Fresno teachers to support her in an attempt to get her job back. There was a fixed mindset that Fresno and Clovis teachers were different and instead of embracing a culture of unity, she focused on using those differences for a personal agenda.

Over time, however, the labs became more representative of a mix of teachers and less segregated.

Steve Ward said it took some adjusting to get the teachers from the two separate districts to work well together because they came from very different teaching cultures and districts.

"How I had to work with (Fresno teachers) is very different than how I had to work with Clovis teachers," said Ward. "That presented some challenges until they found out finally that an administrator could actually support teachers and understand what their challenges were."

LABOR MANAGEMENT RELATIONS

In general, across America, those who support teacher unions say that their worker rights are better protected and that through collective bargaining, they are paid at a more competitive salary. They argue that this equates to attracting better teachers and producing a better education for kids.

Criticisms of teacher unions, on the other hand, suggest that unions can create an adversarial relationship between administrators and teachers, artificially creating a high level of distrust from both sides. This can be hard to overcome if the leadership on the part of either administrators, union officials

or both perpetuates opposing values and a culture of distrust.

Not all unionized school districts suffer this fate, but it's common enough in labor-management relations to be seen as a barrier to a shared vision.

Those who support unions would also argue that rogue administrators (in non-union organizations) can unfairly and arbitrarily penalize teachers they don't like for any reason. They can show favoritism to some teachers and derail the careers of other teachers. While this is not the norm, there's no debate that it can and does occur.

But bad administrators can often effect work strain and penalties on workers in any sort of work environment, union or non-union. Workarounds aren't very hard to find for a determined and malevolent manager in any organization. Even with union representation, workers may not elevate an issue for fear of retribution.

KAFKAESQUE BUREAUCRACIES

We would like to turn for a minute, as a footnote to this topic, to the absurd extremes that both unions and management can go. Often, in these extreme cases, both sides have forgotten the purpose of education and are completely disconnected from what's best for students and teachers and the school district.

In 2010, two documentaries, *The Rubber Room* and *Waiting for Superman*, shed light on how New York City disciplined teachers by sending them to "rubber rooms" for anywhere from weeks to months or years. As many as 600 NYC teachers went to a rubber room every day and some teachers spent as long as 10 years in a rubber room, doing nothing. Yet, they continued to collect full salaries with benefits and pensions.

The atmosphere in the rubber rooms was equated to the gang-like culture in prisons, with cliques of segregated individuals sometimes resorting to physical confrontations

with other groups of teachers. Both the unions and management were responsible for creating rubber rooms and letting them exist in a Kafkaesque reality.

Many of these teachers should have been fired or reassigned to a different classroom or administrative position. But, in a long-standing era of distrust between administrators and teachers, both union and management officials agreed to the "rubber room" concept. It kept bad teachers from losing their jobs, but got them out of the classroom, a win-win for both union and school district officials. The problem is that it was a farcical and absurd solution, representing the worst of bureaucratic potential.

Following the media attention from the two movies, labor and management in New York agreed to shut down the rubber rooms.

Of course, this is an extreme example and we don't believe the culture in Fresno is similar. It only serves to show that mutual distrust and singular agendas can cause administrators and union leaders to lose sight of the purpose of education and what's in the best interest of students.

We want to stress that union or management officials anywhere can suffer from very limited and one-sided perspectives. And usually, they are completely unaware of how limited their perspective is. These are common cognitive biases that lead us to think we know more than other people or have a better sense of reality. The truth is we don't and we have to work hard to gain a broader perspective so that our thinking isn't guided by these biases.

Amos Tversky and Daniel Kahneman discovered these nearly universal biases in 1972. Kahnman later won the Nobel Prize in Economics studying cognitive biases and developing the field now known as behavioral economics. These cognitive biases are caused because people create their own subjective social realities based on their perception and

limited perspective of the input, how they perceive the world. Many cognitive biases are self serving and self directed. They can also effect culture at the macro level and create prejudiced values.

We often don't realize that such a limited perspective can lead to outcomes like that in New York. The potential is always there and both sides are to blame when such an outcome happens.

Both union and management officials should always try to keep an open mind, look for common ground, and also use the organizational mission as a basis for a shared vision, not secondary to myopic agendas.

In the beginning, CART could have succumbed to union-management divisions, as teachers self-segregated into labs and the principal tried to leverage support from the unionized teachers to save her job. The potential was there, but the teachers and leadership were finally able to unite around a common vision and goal for the school that put student outcomes above everything else. And that began with a healthy work environment built on a foundation of trust.

Union and non-union schools anywhere can learn from this example. We tend to gravitate to mindsets driven by distrust of others. At CART, the teachers, administrators and supporters didn't let those mindsets derail what they were trying to build. That's a solid first step to finding and sharing a common vision.

"It's a big deal," said Geil. "If there's any issues (between the union and management), it usually manifests itself on the upper end, not at the ground level. Culture is driven by leadership. It's probably the one thing the two school districts have collaborated on that's actually produced something of value. It's a jewel."
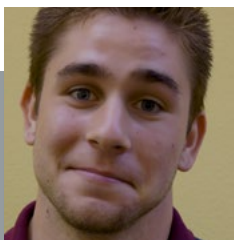
ONE STUDENT PROVES 3RD GRADE TEACHER WRONG ABOUT HIM, WINS SCHOLARSHIP

Joshua grew up in Fresno without a TV or computer in his home and came from poor economic circumstances. He jokes that his only two toys were a shovel and dirt.

He was put in Special Ed classes in the elementary school. He said, "I had this teacher in the 3rd grade who came up to me and told me, 'You know, you're not right in the head.' Her words exactly. She put me into this (special ed) class and I ended up going through middle school and early high school being branded as this special needs kid. It really bugged me because I had always tried to do well regardless. I didn't have this huge mental block. I was audio-visual dyslexic, so B's, D's, G's flip around when I read. I found this huge motivation to prove that teacher wrong and just to do better for myself."

Joshua was able to prove himself by acing a bunch of standard tests in high school and pushing himself to get straight A's. But more important than the A's and proving himself to people who didn't believe in him was the desire to push himself to become a better person, to create more potential. (See sidebar on Growth v. Fixed Mindsets on page 20) He demonstrated a growth mindset about himself, which allowed him to overcome the arbitrary constraints and low potential branded upon him a 3rd grade teacher.

"My motivation came at first from wanting to prove somebody wrong and then it kind of changed things to how much farther can it go," said Joshua.

He went on to CART, where he discovered other people who shared the same passion for learning and pushing themselves that he had. His hard work surpassed everyone's expectations, everyone except perhaps himself and his family. At one point, he and his family were the only people who believed in him. And he didn't let the negativity from other people hold him back.

At graduation, he was awarded the Weber Award Scholarship from CART, which is a 4-year scholarship to Fresno State. It is given only to one student each year.

(For a similar story about a young elementary school student being motivated by negative branding, see the section on Joe Oakey (page 46) and the Steve Jobs sidebar (page 48). Both of them found a passion for learning after a teacher or school had labeled them negatively. Oakey later went on to become Commissioner of Education in Vermont and a PBL evangelist and Jobs, as most people know, went on to create Apple.)

"My greatest fear was to get up in front of people and speak. That was really hard for me. It's funny, because of CART and doing so many projects, I've become a good speaker. Now, I go around to local high schools, middle schools and am a motivational youth speaker."

-Joshua, former CART student

METRICS

One of the challenges that CART faces is how to measure success. This isn't an uncommon problem for schools, when there's such a big focus on standardized tests, and yet, standardized tests don't measure any sort of long-term success.

CART's burden is higher than most high school's because it only serves the 11th and 12th grade, so students aren't in the program for very long and since students split their time between CART and their home schools, they take the standardized tests at their home school.

The consequence is that CART administrators have a hard time pointing to quantitative outcomes, even when the qualitative feedback from parents and students is overwhelmingly positive.

Susan Fisher pointed to a few metrics that made the school standout, particularly one about continuing on to post-secondary education: "We would poll students when they arrived and at that point, it was maybe 46 or 47 percent (said they were planning to go to college or other post-secondary school after graduation)."

Then, they would poll them again at the end of the year, and the number had jumped to between 94 and 96 percent.

The impact of CART on how these students saw and planned their futures was huge. This says more about this program than any standardized test ever could. The students exhibited a massive change in their outlook and exhibited growth in planning and taking responsibility for their future.

The other metric that Fisher pointed to was parent engagement.

Parent engagement isn't something that can be forced or contrived. It's actually a result from a student being passionate about learning. It's a metric of that student's passion and it can be measured.

Each January, CART hosts Showcase, an evening event where every student gives a project presentation to the entire student body, parents, teachers, administrators and the community. During the event, the hallways at CART are filled with more than a thousand people. The parking lots are jammed.

Every single student participates and many are proud to invite their parents, grandparents and extended families to share with them

what they are doing, what interests them in school. Often, it's simply to share the passion they've found for learning and doing and imagining at CART. For some, it's a 180 degree turnaround.

Teacher Seth Chambers said the students in his lab won best presentation one year.

"(A student's) mom came up to us afterwards in tears and told us that when her son was born, the doctor told her that he would never be able to speak," said Chambers. "And here, he had just won best presentation at CART and that she had seen this night and day difference from the boy that walked in the door (at CART) to the one who left. He was sure of himself."

The kids are taught how to give presentations and by the time they get to college, they've already had lots of experience getting up in front of a group of people.

Joshua, a former student, said:

"A lot of the projects we had were presentation projects, meaning you'd do your research on Tuesdays and Thursdays, the whole day while you were at CART, get all the stuff you'd think you need to make that business idea successful, that portfolio idea successful, whatever project we were working on, you didn't get a handout saying this is how you should do it, it was more of a figure it out.

My greatest fear was to get up in front of people and speak. That was really hard for me. It's funny, because of CART and doing so many projects, I've become a good speaker. Now, I go around to local high schools, middle schools and am a motivational youth speaker."

At a typical high school, most parents have no idea what their kids do every day at school. They're out of the loop. That hasn't been the case at CART. It stands as one of the impressive aspects of the program, that the kids can and do find a passion for learning and want to share that passion with their families.

"The biggest surprise (at CART) was the reaction of the parents," said Fisher. "I've been in high school where you have open house

and you sit there the whole night and you maybe have four people come in your room and three of them you already know and don't even need to talk to them. And you never see the people you need to talk to."

At CART, "We were overwhelmed by parents," said Fisher. "Kids brought their parents. They brought their grandparents. A success is when the shopping center across the street calls you and says your people from your school event are taking up all their parking places. And you say, 'Oh, I'm so sorry,' but then you do the fist pump and say, 'Yes! What's better than that? What's better than kids bringing their parents to school to see what they can do? I mean unbelievable."

Sam Geil said, "When they have their showcase, you can't find a parking spot. The place is slammed. It's at overflow capacity. You don't see that anywhere. You just don't see that. You might see that at the grammar school level, but you don't see it beyond that. Anywhere. But you see it at CART."

Steve Ward echoed Fisher's comments. "I had so many parents come up to me and just thank me for the CART program, thanking the teachers for what they had done. They had saved their child, literally saved their child."

Current CART CEO, Rick Watson agreed, saying they have countless testimonials from parents.

The hard part for CART is quantifying success beyond the testimonials and observational evidence

"I think that's the million dollar question," said Geil, referring to the question of how to measure success. "I don't think we have any hard quantifiable metrics. What we need to do is track the students, kind of like they do in the ocean, put the tracker on the dolphins and follow them around."

Geil said, "When you talk to students, you walk away with profound respect for the program."

"A number of students have been re-energized in their interest

for education because of CART," said Geil. "How do you measure that? I call it a blue dollar measurement. It's an avoidance of cost. What CART does is intercept students that otherwise wouldn't be interested in school and probably drop out or have to get their MoJo going in junior college or beyond. It's early intervention in that respect."

Earlier, we talked about the cultural and socioeconomic divisions in Fresno and Clovis. CART not only brings those communities together, it saves those communities money from a social investment perspective, or as Sam Geil put it, "It's an avoidance of cost."

"The data is frightening," said Michelle Swanson. "The newest estimate is every dropout costs us $11,900 in services annually for the rest of their lives."

This harkens back to the 2010 Fresno task force report on gang violence, which called for more funding in prevention and intervention, before kids fall through the cracks or end up on a path with low aspirations and few opportunities.

Swanson's estimate probably doesn't include costs for gang sweeps or other broad initiatives aimed at decreasing crime

UNFORTUNATELY, THE EDUCATION SYSTEM IS FINE WITH MEDIOCRITY

The educational system is okay with low outcomes. "We seem to be fine producing wraths of dropouts," said Swanson. "I don't understand why there's not more urgency. It's just a soul crusher to me that we spend trillions, literally trillions of dollars, getting kids and young adults back in the pipeline as opposed to keeping them there in the first place."

> *"What's better than kids bringing their parents to school to see what they can do? I mean, unbeleivable."*
>
> *-Sam Geil,*
> *CART Board Member*

Growth versus fixed mindset

Carol Dweck, Professor of Psychology, Stanford University

One reason that many schools are looking at models like High Tech High or CART or Expeditionary Learning is the psychological impact that traditional teaching methods and ways of praising kids in the classroom may be flawed.

Carol Dweck, a psychology professor at Stanford, has studied what she calls fixed learning and growth learning. Fixed learning is when kids (or even adults) think they have a fixed intelligence. Often, the kids who earn high grades are told over and over how smart they are. This has the impact of making them think that their smarts are what matter and they can come to rely on it.

The problem is that when they face true adversity, they tend to be more brittle and unable to maintain the level of persistence and hard work to overcome the hurdle they face.

"What it does is, it drives the student from taking any kind of (risk)," said Michelle Swanson. "They become very risk adverse. They lie about their achievement because they can't and don't want to appear vulnerable because that means you're not the smartest kid in the room."

"Believing that your qualities are carved in stone—the fixed mindset— creates an urgency to prove yourself over and over," writes Dweck, in *Mindset: The New Psychology of Success*. "If you have only a certain amount of intelligence, a certain personality and a certain moral character—well, then you'd better prove that you have a healthy dose of them."

And back in the classroom, the kids who aren't praised see that another kid is told how smart he is. So when that second kid doesn't get easy A's, she thinks she's not smart and the psychological impact can be crippling.

In growth learning environments, kids are praised for working hard, not for "being smart." The result is that when these kids are faced with adversity, they are less brittle and more capable of working to improve themselves and achieve their goals.

"The passion for stretching yourself and sticking to it, even (or especially) when it's not going well, is the hallmark of the growth mindset," wrote Dweck. "This is the mindset that allows people to thrive during some of the most challenging times in their lives."

In Mindset, Dweck said that exceptional people are able "to convert life's setbacks into future successes."

She cited a poll of 143 creativity researchers. "There was wide agreement about the number one ingredient in creative achievement."

Persistence.

"And it was exactly the kind of perseverance and resilience produced by the growth mindset."

This ingredient also happens to be the same ingredient that CART emphasizes in Habits of Mind, a philosophy for learning that the students learn early in the program.

Dweck points back to childhood, when everyone was born with a desire to learn. Infants and young children aren't afraid to make mistakes or get embarrassed. It's only as they get older and develop an ability to evaluate themselves that some of them become afraid of challenges.

"Babies don't worry about making mistakes or humiliating themselves," wrote Dweck. "As soon as children become able to evaluate themselves, some of them become afraid of challenges. They become afraid of not being smart. It's breathtaking how many reject an opportunity to learn."

Even though innovative and creative minded people say failure is part of the process and we should embrace failure, there's still a stigma.

Scott Sandage, a professor at Carnegie Mellon University and author of *Born Losers: A History of Failure in America*, said in a New York Times article, that over time, failure has been migrated from an action—failing at a business or other venture—to an identity.

This idea of permanency (failure as identity) characterizes the fixed mindset mentality.

Dweck wrote that students with a fixed mindset suffered higher levels of depression "because they ruminated over their problems and setbacks, essentially tormenting themselves with the idea that the setbacks meant they were incompetent or unworthy."

IngenioMind interviewed a nurse at a large, highly esteemed University of California teaching hospital. She sees new resident doctors all the time and she says they often put patients in danger because they're afraid to ask questions of nurses who have been there for years. "They don't want to look inferior or like they don't have all the answers," she said. "And when they make a mistake, they often lie about it and try to defer blame onto lower-level staff. They're basically *pretend* doctors at that point. They may turn into good doctors, but right then, they're pretend doctors, faking it."

Says Dweck, "Our pre-med students with the fixed mindset would do almost anything for a good grade—except take charge of the process to make sure it happens."

"The fixed mindset limits achievement," wrote Dweck. "It fills people's minds with interfering thoughts, it makes effort disagreeable, and it leads to inferior learning strategies. What's more, it makes other people into judges instead of allies... important achievements require a clear focus, all out effort, and a bottomless trunk full of strategies. Plus allies in learning."

People can't do everything on their own, even though the traditional education system reinforces the idea of individual achievement. Finding allies in learning and cooperating and collaborating are a foundational element to the growth mindset and success in career and life.

As Terry Bradley said earlier, "Relationships, as everyone learns as they get older, play such a huge role in how things eventually happen." If kids (and adults) don't learn to work together, to find allies in learning and in work, they'll continue to exist on an island and not realize the success they might in building strong relationships through those learning years and over the course of their careers.

Places like CART teach people that anyone can develop a growth mindset and challenge themselves to be better, whether they come to CART as a Straight-A student or have had a hard time finding their way in school prior to CART. While the results of the students who struggled before coming to CART are more noticeable, every type of student can grow and learn and train to succeed in life after high school.

"Babies don't worry about making mistakes or humiliating themselves. As soon as children become able to evaluate themselves, some of them become afraid of challenges. They become afraid of not being smart. It's breathtaking how many reject an opportunity to learn."

**-Carol Dweck,
Professor of Psychology,
Stanford University**

SIX ASPECTS OF CART'S PROGRAM

1. Project based learning
2. Block schedule
3. Integrated classes
4. Real World Learning
5. Habits of Mind
6. Learning, Rigor and PBL

1. Project based learning

Project-based learning was not a new concept at the time CART was designed, but it was starting to gain appreciation and increased interested within the educational community.

The word "project" came from Middle English, when it meant preliminary design or tabulated statement. From there, it can be traced back to the Latin, throw forth ("pro" (forth) and "jacere" (to throw)).

John Mergendoller, who's president of the Buck Institute on Education, which helps train teachers and schools on project-based learning methods, said project in Italian is progetti (or progetto), which means blue print or model. He said project-based learning basically started in the 16th Century schools of architecture and art.

A basic concept to project-based learning is to learn by doing. We pick up the skills we need during the course of the project, not during a preliminary learning stage. "It has a very long past," said Mergendoller, "which as part of the educational process, you give students a project to complete."

Project-based learning may be differentiated from typical classroom learning in this way: Project learning is focused on the application of knowledge and typical classroom learning, so-called "chalk and talk" lecturing, is focused on the acquisition of knowledge.[17] For example, while doing a project, a student acquires the knowledge needed to do the project, knowledge that can be applied to the project. In a traditional classroom, knowledge is acquired without a specific "real world" application in mind. This isn't always the case, but these generalizations help in understanding the differences.

Michelle Swanson said it makes a difference giving kids a real world problem to solve. "Those labs [at CART] are based on an authentic problem or product, and that moves you away from self-conscious, self-referential solutions to problem solving."

She said that in CART's labs, they're "learning things just in time to apply them to the problem or the inquiry or the product they are developing. That's an intentional way of designing the work so kids are experiencing it as they are learning about it (and) as they are applying it."

17. Mills and Treagust

In the language of supply chains and assembly lines, there's a term called, Just in Time (JIT), meaning the materials arrive as they're needed and not stored in a warehouse onsite. It's a way to improve operational efficiencies and productivity in business, not acquiring the part at the assembly plant until it's needed. In many ways, learning by doing and by working on an authentic problem is an educational interpretation of Just-in-Time. Kids aren't storing away knowledge in some "data" warehouse in a recessed corner of their brains, where it might be forgotten. They're acquiring that knowledge as part of the active process of the project and applying that knowledge within the project.

This approach was anathema to the heavy focus on memorization and standardized tests that swept the nation in 2000 and 2001.

Just as CART was coming into its own, Congress passed the No Child Left Behind Act in 2001, which tied school funding to standardized testing metrics.

NO CHILD LEFT BEHIND SHIFTS FOCUS TO MEMORIZATION

One of the major emphases of No Child Left Behind was the year over year results on standardized tests. Lawmakers wanted to see an upward trend and penalized schools that didn't show improvement.

In the 14 years since No Child Left Behind was passed, project-based learning has surged in popularity. Many parents, not to mention politicians and educators, have realized that the focus on standardized tests missed the mark and was never a sound measure of educational success. It merely forced schools to game the system in order to sustain funding. This ended up hurting kids by

focusing on memorization and scoring well on tests, instead of learning how to think critically or succeed in college.

Nevertheless, CART, just like every other school, had to adapt to the standards-testing approach to education. The leaders at CART looked for methods that wouldn't compromise their educational method or lessen student outcomes.

UNDERSTANDING BY DESIGN

CART eventually adopted a model from Grant Wiggins and Jay McTighe's book, *Understanding by Design*. McTighe and Wiggins developed a model to build projects around state standards, so teachers could still use a project-based lesson plan, with all the long-term benefits of project-based learning, and put them in a position to do well on the state standards tests.

It consisted of five steps:

1. Look at state standards for the subject areas being integrated into a project and look for benchmarks that will be used in assessing students

2. Brainstorm project ideas around those standards

3. Decide what students should learn during the project

4. Create a relationship chart that connects the topic to standards to evaluation to understanding. Everything should point toward understanding and solving the project problem.

5. Create a worksheet that explains the topic, the standards, how the topic will be evaluated and demonstrate academic rigor, show student cognition and be tied to the real world. And finally list the activities that will support and lead toward the goals of the project.

While many educators have expressed extreme disdain at No Child Left Behind for crippling the U.S. education system,

schools had to adapt or see funding and support disappear. CART was able to adjust its project-based, real-world approach to address the state standards and still maintain its core vision and its DNA.

In the last few years, many states, including California, adopted a new form of standardized tests, called Common Core, which shifted the focus away from memorization. Common Core tests are built around critical thinking and problem solving, so students (and schools) are judged by how well the students go through the steps in each problem.

"And what's profoundly different," said Swanson, "is that those tests are really task driven now, not fill in the blank with this knowledge. We've been pushing this for 30 years. What that means is that (the student) applies skills, knowledge, process, ability to find and defend good information."

Jodi Silva, a teacher at CART, said the climate is changing and the rest of the educational world is coming around to the idea that these tests should look at critical thinking and problem solving skills. A typical multiple choice scantron test can't measure the thinking process. You can get a person who can memorize all the characters in Shakespeare but who can't write a coherent sentence. On the old tests, this person might get a perfect score, while someone who's a good communicator and writer might not.

"We've been doing Common Core for 15 years before there was Common Core," said Silva.

2. Block schedule

"At CART, the courses are integrated so they may focus on materials from one or all three subject areas during the day. The integration is often seamless, so the kids may be learning physics alongside English."

-Bruce Cuthbertson, IngenioMind

CART uses a half day block schedule, with a morning cohort and an afternoon cohort. The morning cohort spends three hours in a CART lab in the morning and then the students are bused to their home schools during the lunch break. At the same time, the afternoon cohort is picked up from those schools and brought to CART.

The block schedule allows teachers to break away from the 55 minute class period. At CART, the courses are integrated so they may focus on materials from one or all three subject areas during the day. The integration is often seamless, so the kids may be learning physics alongside English.

The block schedule isn't only seen in integrated programs. Regular high schools are going to the block schedule as well, as a way to give students more directed focus in a subject twice a week rather than diluted into 55 minute segments every day of the week.

Sir Francis Drake high school in Marin has a project based learning program, but it also uses a block schedule for all its courses.

Mary Kitchens said, "When we came along and said, 'These are our one hundred kids and we have them periods one through four, so we can break up that time anyway we choose. If we want to do a four-hour science lab, we can do a four-hour science lab.' The whole school watched and went, 'Wait a minute, we all want a block schedule.'"

She said she's watched the staffs at other schools painfully tear out their hair, trying to figure out if they should do a block schedule or not. At Drake, it just took the rest of the school seeing the Academy program and other teachers wanting the same thing.

So, on Mondays, the school observes all seven periods. Then the students either have Tuesday-Thursday classes or Wednesday-Friday classes. The amount of class time for each subject remains the same, but they can do more in each period than previously. This type of block schedule is closer to what many colleges and universities use.

"The staff unanimously said, 'Yes, let's do that.' No argument or nothing," said Kitchens. "It was pretty miraculous."

At CART, because the program is integrated, the block schedule isn't divided into separate classes each day. The teachers, working together, develop a lesson plan that may integrate all the subjects at once or break them out as needed.

3. Integrated Classes

Michelle Swanson
Swanson & Cosgrave Consulting, LLC

The third part of CART's approach is to integrate its classes together. Three teachers share a room with the students and work collaboratively through all aspects of the course, which is called a lab. All of the labs consist of four courses and all come with an English course component.

"One of the things that we did was we decided this was going to be integrated," said Fisher. "First of all, we had teacher teams. Teachers worked in teams of three and we integrated the curriculum because most students see high school as very fragmented. 'First period, I have social science. Second period, I have PE. Third period, I have English. Fourth period, I have math.' And they don't see a connection between those subjects."

"So our thought was," said Fisher, "we can make those connections for kids, show them how they're interrelated, use the career focus as the hook, because they choose that, that's something that they like and build in the literacy skills, the reading, the writing, the math, build those things all around this career focus area. If you are interested in forensics, you're gonna read Sherlock Holmes, you're gonna read one of those stories about people who bury bones and bodies, you know what I'm saying? You choose a novel that's associated with the career focus area."

Swanson said she and Walt had created an integrated program at Sir Francis Drake High, before coming to CART.

"We really did a lot of deep work on what it means to do rigorous interdisciplinary projects," said Swanson. "We got a lot of good results both in terms of our graduates in who they were but in terms of all the data and indicators of success. The kids in the integrated program seemed to do very well."

Steve Ward said it took a special type of teacher to work with other teachers and deliver an integrated class to the kids.

"It was just amazing to me," said Ward. "It took the right type of personality to make it work there. That's real critical."

Rod Geist,
VP Central Valley Community Bank

4. Real World Learning

CART heavily emphasizes the importance of an authentic experience, not a mock experience or studying an intangible concept without a real-world consequence or relevance.

Swanson said, "The labs are based on having an authentic client or product and that moves you away from self-conscious, self-reverential solutions to thinking about the other and problem solving."

CART's marketing packet explains that one of the primary reasons kids lose interest in school is not a curriculum that's too difficult or rigorous, it's not being able to tie the classroom learning to the real world.

CART's whole program is built on career-themed courses from forensics to video game design to biomedicine. The labs provide kids an opportunity to get real experience by doing a project in their preferred area. Through the labs, teachers tie academic learning to a real problem or real client.

For example, in Forensics lab, the students might read Sherlock Holmes and then do an internship at a law firm or with law enforcement as their final project. In the Environmental Science lab, students will work with local wildlife and conservancy agencies to count deer or research water levels in creeks or explore the legal and environmental complexities of water usage in California's Central Valley.

"High schools have begun to emulate the kind of work that adults do," said Swanson, "with the kinds of projects and authentic audiences and clients that project work has and drop it back into the classroom. Too often (classroom teaching) is primarily an abstract language. So you use experience and meaning and project."

During the course of the year, students complete four projects and often the fourth project is an internship. The school holds an internship "job" fair and students must bring a resume and wear clothes appropriate for a job interview.

They then interview with prospective "employers" for an internship. Following the day of interviews, CART's business partners who are offering the internships give the teachers feedback on the interviews and make an internship offer to one or more students.

Rod Geist, who's a vice president at Central Valley Community Bank, said the real world element sets CART apart. Geist works with interns from CART every year at his bank.

"I had never seen anything like this," said Geist, "where the faculty and the curriculum were designed to connect kids to real world situations. Everything that I see from CART in the economic finance group is geared toward productivity in the real world. The kids have 4 or 5 modules they work on during the year and every single one they work on could easily be transferred into the work place.

"For example, one of the projects is a history-related project, so they're covering that particular subject, but it was to identify companies that had progressed from a start up to a full-fledged, traded on the stock exchange, kind of business and to analyze the stages of what they did from beginning to end to create that kind of success. That's information someone could use, in a very real way."

It's the sort of research a finance analyst or competitive company or even an entrepreneur might do to better understand the company and the market.

While students may end up following a different career trajectory than the career lab they choose at CART, the lab gives them real exposure to a field and also to the world that adults live and work in.

5. Habits of mind

Part of CART's educational philosophy and practice, especially as it pertains to real-world experience, is Habits of Mind, which was adopted from Arthur L. Costa's *Habits of Mind* book. *Habits of Mind* organized learning around cognitive orientation as opposed to a linear progression of skill set building. Costa is an emeritus professor at Sacramento State University and previously held positions in Sacramento's Superintendent's office and as director of educational programs at NASA.

CART developed its own strategy, called the "CART Wheel" based on many of the elements of Costa's *Habits of Mind*, beginning with persistence, which is the first (and perhaps most important) skill in Costa's *Habits of Mind*.

The other elements incorporated into the *Habits of Mind CART Wheel* are: Intitiate, investigate, collaborate, communicate, connect, reflect, imagine and create.

Jeanne Escalera, who formerly taught at CART, said that Habits of Mind is a foundational piece to teaching CART kids.

"For the first two weeks, we focus on habits of mind," said Escalera. "They do activities and lessons that teach the kids about being critical thinkers and what it means to be innovative, to initiate a project without being told. Critical thinking is really important and habits of mind is critical thinking."

Laurie Hayes, who teaches in the Bio-med lab, said, "It is a way that the kids can see that in order to be successful in problem solving, they have to do, they have to initiate. A lot of kids get stuck (because) they don't initiate the process. They have to do research. They have to collaborate with each other and communicate with each other and connect different areas together. They reflect on this meta-cognition process. The (habit of mind) that we stress the most is, 'They have to persist.' It doesn't always go right. If it goes wrong, you don't stop. You have to provide environments for those kids to be able to go through that process."

Habits of Mind CART Wheel
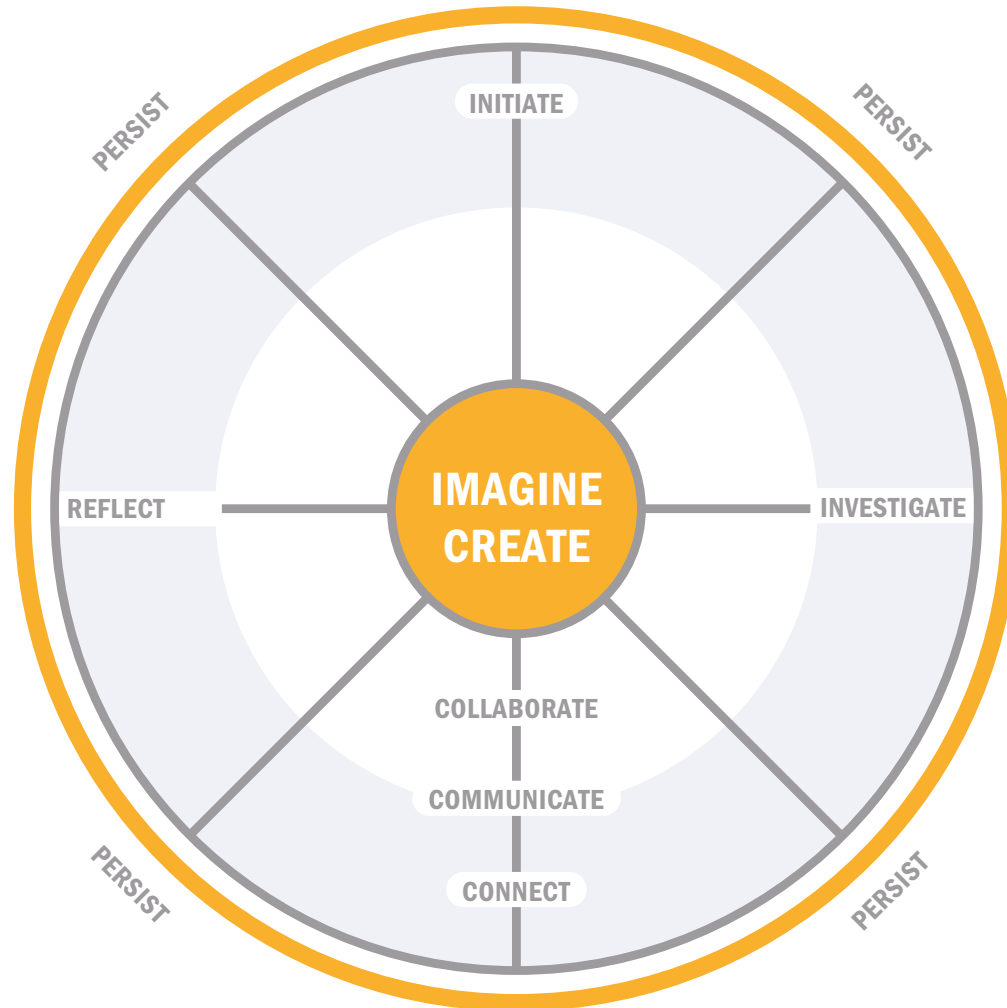
The CART WHEEL will get you where you want to go!

Source: Center for Advanced Research and Technology (CART)

Photo: http://i.ytimg.com/vi/
hu2Aqcyp3qo/maxresdefault.jpg

COSTA'S HABITS OF MIND

(After Arthur L. Costa and Bena Kallick, Habits of Mind: A Developmental Series, Copyright ©2000)

Costa's Habits of Mind consist of 16 problem solving skills and mental cues that promote insightfulness, critical thinking, creativity and reasoning abilities to succeed in society and the real world.

The Habits of Mind are an identified set of 16 problem solving, life related skills, necessary to effectively operate in society and promote strategic reasoning, insightfulness, perseverance, creativity and craftsmanship. The understanding and application of these 16 Habits of Mind serve to provide the individual with skills to work through real life situations that equip that person to respond using awareness (cues), thought, and intentional strategy in order to gain a positive outcome.

1. **Persisting**: Sticking to task at hand; Follow through to completion; Can and do remain focused.

2. **Managing Impulsivity**: Take time to consider options; Think before speaking or acting; Remain calm when stressed or challenged; Thoughtful and considerate of others; Proceed carefully.

3. **Listening with Understanding and Empathy**: Pay attention to and do not dismiss another person's thoughts, feelings and ideas; Seek to put myself in the other person's shoes; Tell others when I can relate to what they are expressing; Hold thoughts at a distance in order to respect another person's point of view and feelings.

4. **Thinking Flexibly**: Able to change perspective; Consider the input of others; Generate alternatives; Weigh options.

5. **Thinking about Thinking (Metacognition)**: Being aware of own thoughts, feelings, intentions and actions; Knowing what I do and say affects others; Willing to consider the impact of choices on myself and others.

6. **Striving for Accuracy**: Check for errors; Measure at least twice; Nurture a desire for exactness, fidelity and craftsmanship.

7. **Questioning and Posing Problems**: Ask myself, "How do I know?"; Develop a questioning attitude; Consider what information is needed; Choose strategies to get that information; Consider the obstacles needed to resolve.

8. **Applying Past Knowledge to New Situations**: Use what is learned; Consider prior knowledge and experience; Apply knowledge beyond the situation in which it was learned.

9. **Thinking and Communicating with Clarity and Precision**: Strive to be clear when speaking and writing; Strive be accurate to when speaking and writing; Avoid generalizations, distortions, minimizations and deletions when speaking and writing.

10. **Gathering Data through All Senses**: Stop to observe what I see; Listen to what I hear; Take note of what I smell; Taste what I am eating; Feel what I am touching.

11. **Creating, Imagining, Innovating**: Think about how something might be done differently from the "norm"; Propose new ideas; Strive for originality; Consider novel suggestions others might make.

12. **Responding with Wonderment and Awe**: Intrigued by the world's beauty, nature's power and vastness for the universe; Have regard for what is awe-inspiring and can touch my heart; Open to the little and big surprises in life I see in others and myself.

13. **Taking Responsible Risks**: Willing to try something new and different; Consider doing things that are safe and sane even though new to me; Face fear of making mistakes or of coming up short and don't let this stop me.

14. **Finding Humor**: Willing to laugh appropriately; Look for the whimsical, absurd, ironic and unexpected in life; Laugh at myself when I can.

15. **Thinking Interdependently**: Willing to work with others and welcome their input and perspective; Abide by decisions the work group makes even if I disagree somewhat; Willing to learn from others in reciprocal situations.

16. **Remaining Open to Continuous Learning**: Open to new experiences to learn from; Proud and humble enough to admit when I don't know; Welcome new information on all subjects.

6. Learning, Rigor, and PBL

One of the persistent myths about project based learning is that it must be easy. If it's fun, if kids are enjoying themselves, it doesn't feel like work.

"Our concern and one of the things that I think drove our planning is that it is very difficult to know what a high school student can do," said Susan Fisher. "You only know what they are willing to do. What they're willing to do is often much less than what their potential is. That's affected by a lot of things. Many high school kids are bored. If anybody says, 'What did you do at school today?', they say, 'Nothing.'"

"Our goal was to take those students who were getting C's and D's," said Fisher, "and make them into A and B students because we thought the potential was there if we could present the material in a way that would be interesting to them. One of the big travesties in high school is kids don't do most of the work. They do what they need to do to get by."

Often, in a typical high school, teachers might give up on those students and focus solely on the top students. Many people might even go so far as to say the C and D students lack potential or are not as smart as the A and B students. The teachers at CART and other PBL programs don't believe this. Certainly, Joe Oakey and Steve Jobs didn't believe this.

Ironically, this is partly why PBL programs are sometimes shunted by Type A parents who want their kids to take all the AP and subject-area prep courses to get into the best universities. The misconnect is that those students are focused on the tests and curricula that look good for admittance, but that might not really prepare those kids to succeed in the same way a PBL program might.

It's no accident that the top business schools in the country, schools like Harvard and Stanford, use project-based teaching for their cohorts of MBA students, to teach skills like leadership and collaboration and critical thinking and communication. But the K-12 education system, particularly grades 9-12 in high school, has been slow to catch up. Most are administered and run today pretty much as they were 100 years ago.

"Too much content gets spoken, as if speaking it to someone means they have learned it," said Michelle Swanson. "Nobody wants to sit and listen to information. There's got to be a bigger idea in play here. So finding the way to get kids hooked on thinking about things and learning to be resourceful."

"The goal was to present a program," said Fisher, "that was interesting and fun and different so that every day a kid went home and somebody said, 'What did you do today?', they had something to say. (We wanted) to make school interesting, to get them engaged, to take responsibility for learning because many students lay it off on the teacher, saying, 'I didn't get that because I had a boring teacher.' It's always somebody else's fault."

Fisher continued. "You don't give them a book and say read this. You come up with activities. We used to call it 'discovery learning.' Let them discover it. Don't lecture to them. Let them discover the facts that you want them to learn. Give them a situation and give them the research to do and let them do it in a group and let them learn this on their own."

But, said Fisher, "We didn't want to have easy, with students saying, 'This is an easy teacher, I want this teacher because this teacher is easy. I want to take this class over here because the requirements are not as rigorous as that class over there.' Our belief was that students needed, most of all, an academic foundation, a strong academic foundation. It was not a vocational program. It was an academic program."

This is one of the two big fears about PBL programs, that they're not rigorous or academically focused. Schools like CART constantly have to justify their programs to demonstrate the academic rigor.

Terry Bradley, former Superintendent of Clovis Unified

TREAT THEM LIKE ADULTS

Schools like CART and Drake and New Tech High have also found that students do better if you treat them like adults.

Terry Bradley said students can rise to the challenge. "A lot of people don't give kids enough credit. If you treat them as adults, for the most part, they'll act like adults and take this responsibility seriously."

CAN YOU GET CREDIT IF YOU DON'T DO THE WORK?

The other big fear about PBL programs, especially for parents of students who already do well in school, is that the top students will carry the others who won't do any of the work. The line of thought is that those so-called lesser students will get credit for the work their kid has done, that the grading system is not equitable, that some students can ride on the backs of other students.

In a PBL environment and integrated program, teachers have to get together to discuss students. This puts more eyes on each student, so it's harder to get by without contributing. When there's a group of teachers, they often have a combined group perspective on which students are doing well and which students need more attention. It's harder for a student to hide.

Some programs put the grading partially back on the students.

"What we did (at Drake) was let the kids divide the points (on a project)," said Mary Kitchens at Drake high. "(For example), if my working group of four got an 80, then we have 320 points to divide between the four of us. And it doesn't mean that each of us is going to get an 80. If I did everything, I might say, 'Look, I did everything and can prove it and give myself a 95. You did nothing, we're going to give you the best F possible and that's a gift, so be thankful.'"

This also forces the students to take responsibility for themselves and for their education. They're more engaged.

"We train the kids," said Kitchens. "We give them a lot of scenarios and train them carefully and we let them divide the points because they know who did what. Then that old complaint (I'm doing all the work and he's gonna get the same grade even though he did nothing) goes away."

At New Tech High in Napa, said Pearlman, "All teams have taken on a rule that if a student slacks, they can be voted off the team. The penalty is that the student must then do the whole project by themselves."

Laurie Hayes, who teaches in the Biomed lab at CART, said parents often want to make sure that if one member of a group is slacking off, it won't cause the whole group to fail. "So we reassure them because we're monitoring the groups all the time, so we know who's flaking off. And their grade suffers, but not the entire group's grade."

At CART, students have called out other team members who have slacked off.

Jodi Silva said she had one girl in a class who got so mad at another girl who wasn't doing her work. "She actually got on the phone and called the girl's mother and told her that her daughter was not doing her part of the group work. It was kind of funny, but at the same time, well, that's what happens. They have to learn to be responsible."

The students learn to take responsibility for the team and address internal problems head on. This is a life skill they'll use for the rest of their careers and while at CART, it assures that a student who's slacking off will get called out by his or her peers, which likely has a much bigger impact in helping that student get on track than if done solely by a parent or teacher. They feel a responsibility to the group.

Victor Cheng, author, *Case Interview Secrets*

TODAY'S JOB APPLICANT AND THE CASE INTERVIEW

Since the 1990s, McKinsey & Company and many other management consulting firms have used the case interview as one of the primary applicant evaluation tools, especially for entry level positions. The practice has moved from management consulting and is used by organizations in all kinds of industries, from medicine to advertising and marketing to computer engineering and biotech.

The case interview can take anywhere from one hour to a couple days and it tests the applicant's problem solving abilities. Usually, the applicant is given a series of difficult situational questions and then the interviewer asks them to walk through the thought process as they solve the problem. The interviewer wants to understand how the applicant thinks and uses critical thinking to solve problems.

The interviewer isn't looking for a correct answer, but wants to see how the applicant thinks on her feet, under stress.

Case interviews are becoming increasingly popular because a resume doesn't tell us much about how an employee will be as a team member or how she can think critically in certain situations. Oftentimes, an employer cannot afford to make a hiring mistake, so it's worthwhile to spend the extra time evaluating applicants and trying to get a sense of the whole person and her particular set of soft skills.

Some case interviews are done in groups, where the applicant is observed working with others. Again, the interviewer isn't looking for a correct answer, but how the applicant gets along with other applicants under the stress of having to work with the very people she is competing against for a position. The case interview can be extremely difficult, particularly for people not versed in this type of job interview or who don't have experience working on teams and projects. Interviewees are typically recent college graduates and will have little work experience to draw from, so they have to draw from their educational experience.

Victor Cheng was a star student at Stanford in the early 1990s. He completed his undergrad in 3 years. He later wrote a book on the case interview. His perception about education and it's relation to doing well in an interview and the real world can be applied to doing well in any job, anywhere.

"I quickly realized that none of my schoolwork had taught me how to do well in the case interview," wrote Cheng, in an introduction to his book *Case Interview Secrets*. "It was a new skill, arguably a far more important one than anything taught in any of my classes. And here's why: Whether I did well in any class didn't materially affect whether I could work in consulting." Or any industry, we would add.

"I soon understood that the single most profitable skill I could learn while in school didn't have to do with English, math, psychology, history, economics, or science."

The most important thing Cheng could learn, but failed to learn at Stanford, was developing critical thinking, collaboration, and project skills. These skills aren't needed just by people in management consulting but by anyone in any industry. That's why the case interview has been employed across a broad range of industries today. Employers want to see how job applicants really think and solve problems, how they'll adapt to their specific work environment.

While Stanford didn't prepare Cheng in the early 1990s how to do well in the case interview, today, Stanford, Harvard and many other schools have taken to putting students on teams in cohorts to work on those very skills, to help them problem solve in the real world and to think critically and work collaboratively and to solve problems on the fly.

These are the skills that those early innovative schools, Saturn School and Drake high and Expeditionary Learning, built their programs around.

Project-based learning and real-world learning, as they are employed at CART, can prepare students for entering the workforce and gives them experience to draw on when they are faced with a case interview by a prospective employer. Students who might have a rigorous background in subject matter areas only may not do as well in the case interview as students who have real experience doing project-based work.

CART may not have set out to prepare students for the case interview specifically, but the school's approach for students to become college and career ready, also prepares them for this increasingly common interview practice. Employers are getting smarter about hiring and schools like CART are getting smarter about how they prepare students for college, career and life.
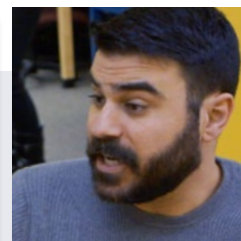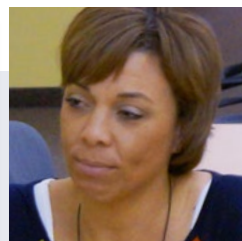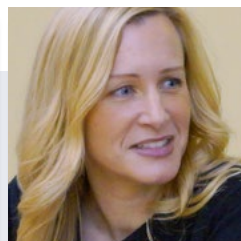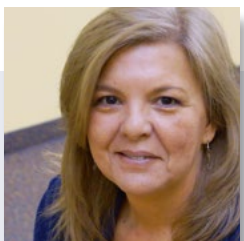
TEACHER ROUNDTABLE

The following is an edited version of a roundtable discussion between IngenioMind and several CART teachers.

Jodi Silva teaches English in the Networking and Web applications lab

Laurie Hayes teaches Anatomy and Physiology in the Bio-Med Lab.

Jill Rossetti teaches English in the Forensic Science lab.

Rachel Kuhtz teaches US History, Economics, and government in the Finance and Hospitality and Event Management lab

Seth Chambers teaches video production in the Multimedia lab

IngenioMind: What makes CART go? What's different about CART?

Laurie: I think what's especially different is we only take juniors and seniors and we take them off their high school campus. Kids get in ruts and they're labeled, so here is a chance for them to leave that and reinvent themselves.

Seth: And it's by choice. They make the decision to come here and I think that's definitely part of it.

Laurie: Twice I've had, especially girls say to me, "I can be smart here and not be called 'white.'" And I thought, "Really, in this year, that's still a problem?!"

Everyone: It is.

IngenioMind: So there's a stigma in some communities against being smart or appearing smart?

Laurie: Right. That is where they are coming from. And so they get to come here and now associate not with, they're not a skater and with all these other groups. They're in the Bio-Med lab. Or they're in the Multimedia lab. So that becomes more of their identity. And everybody around them has the same interest.

Seth: I would definitely echo that. I think that example is indicative of a larger issue where you have all these students that are so completely different that are trying to find commonality, that are trying to seek their identity. And at a traditional high school, I think they're doing it through the same ways. It's always been done through race or religion or shared interest or what have you.

One thing we see across all the labs here is that there's a lab that is made up of students of every socioeconomic background, every race, every religion, every sexual orientation. You name it, each of our labs has a demographic for it and these kids get thrust into this project based environment where maybe they've never been taught to be tolerant of fill-in-the-blank. "But that person's in my group. How do I deal with them? How do I work with them?" We make it difficult to hide, but in doing so I feel that there's much more communal effort, or as Laurie said, it becomes about, "We are fill-in-the-blank lab" or "We are CART." There's a lot of students referring to themselves as CART students and not necessarily as their home school.

IngenioMind: What do CART students learn from working in groups?

Everyone: Laughter

Seth: Everything!

Laurie: It's communication. It's trial and error. It's so many things.

Rachel: Staying on task.

Jodi: Someone who doesn't do anything, who doesn't carry their load, so they have to pick up for this person.

Rachel: And it's different than the group work they normally do at traditional school in that there is definitely this extended period of time where they feel like, in the beginning they may hate each other, and in the end, they are this little gang of each other. They'll hold each other up regardless if one person didn't do all the work. They're going to support (that person).

Seth: It's kind of like, "My family may have issues, but don't talk about my family."

Rachel: Right, exactly.

Jodi: They really will hold one another accountable. When I started, I was in the lab where Rachel is now. It was finance and marketing. One girl got so mad at another girl who wasn't doing her work that she actually got on the phone and called the girl's mother and told her that her daughter was not doing her part of the group work. It was kind of funny, but at the

same time, well, that's what happens. They have to learn to be responsible and they can't hide in the back because, besides the teacher saying something, the other students will as well and try to pull them along.

Laurie: We try to stress to the students in the profession you want to go into, you don't pick your coworkers, especially in a hospital. You're not going to pick the nurses (or doctors) you get to work with. So, you're going to have to learn these skills. And it would be better for you to start learning them now. And we coach them and we direct them. High school kids, they don't even know how to shake a hand and so we have to teach them how to do that, how to look at an adult in the eye, cause if you watch them, they keep looking down. So those soft skills that will really make them stand out when they go to their college interview or when they go to a job interview.

IngenioMind: Do you think they connect because they are connecting the classroom to the real world or because there's a real-world application, they are connecting with it in a more meaningful way?

Everyone: Yes.

Seth: I think that that's the frustration for so many students. It's that If you look at a kindergarten classroom. If you look at the way it's designed, not only is it colorful, it's interactive, it's kinesthetic, it's project based. The one room serves multiple purposes. Kids are adding and spelling and playing all in the same space. Everything is integrated. And then at 3rd grade, that really gets ripped apart and now there's a place and time format. There's a place and a time for English and everything's compartmentalized in a nice little box and that's not the way the real world is. If any one of us wants to learn a

new skill, most of us are at the point where we put down the book and say, 'Give me the saw, let me cut the thing. Hand me that tool. Let me try to use it.' But we don't let kids do that in school. It's compartmentalized, broken up and they don't get how these disciplines connect with each other. We expect them to see how all the pieces fit.

IngenioMind: How do you like it at CART?

Rachel: Oh, I love it. It's everything I wished traditional school was and never was, in terms of teaching and making it fun for the kids and fun for teachers. I don't think that learning has to be by the book necessarily. We all learn differently. It's applying what I learned in business to the social science and being able to teach business also with the support of my team.

You have those moments where you don't have those normal conversations with students that just makes coming here every day, you never know what's going to happen. It's not the same. What we teach is never the same. What the students do is never the same. So we're always constantly evolving. I think that's the biggest part of CART, is that there's this evolution that we have to keep pushing ourselves to do something different, making it pertinent.

Seth: It's part of the ethos too. I recognize from the time I came here, as a first year teacher, that there was clear CART spirit that was embodied in every single lab. It's not that not adhering to that spirit wasn't tolerated, but over the years, that people who don't believe in that naturally filter out. The staff here, anybody who has been here more than a year or two, doesn't just sell what CART is, but they believe in it wholeheartedly. We all drank the Kool-Aid. We love the school. We love the ethos behind it. I think that's part of what helps. When we come to school every day, we're exhibiting the same thing. We're working with our partners. We have this two hours

built in between sessions. It's so important for us to connect, to work with other teachers, to learn from them, to change our classroom, to modify things.

IngenioMind: Do you talk to parents often?

Rachel: I probably see parents more here than I have ever, in terms of teaching. Just because it seems to be an open door policy. Most of the kids, if they are driven, are being driven by their parents. So their parents are here very often so it's easy for them to park the car and come in. Cause their kids are excited about being here, they are not coming for a discipline reason, they're coming for good things. Does that make sense? And then when we do have a problem, it's not that big of a deal. They come in and they feel comfortable having a conversation with us.

Jill: We have so many events. We have a lot of events where we invite the parents to come for, I mean it is for a good reason, like our mock trial or our big showcase that's school wide. There's reasons for the parents to come here and participate and see everything that's going on in the whole school and that kind of gives them a peek at what their student (kid) could do next year in the other lab they're going to take.

IngenioMind: What are some of the parent concerns when considering the program?

Jill: They just don't know what it is

Laurie: I think a lot of the concerns are because it's project based learning and kids are working in groups. They want to make sure that if there's one member that's going to not participate, that the entire group is not going to fail. So we reassure them because we're monitoring the groups all the time, so we know who's flaking off. And their grade suffers, but not the entire group's grade.

IngenioMind: What about bullies? Is it a concern for parents or a problem at CART?

Laurie: I've never seen it. You know, kids are kids.

Jodi: On occasion, but it's not prevalent.

Seth: I don't want to be naïve, but it seems like a lot of those issues, again just like the ethos of the teachers, they filter themselves out. That type of kid, number one, isn't drawn here as much. The students who are here want to be here. There's really a supportive structure as a whole. I find that almost if there was a bully, I can see a whole table (of kids) turning around and saying, "What are you doing?" They would speak up. It's just a different environment.

Laurie: And the quirky kids do well here.

Everyone: Laughter

Seth: Tell me about it.

Jodi: (All the kids) are out of their comfort zones. A lot of times (at the home schools), they're with their friends, and it might be a group of friends, so they feel more comfortable behaving in that manner. But because there are so many different high schools congregating here, they don't have all their friends around. So they're looking around like, "Oh goodness, this person from Buchanan or from Fresno high might think I'm a fool if I act like that," so they really do filter themselves more so than they normally would.

Laurie: And even like on Fridays, the football players are all wearing their jerseys. They could be working in a team and at night they could be going against (each other).

Jill: It's just nice to see.

Rachel: It's a fun little rivalry. We have several cheerleaders and football players in our classroom this year and it's battle

of Barstow and two football players are going against each other and they'll kind of pick on each other during class, but it's all jovial and in good fun. Just kind of get themselves pumped up for the game. And I think it's perfectly acceptable at that point. It's never the overt aggressiveness.

Seth: I was going to say that I think the other issue or most of the questions or issues we have from parents seem to stem from just lack of understanding how the school works. The other thing that I think we really hear a lot is that we get questions every once in a while how rigorous our program is. They'll say, "So and so counselor is recommending an AP English class. Is that somehow better than what's at CART?" And the interesting thing is, for lack of a better word, we've been doing Common Core for 15 years. Before there was Common Core. English was incorporated into every single lab here and it's incorporated masterfully, I think. But there's this idea that somehow if something's easy, that it's not as rigorous.

Laurie: Or when it's enjoyable.

Seth: When it's enjoyable. That's the better term. The issue is that there's an application for it, there's a reason for it. We're writing scripts for a film or we're learning how to do research in the context of this really cool project where we're experimenting with in biomedicine. There's all these connections and somehow the fact that it's not laborious means that it's not as rigorous. That's not true at all.

IngenioMind: One of the issues that has come up in a number of our conversations is, How do you measure success of a program like this? All the students take their standardized tests at their home schools. They're only here for a short amount of time, so even if they did take a test here, how much is CART going to be reflected in that?

Jill: I measure it by our kids emailing us after they're in

college and saying, "This speech class is beyond easy. It's a joke. I know everything they are teaching me plus I am the leader of all these older kids." They are just flying through college so much more prepared than they felt before they came to CART.

Seth: Or their freshman year (in college), they're the only one in their class who has ever spoken in front of a large group.

Jodi: It is difficult to measure. I think everyone here (has asked), "How do we prove that what we are doing is valuable?" We certainly hear from industry, people within the industry who say, "Oh gosh, I hired your student and they were trained so much more easily than others that I've had." A lot of it is just people commenting or emailing or what parents say or what students say when they return. Like my daughter was in the psychology lab here at CART and now she's a psychology major at Fresno State. A lot of what she does, she says, "It's so easy for me because it's just like my lab at CART." To me, as a parent, it's like obviously what they did in the psychology lab was very effective. She's feeling very confident. She's excelling, getting really good grades. It's hard to put a number to it though.

IngenioMind: As we're trying to understand CART, we're trying to figure out how you do measure success. I think the testimonials are key, but when we compare CART to other schools, if you look at it on a macro level, it's harder to quantify.

Seth: It's tough because you're not necessarily going to get a quantifiable amount on a test. But if really what we're teaching is real world skills, is business management soft skills, those things aren't necessarily going to evidence themselves until the second, third or fourth year of college or even after. That's kind of the tough part.

Jodi: We always think too, "Is this standardized test measuring success?" I mean, students, they'll score exemplary, however they measure it, but they've never really written a paper. So you see them, they come in, in this upper quatrain for English language arts, but that's filling in a bubble. But then to actually write something or come up with a thesis and conduct research and support it. Those are two very different things. That's why we hear from industry leaders (that) kids are coming out and they are unable to read a manual and put it in terms that are simplified or follow basic instructions because they're so used to being told, "Here, fill in the blank," or "Answer this in a couple of words." They're getting A's in English, but not necessarily ever writing more than a sentence or two. I don't know that a standardized test is really a measure of success.

Laurie: I've also been surprised at the number of parents that have come to us and said they don't think their child would have graduated high school. And I'm like, "No, this is best student in my class. What do you mean she wouldn't have graduated high school?" She was just headed in this downward spin and didn't know why she should study.

Seth: It's tough when we have so many touchy feely stories. It's difficult to compare those. When it's apples to apples. We had a student, three years (ago) now it was. We do a showcase, this big competition every year. The only thing that we all compete in lab to lab is Best Presentation, where the students get up on stage and have to present their project. This was a year that our lab, Multimedia, won. One of the students that was in the lab, his mom came up to us afterwards in tears and told us how when her son was born, how the doctor told her that he would never be able to speak. And here, he had just won for Best Presentation at CART and

that she had seen this night and day difference from the boy that walked in this door to the one that left, just how he was sure of himself. He knew how to function in a team. It's those things that keep us super excited about our job and make us want to come back every day even though we don't necessarily have yearly statistical data that backs it up.

IngenioMind: Steve Jobs once was asked if he was optimistic that technology would solve the big problems in education. He said, "I absolutely don't believe that. The most important thing is a person. A person who incites your curiosity and feeds your curiosity."

Rachel: That's generally why I got out of teaching (at a traditional high school) to start with. I had a miserable year where I felt like I'm pushing paper, like all of my kids are just numbers and I no longer feel that connected with. And I legitimately thought I will never go back to teaching because I lost it, because I didn't like the way education looked. I didn't want to be part of that. I didn't want to be a paper pusher. I didn't want my students to be numbers. But I didn't know how to change it for myself and I didn't have the administration that was going to support me in that either. So I left (teaching for eight years).

What we're doing here, we're making sure every student's life feels like it matters. It's heartwarming and not all of them are the A+ students like Laurie said, like I think everyone has said, We have a cross section of our society.

IngenioMind: So you have A students as well?

Rachel: Yea, we have AP students.

Jill: We have to challenge them too.

Rachel: We have students who are on Special Ed contracts since they were infants.

Seth: I had a student several years back and she was an A student the whole time in my class at CART. I want to say this is toward the end of the school year, maybe March, April, May. It was on a Friday and I asked, "What are you doing this weekend?"

And she said, "Oh, I'm doing Saturday school."

I said, "What are you doing Saturday school for?"

And she just kind of stopped and said, "Mr. Chambers, I maybe got a C as my highest grade, the max, before I came here to CART."

I said, "Wait, What?"

She had excelled. She was Type A. I could no joke see myself working for this girl someday.

And she said, "Something just clicked in me here. It was different."

And I only knew her as this Type A, letter grade A student.

I think what CART has helped me to do as an instructor, and even all of us, has been to kind of understand that when you're teaching effectively, you have time to spend with the students that are on the low end of the spectrum and you have options for students who are on the high end of the spectrum, to keep them engaged. Especially when you're in a team environment, where you do have two or three other teachers that are supporting you, it gives you a chance to work with the student while they're doing this. Or while they're working with the student, you can cover and pick up the ball. Instead of being everything to everyone, you are what that student needs at that time. There are other pieces in place to help the class move along if they need to.

Jodi: We had (a student) a few years ago who had gotten straight A pluses all the way from Freshman through Senior year, but sometimes the upper end students who have the 4.5, 4.6, 4.7 GPAs, they will have frustrations in the beginning at CART because they are used to, "It's my way's the right way.

I know how to do it." They just want to sit in the corner and work on their own. They're the ones who will have (more) difficulty (at first). I've had them. They've never gotten below an A their entire life. In a CART class, coming in with a B or a C while other people have A's, it's frustrating. It's very different.

Jill: They don't want to work together with other people. It's good for them though.

Jodi: It is. They know they have to pick it up and need to work.

IngenioMind: Is it easy to make the transition to teach at CART? How are CART teachers different?

Jodi: It is different (here). You do have to make that transition also and being suddenly in this team environment instead of in your own little place. So you have to have that kind of personality for it and be flexible. I mean there are teachers who have come here and up and left half way. They made it through the first semester and said, "No more. I'm gonna go back and be in my own classroom."

Laurie: There's always other people watching us.

Seth: That's something too. There's always someone watching and you have to work with other people.

IngenioMind: So some teachers don't adapt well to that?

Jill: Their ego's too big.

Seth: Just like some of the examples of those kids we mentioned, those kids that got 4 point pluses their whole life and then they have to work in a group. And then they fail. This is the same. The same thing is true for teachers.

Jill: You have to keep adapting to new things, like Laurie was saying with (doing an) Ebola (lab this week because it was in the news), you can't just say we're going to do last year's thing. You can't.

Seth: There hasn't been a single year here where I've taught something the way it was taught here before. We're constantly adapting, changing, and altering the way our lessons are taught, the way that we connect with students. You have to be a very flexible instructor here, I feel.

IngenioMind: That sounds like the definition of innovation. Adapting, changing, being creative, solving problems, that sounds like innovation. That also sounds more like college and grad school than high school. How is CART like a college or university? What are the similarities?

Jill: I tell the kids you have just found your people. These are the people you are in the same major with in college. When you're in General Ed, you're, "Eh, these classes are alright," then you find your people your third year, and you're like, "These are my people. This is my major." The kids, they either realize, "This is the job I want to have," or "These are not my people and I don't want to do this and I am not going to waste my parents' money going into this major in college." So I think it's a good place for them to start and figure out what they want to do for the rest of their life.

Laurie: And students will always say that we treat them like adults.

Jodi: I think college has become more like CART. When I was in college, a lot of it was lectures, taking notes, and then you take a test. Now it seems like there's a lot more writing involved. Research, writing, working in groups, presentations to the class or to people on the outside. So I think we're getting more and more like college. And also not having the (school) bells.

Seth: It goes back to that ethos too. You walk by almost any lab here when that lab is out to break, there are students who are choosing to stay in that room. You come by here every day at the break between AM and PM session, there's students here at CART. You walk around these classrooms every day after school, there are students here at CART that are all here of their own desire, their own interests.

Rachel: If we opened the doors on Saturday, they would be here. It's true. Our lab has traditionally done a Thursday night lab from 4 to 8 and students just come here to socialize because it's free and it's supervised. They're coming from schools across town. Their parents trust that we're going to be here and that they're going to be where they are supposed to be. And maybe they'll get some homework done.

Seth: And it's safe.

Rachel: It also gives them the opportunity to relate to an adult that's not their parent and talk to them and learn to communicate with adults. Those are skills that they have to have.

Seth: It is a fun place to work. I can honestly say I have never had a job that I have loved as much as here. I love going to work every day. I love my kids, even in the days when you're exhausted. It's still a great job. To be blessed enough to be in an environment where you're mentally challenged, where you have peers that are nice and engaging and you interact with them on a regular basis. Students and clientele who are constantly pushing you and you're learning from as well. I think being here has made me a better teacher because the students are engaging me as much as we're trying to engage them. It's a pretty awesome thing.

Teacher Interaction and Teacher Happinness

In an integrated teaching environment, it's harder for kids to slip through the cracks or go unnoticed by teachers because the teachers talk about them among each other.

"That was a big argument that convinced a lot of people to do this," said Kitchens, who teaches in a PBL program at Sir Francis Drake high. "The principal (at Drake) at the time promised, 'If you are gonna do this, we'll give you a common prep period. And during that common prep period, there's no rules, but the one thing, the only rule, is that you have to talk about the students.'"

She went on, "As it turns out, they end up talking about the kids, like parents do, endless about their kids, and that's a good thing. We were able to catch kids falling through the cracks so much more quickly. So much more quickly!"

"There was a very high level of autonomy that was encouraged in each of the labs, at CART" said Swanson. "I think the teachers really embraced and owned that work to a very high level."

Finding the right teacher chemistry for an integrated program can be challenging. Some traditional teachers just aren't able to adapt to a team teaching environment.

"One of the hardest things about this program," said Susan Fisher, "is team teaching. One of the hardest things is to find three teachers whose styles can be compatible. You have to figure out how to give students a chance when you have divergent opinions, so the hardest thing was getting the teams together."

Former superintendent Terry Bradley said, "One of the things we really had to work on was making sure the team of teachers in each one of the labs were working together. There were a lot of teacher changes that had to be made in order to get the right people in the right labs working together. Once that got done, CART took off."

At Drake, Mary Kitchens said she loves working with her team. She added, however, that the teams are often created informally. "For the most part, we've let it be grassroots forming, 'I wanna work with you, let's do this together.' People who got stuck working with people they couldn't work with, it just didn't last. It went away and other people got together (in an integrated teaching group) to take up the slack."

"I love working with (my team)," she said. "I love this. I love planning with them. It's really rich. It's really funny. We laugh a lot. I love talking about the kids with them. I'd be really upset if my team got separated."

In fact, every single teacher that IngenioMind interviewed, said this is why they went into teaching, to be able to love what they do and have a direct impact on kids. CART and places like it were an epiphany for them and they'd never consider going back to the traditional classroom. That enthusiasm and passion likely improves the student experience and the various outcomes. This is the same passion that we've heard about from CEOs and visionary leaders who point to a special teacher who inspired them to learn and to embrace the world, who brought a certain passion to the classroom. (See sidebar on Steve Jobs.)

Adam Higginbotham interacting with CART student

Jeanne Escalera, who taught for 25 years in a traditional classroom before going to CART to teach in the first year, said, "I wouldn't teach any other way. If I had to go back to a classroom with a textbook, I'd find another job."

Escalera said she was working for the California Department of Education in 1999 when she heard Susan Fisher talking about CART at a conference. "I loved the idea of putting students into areas of interest, of integrated academic content with a career focus. I begged Susan to hire me and she did."

Even the best teams of teachers have turnover and change, as teachers retire or move away and take a job somewhere else.

"You bring in new people," said Fisher. "And there's time to spend acclimating them to what it is we're trying to do, how we're trying to do it. So you're forever trying to reorient people to what's our mission. That's the challenge. But now it's 14 years later and the school is still being successful."

Teaching at CART or perhaps in any PBL program, seems to be contagious in a very positive, life altering way. We'd like to go back to what Seth Chambers said in the teacher roundtable discussion earlier:

"I can honestly say I have never had a job that I have loved as much as here. I love going to work every day. I love my kids, even in the days when you're exhausted. It's still a great job. To be blessed enough to be in an environment where you're mentally challenged, where you have peers that are nice and engaging and you interact with them on a regular basis. Students and clientele who are constantly pushing you and you're learning from as well. I think being here has made me a better teacher because the students are engaging me as much as we're trying to engage them."

"I can honestly say I have never had a job that I have loved as much as here. I love going to work every day. I love my kids, even in the days when you're exhausted. It's still a great job."

-Seth Chambers,
CART Teacher

HISTORICAL CONTEXT

PBL 1.0 (PBL Beta Testing)

The context that helped create the climate for many of project-based learning schools, like CART, that would appear in the late 1990s and early 2000s goes back to the presidency of George H.W. Bush and R&D-type investment into innovation in education. "There was a first wave of innovation (before the High Tech Highs, CARTs and New Tech Highs) actually occurred in the early 1990s in the U.S.," said Bob Pearlman, who consults with schools implementing PBL.

One of the first to be widely recognized was the Saturn School of Tomorrow, based in St. Paul, Minnesota. It was named partly after the innovative, upstart Saturn automobile project, which itself was a response to the Japanese dominance of the auto industry in the 1970s and 80s.

In its prospectus, the school sought to lead a wave of educational innovation, by requiring "a sense of 'ownership' from its participant 'shareholders': students, parents, teachers, administrators, community, the private sector. Ownership (was) a lesson learned late by our auto industry as we scramble to compete with Japanese manufacturers."(Saturn School of Tomorrow Prospectus)

The urban school served a large minority population in grades 4 to 8 and focused on integrating technology into the curriculum. Additionally, the school created a whole new approach and design for education, including a focus on process in addition to content, internships, a school council made up of teachers, students and parents. The school also required parents to participate in their children's education through "Personal Growth Planning" conferences during the year. Tom King, who founded the school, said that virtually 100 percent of parents participated.[18]

18. As a footnote here, we commend almost everything about the Saturn School of Tomorrow, but want to point out the difference in parent participation at CART and at Saturn, mostly because parent participation and feedback is such a glowing metric of the CART program. At CART, parents come because their kids have discovered such a strong passion for learning and desire to share it. We think CART's approach lets the energy from student passion drive the school's success.

> *"But when we say, 'break the mold,' we've got to give communities the power to experiment, to think anew, to be daring."*
>
> -President George HW Bush

The Prospectus for the Saturn School of Tomorrow that was adopted by the St. Paul Public Schools reads like a manifesto and calls for a revolution in education. Even though the document is nearly 30 years old, its message rings true, even today:

> *The need to know in our society grows at a continually accelerated pace. Eighty percent of occupations in this country already are information-based. We live in a world in which information and knowledge are increasingly important commodities. Yet, levels of education within the general public already are inadequate. By the 21st century, we will face a knowledge crisis of epidemic proportion. Simply put, more people will need to know more than ever before.*
>
> *...What is imperative, then, is an innovative proposal for change, a significant departure from current practice, a re-direction of education for the 21st century.*
>
> *...The Saturn School of Tomorrow is a bold and innovative blueprint for the future. We propose developing a new schooling process for the 21st century. We envision continuous learning[19] to promote student mastery and competence, more effective involvement of professional staff, new and participatory staff roles, student and parent involvement, employment of new learning tools and technologies, flexible school calendars, and community and private sector participation.*
>
> *Prospectus, Saturn School of Tomorrow*

The innovative school attracted thousands of visitors annually, including President Bush, who visited it in 1991. Bush was recognizing the Saturn School in his America 2000 and New American Schools initiatives to change America's education system to give students the skills to succeed in the 21st Century and to make America more competitive with the rest of the world.

In a speech at the Saturn School during his visit on May 22, 1991, President Bush said:

> *"Like any new idea, we don't know what tomorrow holds for the Saturn School. And there may be aspects of its approach that, from time to time, generate controversy. But when we say "break the mold," we've got to give communities the power to experiment, to think anew, to be daring."*

Bush's words should still apply to schools and communities everywhere. Communities and schools should have the power to experiment, to think anew and to be daring. Often, politics and bureaucracies, together, link arms to put barriers up against experimentation and innovation and new ideas. It makes it even more remarkable when a school like the Saturn School or CART succeeds.

Unfortunately, in the early 2000s, after the passage of No Child Left Behind and when Bush's son was president, standardized tests changed the face of education, such that school funding was tied to standardized test measurements, not whether a school was innovative or helped students succeed.

Even the highly regarded Saturn School of Tomorrow suffered after No Child Left Behind was passed, when a local journalist pointed out that its math scores had dropped one year. Due to an outraged community, the school ended up shutting down and being reformatted back into a traditional school. This was a lesson that no school, no matter how innovative or successful it was with kids, could ignore the state standardized tests.

Pearlman said it's possible for a school like Saturn that's doing project-based learning to produce extraordinary successes with most of its students, but not see that success translate on a standardized test.

"There are all sorts of cautionary tales like the Saturn school," said Pearlman. "If you're in the field, what you gotta do is make sure your kids do well enough on those things (tests) so that you can just do more of those things that you think works, and not get screwed."

Bush's words should still apply to schools and communities.

19. The phrase, "continuous learning to promote student mastery," as used in the Saturn school's manifesto, echoes the Zen concept of mastery as well as the Japanese term "Kaizen," which means continuous improvement. Kaizen was a key part of Toyota's philosophy. The famous Toyota Production System was designed for effecting kaizen and subsequently, kaizen became a popular corporate strategy in the 1980s and 1990s. Interestingly, the Saturn School of Tomorrow not only emulated the Saturn automobile in its homage to Japan, but also integrated a corporate strategy in improving education, which was a novel idea.

PRESIDENT BUSH AND THE NEW AMERICAN SCHOOLS DEVELOPMENT CORPORATION

President George H.W. Bush had a bold vision in trying to transform education. It started in 1989 when he held an Education Summit in Charlottesville, Virginia, with 49 of the 50 state governors. The summit produced goals of improving student abilities across a range of subjects and to improve graduation rates, college acceptance rates and employability skills by the year 2000.

Kids who were in the first grade during the Education Summit would be graduating high school in the year 2000, so the focus was on changing education for their generation and for the future, to prepare them and the entire country for the 21st Century.

Some of the outcome goals from the summit were:

- The readiness of children to start school;

- The performance of students on international achievement tests, especially in math and science;

- The reduction of the dropout rate and the improvement of academic performance, especially among at-risk students;

- The functional literacy of adult Americans;

- The level of training necessary to guarantee a competitive workforce;

- The supply of qualified teachers and up-to-date technology; and

- The establishment of safe, disciplined, and drug-free schools.[20]

Among other aspects of Bush's education plan, as detailed in America 2000, he called for the creation of 535 New American Schools, one in each of the country's 435 congressional

districts plus 100 others nationwide.[21] Bush would provide federal education grants for the creation of these schools. Private industry and non-profit foundations were also asked to help fund the creation of these schools.

There was heavy bipartisan debate over the bill. Democrats and Republicans finally agreed to a series of compromises, including the elimination of private school choice and limiting the testing standards, but the bill was held up in the Senate by Republican earmarks. Several Republican senators were awaiting signals from the White House whether the bill should be passed or not. President Bush let the bill die, presumably hoping that he could re-introduce his initiatives in the second term.[22]

"Guess what," said Pearlman, "He lost the election to Bill Clinton. Even all of us who do this work tended to be democrats, we were quite disappointed."

The idea of creating new innovative schools in every congressional district across America appealed to just about any educator. The president's hope and vision for new schools and new school designs being implemented across the country would never be fully realized.

President George Bush and U.S. Secretary of Education Lauro Cavazos (right of Bush) with Governors (left to right) Booth Gardner (D-WA), Terry Branstad (R-IA), and Bill Clinton (D-AR).

20. Vinovskis, 1989
21-22. Backman, 2009

While Congress was debating the president's bill, the New American Schools Development Corporation (NAS) was created as a private non-profit in 1991 to fund the development of new, whole school designs.[22] NAS was formed with about $20 million from RJR Nabisco, Gerstner, and IBM, along with some other corporations.

NAS funded teams, via a competition, to develop and demonstrate whole school designs aimed at increasing student performance.[23] This essentially was a pilot project for Bush's vision.

New American Schools sought to bring together the best educators, researchers and business people to create "break the mold" schools. This program wanted to develop, test and foster innovative schools that were not constrained by existing education regulations and mindsets and out of which would come innovations in public education that would prepare students for 21st Century's needs in society.[24]

NAS held a design competition for new types of schools and received nearly 700 proposals from around the country. In an article in Education Next from 2002, Jeffrey Mirel said, the RFP process required that "the designs be replicable in other communities: 'This is not a request to establish 'model' schools. The designs must be adaptable so that they can be used by many communities to create their own schools.'"

Each NAS school would receive a one-time $1 million grant as a start-up fund. The approach was not unlike a venture capital firm making investments in a number of startups with new and revolutionary ideas. In this case, it was to change the entire educational paradigm, using a public-sourced R&D model. This crowd-sourcing approach to innovation has taken off more recently in the era of social media.

"It was a huge competition," said Pearlman. "with new school designs. That was an extraordinary development."

The legacy of NAS would never realize new design schools in all 435 congressional districts. According to Mirel, the effort was generally supported in the media, but some stalwart liberals railed against NAS in the same way they did with the Bush Administration.
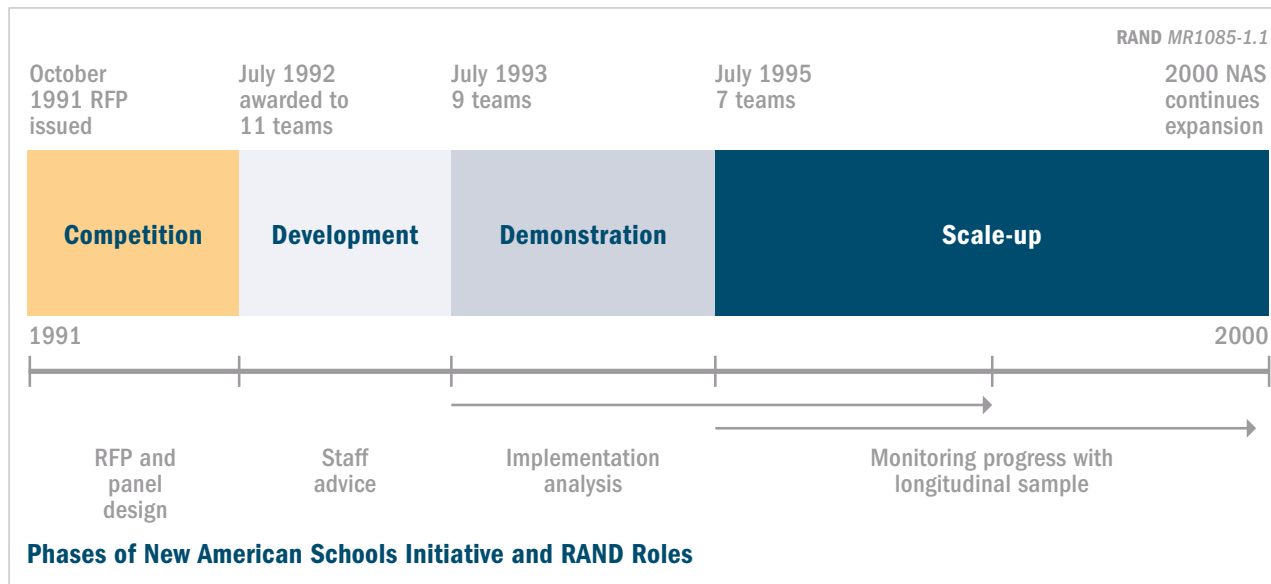
Mirel pointed to a 1992 article in The Nation that characterized this negative view:

> *"Most of the educational R&D teams endorsed by the corporation comprise an incestuous circle of right-wing ideologues and privatization advocates, teacher-hating technocrats and recession-rocked military contractors, their funding made palatable to the press by token support for established and respected liberal school reform advocates."*

Conservatives also criticized the NAS school efforts for largely representing progressive ideas such as learner-focused education and project-based learning.

Eight of the proposals represented a merging of the classroom with the society and the real world, an idea that can be traced back to John Dewey. The intent was to create critical thinkers, not students who could retain a long list of facts.

Conservatives said this approach devalued the necessary rigor of education, that the focus on fun and entertaining schools put true education in the back seat.(See sidebar on Learning, Rigor and PBL on page 29) They never opened their mind to the idea that education could do both.

RAND MR1085-1.1

October 1991 RFP issued	July 1992 awarded to 11 teams	July 1993 9 teams	July 1995 7 teams	2000 NAS continues expansion
Competition	Development	Demonstration	Scale-up	

1991 — 2000

| RFP and panel design | Staff advice | Implementation analysis | Monitoring progress with longitudinal sample |

Phases of New American Schools Initiative and RAND Roles

22-23. Bodilly et al, 1996
24. Berends et al, 1999

> *"Some conservatives still hang onto the myth about rigor and some progressives and teacher unions still fear venture-fed innovation as a corporate takeover of our educational system. Both extremes can be myopic to the positive potential of innovation efforts."*
>
> -Bruce Cuthbertson, IngenioMind

Both progressive and conservative views still linger. Some conservatives still hang onto the myth about rigor and some progressives and teacher unions still fear venture-fed innovation as a corporate takeover of our educational system. Both extremes can be myopic to the positive potential of innovation efforts.

These closed mindsets are reminiscent of the same oppositions that fracture society into segregated communities and cultures and perpetuate the US/Them syndrome. These closed minds are an effect of cognitive biases, as we discussed earlier.

So, both sides in Washington, at times, were against these "break the mold" schools largely because they viewed them with distrust through partisan lenses. They focused on the negative instead of their innovative potential. They saw what they wanted to see.

Ultimately, NAS awarded contracts to 11 teams to spend a year refining and demonstrating their design to the NAS.[25]

Two of the 11 winning designs became foundational models for a project-based approach in education.

The first of these two was a winning design called Co-NECT Schools. Co-NECT began at BBN Educational Technologies group in Cambridge, Mass.

Co-NECT sought to improve achievement by incorporating technology (particularly Internet technology), organize lessons around interdisciplinary projects and organize learning environments into multi-grade clusters.[26] The project-based curriculum was to be implemented and continuously refined by teams of empowered and accountable teachers.[27]

Co-NECT encouraged "authentic pedagogy," which, according to Rebecca Herman, author of *An Educators' Guide to Education Reform*, "requires students to think, develop in-depth understanding and apply academic learning to important, realistic problems."[28]

The exposure brought by the NAS design award drew more attention to Co-NECT and their methods. In 1992, Co-NECT had 75 schools nationwide.

In an interview with IngenioMind, Bruce Goldberg, founder of Co-NECT, said, "I think our popularity hit its zenith once we embarked on fairly large-scale projects that incorporated cross-school and district effort and cooperation. For example, we did two large scale projects involving music—one in Memphis and one in Dade. The Memphis project (Kids 'n Blues) and the Dade project (Kids 'n Salsa) had as its "product" a music CD created entirely by students (k-12). I think we began to take off at that point, sometime around 1996."

Goldberg said modern iterations of PBL schools drew on cases like Co-NECT or Expeditionary Learning just as he drew on earlier school models. "We learned from the Coalition of Essential Schools, The Saturn School, Debbie Meier's efforts in NYC, some experimental schools in Europe, and so forth."

OUTWARD BOUND

In 1991, Outward Bound and the Harvard Graduate School of Education collaborated on another winning NAS design called Expeditionary Learning.

Outward Bound was founded in 1941 by German educator Kurt Hahn and grew into a well-known outdoor educational organization through the 1970s and 1980s. The organization used challenging outdoor expeditions to lead young people on a journey of self discovery. Students problem-solved tasks in the outdoors and realized personal growth, improved self esteem and improved social skills.

The Outward Bound process was captured and diagramed in a flow chart (next page) by two researchers in 1976, Victor Walsh and Gerald Golins.[29]

Expeditionary Learning Schools (ELS) took some of the basic tenets from Outward Bound and created a project-based program. The RAND Corporation did a series of follow up studies in the 1990s and early 2000s on the impact of the demonstration design schools. The Expeditionary Learning Schools were highlighted for their successes. The RAND studies found that 9 of the 10 schools in the NAS program that implemented ELS showed significant improvement in student standardized test scores.[30]

25-27. Bodilly et al, 1999
28. Herman, 1999
29. Walsh and Golins, 1976
30. Thomas, 2000, Berends, 1999

While these two school designs (Co-NECT and ELS) demonstrated the potential of a project-based approach to learning, there were other dispersed schools and approaches to project-based learning that were incubating and realizing positive benefits in small and large communities across the country. This report cannot touch on or name all of these efforts, but Co-NECT and Expeditionary Learning didn't hold any exclusivity over this approach to learning. They just happened to get more attention than some of the others.

Today, Expeditionary Learning has partnered with more than 160 schools and 4,000 teachers, serving 53,000 students in 33 states. Co-NECT spun out of BBN in about 1998 to form its own organization. It grew to a network of 200 schools in 40 states. It was sold to Pearson Education in 2006.

The success of both of these school designs seemed to raise the awareness of project-based learning and led to the creation of a dozen education programs and thousands of schools over the following decade.

FOCUS ON 21ST CENTURY WORKPLACE SKILLS

Back in 1990, the Secretary of Labor Elizabeth Dole created the Secretary's Commission on Achieving Necessary Skills (SCANS) to address the skills that young workers will need to create a high-performance economy and be globally competitive. Workers will not only need these skills to succeed individually, but also to help U.S. businesses become more competitive in a global economy.
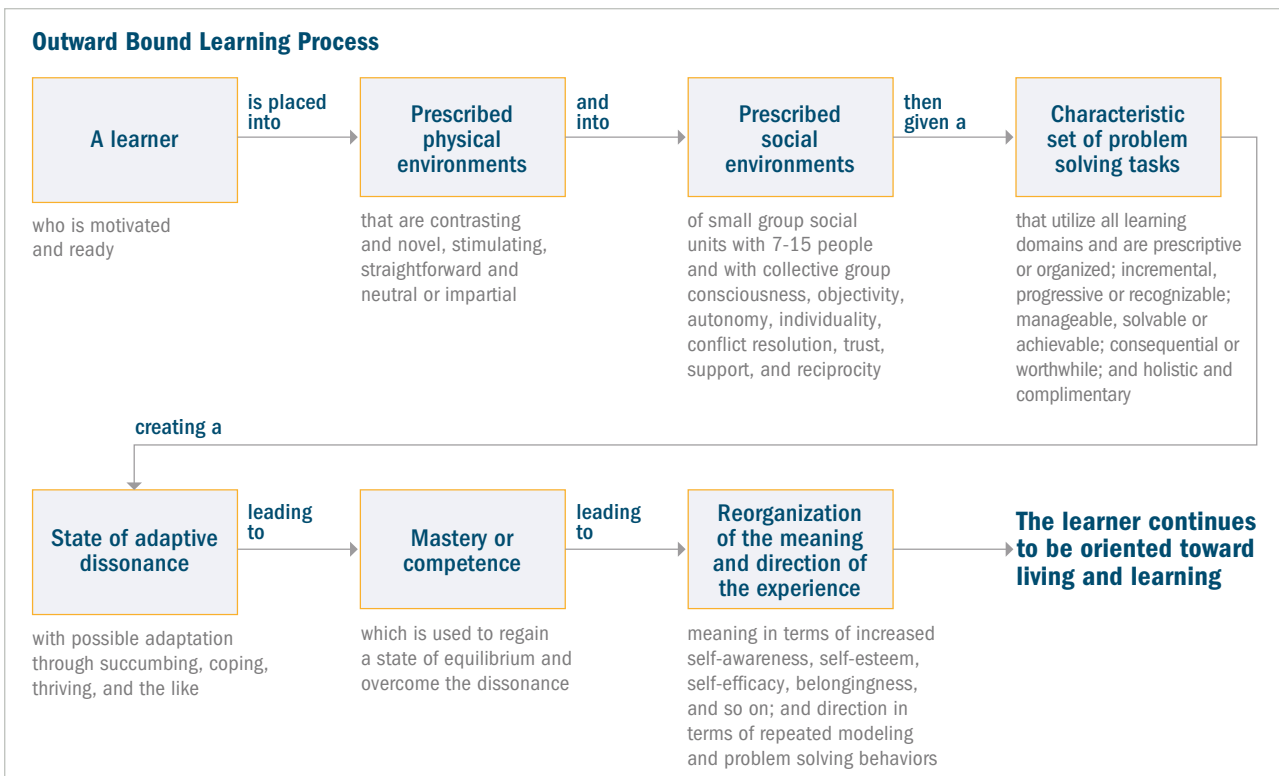
"(There) was a powerful movement toward economic competitiveness," said John Mergendoller at the Buck Institute for Education (BIE). "Are our children going to be able to compete? Are they going to be able to solve problems?"

The Commission released its report, the SCANS report, in 1992. It identified three foundational areas: Basic skills like reading, writing, and communicating; thinking skills like problem solving, creativity, and knowing how to learn; and personal qualities like responsibility, honesty, and self esteem.

Many of the skills identified in the report are the same ones that schools like CART and Drake and New Tech High and High Tech High have articulated in their approach to education.

"It was mainly saying that kids needed to have communication skills, critical thinking skills, collaboration skills," said Pearlman. "It was the same stuff that was developed 10 years later under a brand called 21st Century Skills."

In 2003, the Partnership for 21st Century Skills (P21), a collaboration between the department of Education and a handful of non-profit and technology companies, such as the National Education Association, Apple, Microsoft, Dell, SAP, and Cisco, developed a report updating some of the core competencies from the SCANS report.

Outward Bound Learning Process

A learner is placed into **Prescribed physical environments** and into **Prescribed social environments** then given a **Characteristic set of problem solving tasks**

who is motivated and ready

that are contrasting and novel, stimulating, straightforward and neutral or impartial

of small group social units with 7-15 people and with collective group consciousness, objectivity, autonomy, individuality, conflict resolution, trust, support, and reciprocity

that utilize all learning domains and are prescriptive or organized; incremental, progressive or recognizable; manageable, solvable or achievable; consequential or worthwhile; and holistic and complimentary

creating a

State of adaptive dissonance leading to **Mastery or competence** leading to **Reorganization of the meaning and direction of the experience** → **The learner continues to be oriented toward living and learning**

with possible adaptation through succumbing, coping, thriving, and the like

which is used to regain a state of equilibrium and overcome the dissonance

meaning in terms of increased self-awareness, self-esteem, self-efficacy, belongingness, and so on; and direction in terms of repeated modeling and problem solving behaviors

On its website, P21 advocated that all students need to acquire 21st Century Skills. "Rapid changes in technology and the globalization of the world's economy have ensured that we need to do a better job of educating all our students in order to prepare them for success. 21st Century Skills are no longer just for the top tier, or just for those students headed to college, but essential for all students."

It categorized 21st Century Skills into four key areas:

1. *Core subjects, such as reading, writing, world languages, math, economics, geography, history, art.*

2. *Learning and Innovation, which included creativity, critical thinking, problem solving, collaboration and communication skills.*

3. *Information, Media and Technology, which included becoming literate in technology, media and communications technology*

4. *Live and Career Skills, such as leadership, taking initiative, remaining flexible, and being able to adapt to a changing work and economic environment.*

From the P21 Framework[31]

Other leading organizations have developed similar frameworks. The Business Roundtable and the National Network of Business and Industry Associations, with support from large foundations such as the Gates Foundation, has created a list of skills called *Common Employability Skills* that "all employees need, no matter where they work."

They include (1) Personal skills such as adaptability, initiative and professionalism; (2) People skills such as communication, respect and teamwork; (3) Knowledge skills such as being able to read and write, do math and understand science, use technology tools and think critically; (4) Workplace skills such as problem solving, organization and decision making.

In an article on 21st Century Skills, Bob Pearlman said, "Every country has done a good job of articulating the knowledge and skills that students need, but few have developed or identified the curricula, assessments, facilities, and technology that would foster 21st Century Learning."

Whether the focus is the SCANS report, 21st Century Skills, Common Employability Skills, or College and Career Ready, the problem that educators are dealing with, said Pearlman, "is how do you actually accomplish that? How do kids get those skills? Well, they gotta work on projects, collaborative projects and that helps them get those skills."

Mergendoller echoed Pearlman. "How do you help kids learn to be problem solvers? Well, you gotta give them problems to solve. How do you get kids to think critically? You have to give them questions that require critical thinking. All of this is at the heart of well-done project-based learning."

Schools such as CART have developed a framework that teaches 21st Century Skills and to the needs of a global economy and a global workforce. But many of the efforts by CART and similar schools and networks of schools, such as New Tech High, High Tech High, Drake, Envision Schools, Expeditionary Learning Schools, are still the exception, not the norm.

Pearlman said there are probably 500 PBL schools among all the networks and individual schools across the country. "It's a footprint," he said. "You know, the country is huge." Mergendoller thought that right now, there were about a dozen school networks across the country advancing their variants on project-based learning, though most had their own name and branding for what they called it.

But there's no project-based learning movement. "They use their own terms," said Mergendoller. "That's one of the problems. Maybe it's not a problem, but it's an explanation of why there isn't a PBL movement, because everybody calls it something else. I think all these things sort of developed separately while trying to accomplish the same goals, but doing their own thing with their own people, their own schools and so forth."

"The districts we work with today," said Mergendoller, "they have their own terms for it, a 21st Century school district, a school district preparing our students for tomorrow, but their eyes are really on preparing kids that are college and career ready and project-based learning is a way of doing that."

Said Pearlman, "Societies need citizens who are smarter, more creative, and more capable of leading, managing, collaborating and networking with productive people around the world."

31. http://www.p21.org/about-us/p21-framework

Joe Oakey, PBL evangelist and former Commissioner of Education, Vermont

PBL 1.5
1990, MARIN COUNTY

Autodesk, known for its CAD and design software, inadvertently got into PBL and changing the face of education in 1990.

At the time, Autodesk identified internally as a corporate counterculture with poets, dancers, masseuses and other artists on staff. The company was focused on pushing the edges of creativity, with projects on self-generating computer graphics movies called Cellular Automata and a software package based on James Gleick's bestseller, *Chaos*.[32] The company later worked with such film companies as Pixar. Although many of these projects never developed into commercial successes, they were seen as essential to the creative culture at Autodesk.

Joe Oakey, who was manager of Autodesk's education department in 1990, had a passion for project-based learning going back to his childhood. In a series of news columns for PBL News in 1997, he explained how he went through a troubled and somewhat disjointed K-12 experience, transferring many times from one school to the next. He largely had to cobble together the education on his own. Although he didn't get much from school, he credits spending time in his father's workshop in an old barn, where he learned to use many of the tools and machines, as perking his curiosity and passion for learning.

His school experiences, on the other hand, were so bad, they could have ruined learning for him.

His first school experience with PBL was perhaps when the teacher asked students in his 5th grade class to bring an animal or pet to class for show and tell. His favorite animals were elephants and snakes. Since he didn't have an elephant handy, he caught a garter snake and brought it in a brown paper bag to class.

When he took out the snake, the teacher screamed and started hitting him with a ruler until the ruler broke.

School continued to disappoint.

In high school, he wanted to take courses like woodworking and architectural drafting, but was often discouraged or not allowed because those courses were considered vocational, not college prep.

Then, his father had a heart attack and needed his help. His father earned a living by traveling around to companies and manufacturing plants and helped them design machines to automate business processes.

While his father rested in hotel rooms, Oakey went out to the job sites to present designs ideas and plans to company managers. At the end of the day, Oakey would return to the hotel room where his father had been resting and they'd go over problems encountered during the day and review drawings and design plans.

About this part of his education, Oakey wrote:

"I consider the six months I spent working in the private sector as my father's representative the most valuable of my total educational experience. First, it had real meaning. Prior to that work, math was easy for me, but not interesting. When I learned, in machine design, some real-world applications of mathematics, the subject suddenly came to life for me.

"Similarly, English no longer was just English, but a process of communicating ideas and concepts to others in a way that allowed them to understand without ambiguity. And engineering, I had learned, cannot be ambiguous. Listening and understanding others was critical, especially as a youngster dealing with experienced adults."

Oakey had a long career in education before going to Autodesk. "He had been a principal, a superintendent in upstate New York and Vermont," said Pearlman. "He'd been a commissioner of education in Vermont and then in Micronesia also. He was quite a guy."

Then he went to Autodesk. "He's the one that seeded AutoCad all over the country in the early years, when it was just the PC application," said Pearlman. "As a result, he seeded community colleges, colleges, and high schools with their software. And they

32. Coale, 1990

> *"I never hated learning, it was schooling I disliked, and in many cases, even today, schooling cannot be equated with learning. In fact, in some ways, as we all know, school can inadvertently interfere with learning."*
>
> -Joe Oakey,
> PBL evangelist and former Commissioner of Education, Vermont

basically won the marketplace through his efforts... So, in 1991, Autodesk said to him, 'What can we do for you? You've done all this for us. What can we do for you?' He said, 'Help me start a foundation.' So they helped him start a foundation that was called the Autodesk Foundation."

The Foundation was focused on education in Marin.

One of Oakey's first tasks with his Foundation was to put together an annual conference to bring educators together to talk about education, particularly project based learning.

"Joe Oakey's the one who actually started getting PBL practitioners together every year and exponentially grew this field," said Michelle Swanson. "That's when a lot of things took root, a lot things like MET and High Tech High and the Envision Schools and Expeditionary Learning. Those are all the same characters who have been running around together for the last 30 years evangelizing about projects and integration and brain friendly (teaching methods), all this, that list of traits that we consider valuable in teaching and learning. And we just keep refining it over time. (That) network of folks have gone on to do really innovative work in teaching and learning."

"It was very, very local (to Marin)," said Pearlman. "He came to Boston to see me and asked me to put together a symposium in Marin County for Marin educators and bring in some of the best people in the country to mix with them."

"I identified 12 people who were the best practitioners in education technology and project based learning and we went to Marin and did a symposium with 30 educators."

The annual conference that started with 30 people in 1991 grew to about 300 people in 1996 when Pearlman joined Autodesk and to 2000 people at the San Francisco Civic Center in April, 2000.

"Most of the people who had started all these organizations, whether it's New Tech or High Tech High or Envision Schools, Expeditionary Learning," said Pearlman, "all of these people who are the leaders of these organizations today were young teachers and presenters at that conference."

Later in life, Oakey said people often asked him why he became an educator if he hated learning so much?

> "The short answer is, *I never hated learning, it was schooling I disliked, and in many cases, even today, schooling cannot be equated with learning. In fact, in some ways, as we all know, school can inadvertently interfere with learning."*[33]

Swanson, who worked with Walt Buster in developing CART and knew Joe, said:

> *"Here's a guy who was commissioner of education in Vermont, who was screaming, 'Throw out the bloody text book.' I mean it was heresy. And he would stand up to anybody and say it because he was in his 60s by then. He kind of came across as Mr. Wilson, 'Get off my lawn, Sonny boy,' but it was all in the right direction. He believed in kids and he found this few dozen people who were doing this remarkable work with kids and brought them together and shined a spotlight on them, then they each brought one or two people and they each brought five or ten people, so pretty soon there was this huge movement and right about then, the Buck Institute came into being.*

33. Oakey, 1999

STEVE JOBS AND PBL

Oakey's experience was somewhat like Steve Jobs' experience as a child. In an oral history interview through the Smithsonian and ComputerWorld in 1995, Jobs shared his thoughts on growing up and the role education played.[34]

Jobs' father was a machinist and had a workshop in their home in Mountain View where Steve learned to use some basic tools and build things.

Then, a new neighbor, Larry Lang, moved in down the street. He was an engineer at Hewlett Packard and was into HAM radios. The man put a microphone and speaker in front of his house so that kids could speak into the microphone and hear it amplified.

Jobs developed a friendship with Lang, who introduced him to Heathkits, which were mail-order kits to build finished products like radios or televisions.

"It gave a tremendous level of self-confidence, that through exploration and learning one could understand seemingly very complex things in one's environment. My childhood was very fortunate in that way."

Job's experience at school didn't start well and the type of authority in the school was something he hadn't encountered before. Up until the 4th grade, Jobs said, "They came close to really beating any curiosity out of me."

He was getting into trouble, blowing up explosives in a teacher's desk, locking all the kids' bikes up so they couldn't be unlocked, getting sent home all the time.

Then he met a teacher, Mrs. Hill, in the 4th grade who re-ignited a desire in him to learn. At first, she bribed him with $5 and a lollypop to do a mathematics workbook, but then she started buying him kits to build, a camera kit.

"I ground my own lens and made a camera. It was really quite wonderful. I think I probably learned more academically in that one year than I learned in my life."

Jobs pointed to the experience as putting him on the right path and nurturing his curiosity in creating things.

"I'm 100 percent sure that if it hadn't been for Mrs. Hill in 4th grade and a few others, I would have absolutely have ended up in jail. I could see those tendencies in myself to have a certain energy to do something. It could have been directed at doing something interesting that other people thought was a good idea or doing something interesting that maybe other people didn't like so much. When you're young, a little bit of course correction goes a long way."

When asked if computers were a way to bypass some of the endemic problems with schools, Jobs said they weren't.

"I've helped with more computers in more schools than anybody else in the world and I absolutely (am) convinced that is by no means the most important thing. The most important thing is a person. A person who incites your curiosity and feeds your curiosity; and machines cannot do that in the same way that people can.

"The elements of discovery are all around you. You don't need a computer. Here - why does that fall? You know why? Nobody in the entire world knows why that falls. We can describe it pretty accurately but no one knows why. I don't need a computer to get a kid interested in that, to spend a week playing with gravity and trying to understand that and come up with reasons why."

Steve Jobs didn't use the term project-based learning, but his experience was very similar to Joe Oakey's. It started with an early curiosity and introduction to building and using tools, and hanging around a workshop, to asking questions about the world and how things worked and pursuing projects as a means to learning about the world.

34. Jobs, 1995

SIR FRANCIS DRAKE HIGH SCHOOL

After he founded Autodesk Foundation, Oakey partnered in 1991 with Sir Francis Drake High and Walt Buster, who would later create CART. They established a project-based learning program, which still exists today. But it wasn't a success that first year and needed some tweaking to get right.

The program was set up with a block schedule in the morning where students might work on some math problems one day and do an English project the following morning. The afternoons were set aside for electives and long-term projects, such as working on a computer-based design project. Autodesk put a big emphasis on computers in the program.

Mary Kitchens, who worked in the PBL program at Drake, had met Michelle Swanson at nearby Redwood high school. Swanson would later join Buster in Clovis and helped create the CART program.

"Michelle had started a student-run theatre company," said Kitchens. "Michelle hired me as a guest artist in the theatre company, working with the students and then she moved over to Drake and I followed along. They were setting up a program. Joe Oakey was involved. It was kind of a school within a school."

"They were trying some stuff that was difficult to try and it sort of blew up, but they went back. You know, you learn a lot (from a failure). So they went, 'Okay, that didn't work, so we're gonna do it differently.'"

They created a cohort track with lower and upper grade levels, called Academies. The 9-10 Academy had a core educational focus, combining courses in English, social studies, integrated science, art and drama. Students would take world languages and math as separate courses in the afternoons. The 11-12 academy could have a more narrowed focus of interest, such as environmental science or communications, so students could follow a path that aligned with their interests.

Kitchens said they somewhat created their program on the fly. They read the SCANS report and also Adria Steinberg's, The Six A's of Project Design.

THE SIX A'S OF PROJECT DESIGN	
AUTHENTICITY	▪ DOES THE PROJECT EMANATE FROM A PROBLEM THAT HAS MEANING TO THE STUDENT? ▪ IS IT A PROBLEM OR QUESTION THAT MIGHT ACTUALLY BE TACKLED BY AN ADULT AT WORK OR IN THE COMMUNITY? ▪ DO STUDENTS CREATE OR PRODUCE SOMETHING THAT HAS PERSONAL AND/OR SOCIAL VALUE, BEYOND THE SCHOOL SETTING?
ACADEMIC	▪ DOES THE PROJECT LEAD STUDENTS TO ACQUIRE AND APPLY KNOWLEDGE CENTRAL TO ONE OR MORE DISCIPLINE OR CONTENT AREAS? ▪ DOES IT CHALLENGE STUDENTS TO USE METHODS OF INQUIRY CENTRAL TO ONE OR MORE DISCIPLINES? (E.G., TO THINK LIKE A SCIENTIST) ▪ DO STUDENTS DEVELOP HIGHER ORDER THINKING SKILLS AND HABITS OF MIND? (E.G., SEARCHING FOR EVIDENCE, TAKING DIFFERENT PERSPECTIVES)?
APPLIED LEARNING	▪ DOES THE LEARNING TAKE PLACE IN THE CONTEXT OF A SEMI-STRUCTURED PROBLEM, GROUNDED IN LIFE AND WORK IN THE WORLD BEYOND SCHOOL? ▪ DOES THE PROJECT LEAD STUDENTS TO ACQUIRE AND USE COMPETENCIES EXPECTED IN HIGH PERFORMANCE WORK ORGANIZATIONS (E.G., TEAMWORK, APPROPRIATE USE OF TECHNOLOGY, PROBLEM SOLVING AND COMMUNICATION)? ▪ DOES THE WORK REQUIRE STUDENTS TO DEVELOP ORGANIZATIONAL AND SELF-MANAGEMENT SKILLS?
ACTIVE EXPLORATION	▪ DO STUDENTS SPEND SIGNIFICANT AMOUNTS OF TIME DOING FIELD-BASED WORK? ▪ DOES THE PROJECT REQUIRE STUDENTS TO ENGAGE IN REAL INVESTIGATIONS, USING A VARIETY OF METHODS, MEDIA, AND SOURCES? ▪ ARE STUDENTS EXPECTED TO COMMUNICATE WHAT THEY ARE LEARNING THROUGH PRESENTATION AND/OR PERFORMANCE?

Source: Adria Steinberg's *The Six A's of Project Design*

"We were concerned that these people were saying that our kids didn't know how to do anything," said Kitchens. "They might know stuff, but they didn't know how to do anything. They couldn't work together. That's what we set out to fix."

The same concerns persist today. The interest, in 2015, is stronger than ever and it was front and center at Sir Francis Drake in 1991. Today, a growing list of organizations say our kids need to learn critical thinking, collaboration, and other real-world skills, not only in order to succeed for themselves but to help U.S. companies remain competitive in a global economy.

THEATRE ROOTS

Swanson and Kitchens also drew heavily on their experience in theatre and putting on plays.

"Being theatre people," said Kitchens, "we were used to doing projects over and over again. That's what putting on a play is. It felt really natural to us."

The project focus was on skill as opposed to content. "They can get content whenever they need it," said Kitchens. "It's easy to get. Content is secondary. The trick was teaching them how to access it and how to use it and how to synthesize it."

But it had to be rigorous as well. The idea was to raise the level of student engagement and use that engagement to raise the level of rigor.

"We did a lot of deep work on what it means to do rigorous interdisciplinary projects," said Swanson. "The shift has to happen where kids are engaged to get to rigor. We got a lot of good results in terms of our graduates in who they were but in terms of all the data and test scores and indicators of success that a district would keep. The kids in the integrated program seemed to do very well."

After starting the Drake program, Walt Buster went to Clovis as Superintendent of Education in 1996 and Swanson later followed to help create and launch the CART program.

"The most important thing (in education) is a person. A person who incites your curiosity and feeds your curiosity; and machines cannot do that in the same way that people can."

-Steve Jobs

INNOVATION AND THE FUTURE OF CART

We've looked at the history of both CART and the evolution of PBL. CART understands that it cannot sit on its laurels. It needs to continue to innovate, to try new models, to "break the mold" as one U.S. president once said.

The administrators and teachers at CART are doing just that. They're looking for ways to improve and expand education, to rethink how education can and should be delivered. One of these ideas is to partner with a local technology group that's building a tech hub to revitalize the Fresno economy. CART's participation brings ups the idea of a school district's role in society and its potential role in local economic development.

Few communities have connected their K-12 education goals to the broader community goals in this way, and CART may find this approach as changing education forever, giving young people the perspective that they can directly impact the future of their communities.

CART AND THE DEVELOPMENT OF AN "INNOVATION CLUSTER"

Fresno has suffered at times from high unemployment, mainly due to a heavy dependence on one primary industry (agriculture). CART's position in pointing kids toward careers in technology and computer science, among other disciplines, does impact the economic future of the Fresno area.

Currently, CART is exploring a relationship with Bitwise Industries to offer several labs to CART students at the Bitwise technology hub in downtown Fresno.

Bitwise Industries is the parent company of The Hashtag, a 24-hour workspace; Geekwise Academy, which offers cutting edge technology classes; and Shift 3, which does software development and online marketing with local and worldwide clients.

Jake Soberal, CEO Bitwise Industries

Irma Olguin, the visionary and co-founder of Bitwise, said, "When I first moved back to Fresno nine years ago, I dreamed of a space that freelancers and entrepreneurs like myself could use to get work done. We needed a 24-hour facility with large desks, fast internet, plenty of whiteboard space, and an environment in which to collaborate. Places nearby to eat and get coffee were on the wish list. The success of the Hashtag for individuals and micro teams spurred the idea of a tech hub for small and large companies with the same needs."

Although Bitwise was not part of an official redevelopment or economic revitalization plan on the part of Fresno, it has served as a hub and destination for local technology entrepreneurs.

Economic development professionals often talk about creating an economic cluster. The Bitwise approach builds the cluster from the bottom up, with a focus on people and training.

Jake Soberal, Bitwise's CEO, said, "We have a population of a million people that is horribly underutilized and underserved. If you look at the technology industry, the biggest problem globally is how do we find talent fast enough to keep up with demand."

Soberal said there's enough technology work to go around so that cities like Fresno can grow jobs at the same time as other cities like Portland or Austin.

"The truth of the technology industry is much less that of a zero-sum game," said Soberal. "Our focus is on developing people and we think people, in turn, then develop companies. Whereas the approach in Austin or Portland has been much more heavily focused on investment capital and the idea of let's invest in companies...and let's let that drive individual growth."

"Our focus is on developing people and we think people, in turn, then develop companies."

-Jake Soberal, CEO Bitwise Industries

> *"I'm excited about putting our kids down there in and among all those young entrepreneurial people who have incredible ideas of how to change Fresno, the nation, the world"*
>
> -Rick Watson, CART CEO

This bottom up approach to economic development is going well, with Bitwise now building a 50,000 square foot facility to meet the rising demand of new tech companies wanting to cluster together.

CART hopes to expose its students to the high energy and water cooler effect at a technology hub like Bitwise Industries. Not only will the students get an education, they'll be able to observe the industry in action and network with many of Fresno's entrepreneurs.

"Students will spend time learning against the backdrop of professionals," said Beth Garoupa, who is both Dean of Curriculum and Instruction at CART and is designing the curriculum framework at Geekwise Academy, "and begin to think of their futures as clear and attainable."

Rick Watson, CEO at CART, said the effect is much greater on students than just introducing them to the technology industry.

"It helps them begin to formulate those questions in their mind about what they want to do and what they can do," said Rick Watson. "I'm even more excited about putting our kids down there in and amongst all those young entrepreneurial people who have incredible ideas of how to change Fresno, the nation, the world and so on."

Looking forward, the potential partnership with Bitwise may lead to a second CART campus in downtown Fresno, which will help anchor Fresno's revitalization efforts, even if it's done independently.

Regardless of how the relationship with Bitwise evolves, it shows that CART is willing to take risks and to keep trying new things. We believe that this mindset and approach is the best way to realize world-changing innovations. We don't always know what the outcomes will be and often, they are not what we imagined, but that's how extraordinary change and evolution happen.

Beth Garoupa, CART Dean of Curriculum and Instruction

ANALYSIS

Is CART innovative?

We're going to start this section with a general essay exploring the concept of innovation which isn't specifically about CART. The essay will cover a range of areas from our cultural fascination with innovation and innovative people or companies, to some of the underlying reasons for this. It will delve into topics of mythology, aesthetics, luck, cognitive biases, and behavioral economics.

The purpose of this section is to create a rough sketch of how we understand innovation. In it, we'll actually start to take apart some of the popular understandings about innovation as a means to look at it from a new perspective.

This essay is not short and does not speak to the CART situation directly. But following the essay portion of this section, we'll return to CART and speak to many of the aspects that we think make CART special and as an example in time of the evolution of educational innovation.

We'll also try to understand that many of the things we like about CART may not be innovations, but may be exemplary just the same. Something doesn't have to be an innovation to be exceptional or extraordinary and certainly, extraordinary things aren't always innovations.

Why are we putting an essay on innovation into this case history?

That's a good question. The purpose of this case history is threefold. First, we ultimately want to better understand innovation and we believe a case history is one approach and can provide context for talking about the abstract idea of innovation.

Second, this case history is also about what makes CART exceptional and enduring, whether we believe those qualities to be innovations or not.

The CART story is a fascinating narrative, with a whole slew of inspirational people and ideas that come to life in the story. In some ways, CART's history is a story of persistence and commitment to new ideas and a new paradigm in the context of a very slowly changing educational environment.

Third and finally, we consider the CART story in the context of innovation at a macro level, as participating in a phenomenon called "innovation clusters." This is an area that's been researched as much as innovation at the individual or company level. Think of it as macroeconomics versus microeconomics. We similarly have the fields of macro-innovation and micro-innovation.

AN ESSAY ON INNOVATION

Innovation is a hard idea to define because it has become overused in countless contexts. We hear it every day being used just about everywhere we turn, on TV, at the store, at the gym or in our yoga classes, on the radio, at work. It's hard to avoid hearing about innovation and innovative products and services and people.

The word "innovation" has been in use for hundreds of years, though up until recently, it carried mostly a negative connotation. (See the chart that tracks usage of the word innovation in books over the last 400 years.)

Benoît Godin has been working on a historiography of innovation through the ages. As an example of the negative interpretation of innovation, he points to the case of Henry Burton, who was a Church of England minister. Burton was accused by the Church of "innovating" in his sermons and interpretation of doctrine and discipline. He had his ears cut and was put in prison.

If you look at the spikes in the use of the word "innovation" before 1800, it's not hard to imagine that those surges in use were nearly completely negative and directed at people for going against orthodox values in the church and state.

Interestingly, this interpretation suggests that innovation means breaking with convention or tradition. Up until recently, that wasn't necessarily a positive quality or value. Today, we might say Burton was progressive or even a Maverick.

Today's meaning isn't all that distant from the meaning in Burton's day. We just happen to look on that sort of individual independence and thinking more positively.

Like certain profanities, the word innovation tends to adapt to its usage. It is perhaps the single most overused word in business today. If you turn on prime time television, it's likely that quite a few of the commercials will use the word in their marketing.

In those contexts, it usually takes on the meaning of something new, something novel or not seen before, or as in the case of car ads, it can mean some technological advantage the brand might claim or some feature that the car company knew we wanted even before we did.

It's a term we often associate with entrepreneurs, inventors and visionaries. We use the word to explain why well-performing companies are successful. *Fast Company* magazine releases an annual list of what they call, "The 50 most innovative companies."

These companies are lauded by *Fast Company* magazine for their business success, releasing a product into a new niche market or for attracting Silicon Valley VC funding. *Fast Company*, like most of the business world, tends to interpret innovation as part business success, part business acumen, part novelty and part finding or creating a new market that didn't previously exist.

In 1994, Jim Collins wrote a book called *Built to Last*. The book explained how and why great companies thrive and survive when others ultimately disappear. One of its arguments was that these companies were visionary in some way. Today, the term innovative is nearly interchangeable with the term visionary, at least in the sense that Collins used and that *Fast Company* currently uses in describing the companies on its annual lists. Collins' book, however, largely suffered from short-sightedness. Many of the examples of great companies that were visionary faltered over the next 15 years and had seen their earnings, stocks and

Historical use of the word "innovation" in books[35]
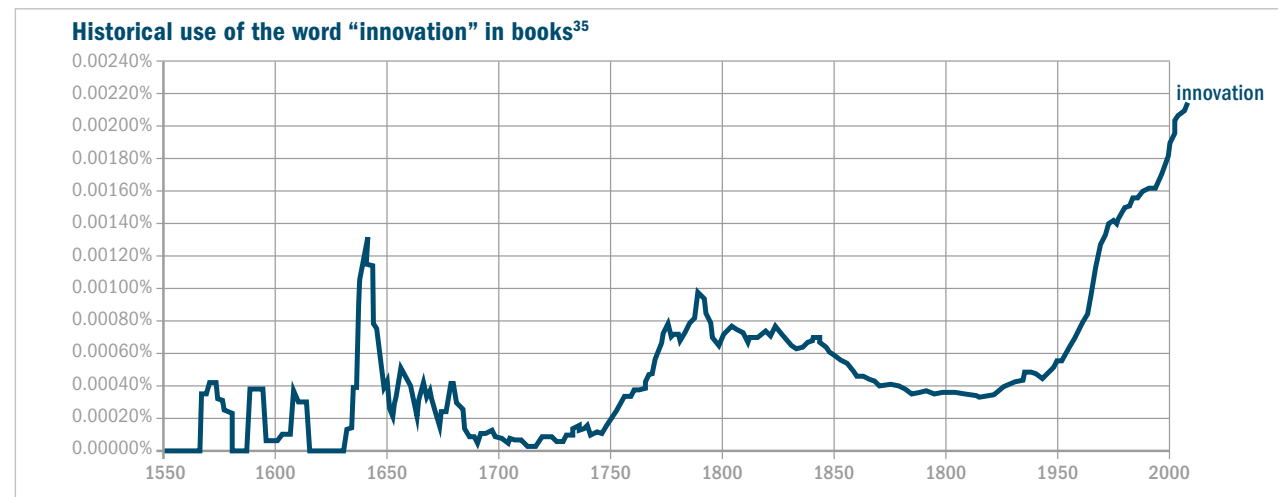
35. Google NGRAM analysis of the word innovation in books through history.

"Having a novel idea or being a first mover into a new market isn't the same as changing a paradigm or changing the way we think."

-Bruce Cuthbertson, IngenioMind

reputations plummet.[36] Some, like Circuit City, had gone out of business.

The same can be said of Fast Company's lists. Many, if not most, of these so-called "innovative" companies will likely be gone in 10 or 15 years or become obsolete. Their visions and values will leave no permanent mark on history. Yet, today, we call them innovative.

Part of the problem is that few if any of these companies could accurately explain their own success. Certainly, marketing VPs and the media will create very compelling fairy tales built on the hero myth that will titillate our fascination and desire to understand the magic in these companies and individuals.

To us, innovation is a process of lasting change. We can't say whether any of the companies in *Fast Company's* list will actually achieve innovation or not. It's too early for most of them. Yes, many of them have novel ideas or have found a way to exploit a new market as a first mover. But having a novel idea or being a first mover into a new market isn't the same as changing a paradigm or changing the way we think.

If you were to go into a book store and pick up any of the 20 bestselling business books, nearly every single one of them would use the word "innovation" repeatedly. In this era of economic growth (meaning the era from the industrial revolution to the present) we've become fascinated with how and why companies succeed and how great business leaders are able to accomplish success, wealth, fame for tgeir organizations or individually. The business section of the book store is full of self-help books that claim to peel back the layers and give readers some insight into the "magic" of innovation and how we or our companies can become innovative and successful.

This fascination might be called the silver bullet theory or a grail quest. We're constantly looking for a magical answer.

This idea, this concept of "innovation" has become a myth in the modern business world. There's something magic or transcendent

about so-called innovative companies and leaders. And most of the rest of us are clambering to figure it out.

Part of the problem is that few if any of these companies could accurately explain their own success. Certainly, marketing VPs and the media will create very compelling fairy tales built on the hero myth that will titillate our fascination and desire to understand the magic in these companies and individuals.

Hero myths usually have three main components, a hero, an obstacle (or sometimes a villain) and the use of some extraordinary talent or magic to overcome the obstacle (e.g. slay the dragon) and set the world right again, on the correct path. In the realm of innovation, innovative heroes often draw on a new technology (e.g. magic sword) or use their special ability to see unseen opportunities that others don't see and to overcome some obstacle, usually a barrier of entry into the market. If this barrier is described as a villain, it's usually a dominating company, a Microsoft-type entity that is all powerful and controlling, sometimes a monopoly or near monopoly. Sometimes the entry barrier or obstacle might be a government agency or bureaucracy. Think of Star Wars and the role of The Empire.

One interesting point is that we talk about innovative people or companies more than we do about actual innovation. One is an adjective we use to describe someone or something. The other would be a noun, an actual thing or occurrence or result.

This distinction is important because innovative people or companies may not have actually done anything innovative yet, but we like to give them that ability, as if innovating is a character trait. Same with products. We attribute products as being innovative in some way, which is basically a marketing pitch.

For the sake of narratives, we like to understand innovation in terms of the hero myth, where an individual overcame some challenge. Or the individual (or company) has some special ability to see invisible things in the world, that the rest of us cannot see. Unfortunately, these narratives are made up in retrospect and often, only loosely fit the facts, if at all.

36. To name a few: Fannie Mae, Ford, Motorola, Sony, Walt Disney, Nordstrom, Circuit City. Daniel Kahneman, in *Thinking Fast and Slow*, explained the principle of regression toward the mean, that if a variable was measured at an extreme on the first measurement, it would tend to be closer to average on a second measurement. The companies that Collins measured, as a group, tended to regress toward an average and did not show long-term visionary traits.

One of the main mythologies that we associate with entrepreneurs and visionary leaders is the idea of creating something new or discovering a new frontier. The idea is perhaps as old as narratives and language itself, but certainly is prominent in the American myth of the Western frontier, which many use to describe scientific and technological advances and discoveries. Silicon Valley is often seen as a metaphor of the Western (or American) frontier.

We even use the word "Maverick," which was the surname of a Texas rancher who refused to brand his cattle and went his own way, to describe just about any entrepreneur who is guided by a strong sense of his own unique vision and refuses to heed the warnings or advice of others, "the naysayers" as they often refer to those advice givers after they've become wealthy and successful. Typically, when such an entrepreneur is successful, they tell the story of sticking to their vision against these naysayers and others who questioned them. Their own story becomes one and the same as the myth, a retelling of it. And we forget all the "Mavericks" who failed and whose numbers dwarf the success stories a thousand fold or more.

INNOVATION, LUCK AND THE PERFECT STORM

Another aspect of this narrative: We tend to think innovations are the result of focused intentions.

To us, this assumes that outcomes are intended, which isn't always the case or which we believe is actually rarely the case. Almost always, luck plays a major role in innovation outcomes. Although we may be able to envision a new product or service or identify a new market, we rarely can predict actual outcomes.

Luck is largely undervalued in the business world as people have an almost innate need to create a cause and effect linear progression of explanation after the fact. This happened because what came before caused it. Without these explanations, which we'll call mythologies, the world wouldn't make any sense to anyone.

We might say luck is almost un-American. If we were to take it seriously, it would devalue all the myths we hold so dear, the idea of the American Frontier and the visionary leader and entrepreneurialism. That's why there's so little research on luck because if luck played any significant role, our myths become unstable and the world we believe in, the values that give us inspiration each morning may actually have little or no meaning.

In his book *The Black Swan: The Impact of the Highly Improbable*, Nassim Taleb explained that people need to create explanations for why things happen and that these explanations are either extremely oversimplified or dead wrong most of the time. But they give humans a sense of understanding over the world.

This isn't to say that we believe people cannot be innovators and effect innovations to occur by a deliberate process. We think people can position themselves and train themselves to think differently, to approach problem solving from angles that aren't immediately obvious. We also believe that persistence in any endeavor will often lead to more positive outcomes than if we quit in the face of adversity. Some might say through persistence, we make our own luck. We'd disagree, but certainly persistence increases successful outcomes.

Many organizations believe in or even apply this operational strategy with the hope of realizing innovations or results that lead to business success. Some organizations have even formalized this sort of approach by creating innovation labs. Think XeroxPARC, IBM Research or Research at Google. Some of these efforts have resulted in product successes and some have produced what amounts to business garbage. Most of their efforts fail, but occasionally, something novel and surprising emerges. We rarely hear of the results because they are working on specific problems that might not have widespread use or appeal.

As a footnote, we might wonder why some of these deliberate efforts succeed and some don't. Without going into this topic too deeply, we believe that innovations (using this term very loosely) seem to occur less frequently in open, freeform environments, where individuals are given boundless freedom to create whatever fancies them. Typically, they'll be more productive and come up with better solutions in an environment with a problem to solve and greater restrictions on their abilities. The Manhattan Project is an example.

Back to understanding luck. Successful innovations or even simple business success is often the result of a whole range of factors, many of which we would consider luck. But perhaps a better way to look at it is to think of a business success as occurring in a perfect storm. Say a company identifies a new market for a product and is successful in entering that market. The factors that create that outcome are usually not linear, but amount to "a perfect storm" of events, ideas, economies, and people converging in some largely unpredictable way. To predict outcomes, as we wont of entrepreneurs and visionaries, in essence is to predict the weather next month or next year. So many variables are at play. Most of them aren't even visible to us in any way. This is what luck is. It's not to say there isn't a logic to outcomes. It's only to say that understanding or recognizing all the variables is far beyond the capabilities of the human mind, especially because our perspective on the world is from a very limited point of view in time and place.

INNOVATION, LUCK AND SUCCESS

Success and innovation really have no relationship to one another. It's something that we've created, a mythology for success. Success happened because of something or someone innovative. We've created a simple, yet false, connection in place of the perfect storm of countless variables influencing an outcome.

It's our feeble attempt as humans to try to understand success. The cause, at least in today's media and marketing departments, often comes down to the innovative person or product playing the leading role in our narratives about success.

I was reading earlier about Twitter and its success. The founders have realized unfathomable wealth and fame from their product, but they acknowledge they didn't know what Twitter was as it was being developed and even as it grew. The story hadn't been written yet. It was a confluence of a perfect storm that was completely unpredictable in every single way.

Now, we can look back and call them visionaries, but the truth is they were no more visionary than anyone else in the world. They didn't see any sort of future for their product remotely like what occurred. It just came about that way. It was fully unintentional. They were doodling experimenters and stumbled in blindness upon a winning lottery ticket.

I believe the same can be said of most of the blockbuster successes: Facebook, Google, YouTube, eBay.

No one knew what they would become and often, their aspirations were much, much smaller and often had almost no relation to how these products and success stories evolved.

Yet, when these occurrences and paradigm shifts occur, the business world brands the experimenters as innovative visionaries and they are handsomely rewarded. Moreover, there's a general sense that they somehow captured some bit of elusive magic. In their wake, there are waves and waves of articles and books and seminars that claim to understand what that magic was and how we might capture it for ourselves.

Venture capitalists will also place heavier and heavier bets on those individuals that have won the game once. Yes, the luxury they are afforded from a major win allows them to keep experimenting and perhaps they'll be struck by lightning again. But even then, it would be heavily influenced by luck and the perfect storm more than anything else.

EXPERTS, LUCK, PEDIGREE AND IVY COVERED SCHOOLS

Part of this perfect storm would be pedigree. People born and raised and who go to school in areas that relish entrepreneurial spirit and are grounded in the mythologies of innovation, the American frontier and so on will realize more entrepreneurial success than people not born or raised in these areas.

Pedigree would include access to highly ranked schools like Stanford or Berkeley or Harvard, where the connections and access to capital are much greater than say at the University of Arkansas or Mississippi State.

Naturally, we're going to see more entrepreneurs and more successful entrepreneurs in these areas. But we'll also see far more unsuccessful entrepreneurs and failed business ventures. The problem is we don't pay attention to the failures or their massive numbers. We focus on what we want to see: The success stories.

EXPERT STORY TELLERS

Back to mythologies and the narratives we create.

Nassim Taleb and Nobel-winning economist Daniel Kahneman both have pointed out that all the so-called experts in the financial industry are frauds. They claim to be able to pick winners, but statistics clearly show that no one has ever been able to pick winners consistently, year in and year out. Most suffer from selective memory, so they're able to create a narrative for themselves that leads them to believe they know what they are doing.

Taleb even pointed to a researcher who found that so called experts were actually worse at picking winners (the more they knew, the worse their picks were) than complete non-experts, say a taxi driver or any 13-year old.

You can find these so called experts in a whole range of fields: politics, economics, finance, venture capital, sports and so on. Taleb said you want an expert when it comes to fixing the plumbing, but not when it comes to picking stocks or predicting the winner of the Super Bowl or an election.

Too often, we turn to so-called experts who will create reams of analysis and barely decipherable data, that ultimately will be used to support a preconceived position.

Taleb recognized that most, if not all, of these sort of experts were basically selling snake oil and that in fact, non-experts often can provide better advice than "experts." In general, the less indoctrinated someone is within an industry, the better advice they'll be able to provide.

These experts are the ones who create very compelling narratives. They are great story tellers and we easily get mesmerized by them. They lay things out with such simplicity and elegance. Their views and stories fit the facts (and they get us to discard other non-conforming facts without even realizing we're doing it) and we buy whatever they're selling.

HOW DO WE THINK?

Let's turn our attention for a bit to two underlying aspects of innovation. We've already talked about our propensity to create narratives, mythologies if you will, to explain events and occurrences, to put order onto the world. And we recognized there's a whole class of expert story tellers who carry business cards with titles like economist, financial planner, financial analyst, risk manager, strategist, and management consultant, to name a few. We'd like to look a little deeper at how our minds work and how they create these stories.

This serves two purposes, first to understand how those narratives are created. And second, perhaps more interestingly, how the creative process works and how it can be used positively in problem solving and as part of the engine that can realize innovation.

It's a bit ironic that our thought processes create the mythologies, the same ones told over and over by expert story tellers, that provide for a stable outlook on the world and yet those same processes give us the ability to create new and novel ideas that can be innovative.

Perhaps, it's the great irony of being human. We have the ability to create magnificent false (yet believable and often widely accepted) stories about reality and yet, we can apply that ability to realize new ideas and new works of art and to let it guide us into new understandings of the universe. It's the basis for scientific exploration and it's vital

to our evolution as a species, an innate trait to find new connections and new paths of exploration and to discover the previously unimaginable and unfathomable. It makes up all the qualities that we identify as innovative and creative as well as all the qualities that lead us to create mythologies and false narratives. We'll call these thought processes "associative thinking."

WHAT IS ASSOCIATIVE THINKING?

Generally, it's a term that we use to talk about non-linear thinking.

Amos Tversky[37] and Daniel Kahneman, who won a Nobel prize in economics for work in decision making and cognitive biases, explains that our brains are wired to make associative decisions on very little information. They called it Type 1 thinking, where we make quick decisions. We're wired to make associative connections quickly, with little analysis. Kahneman refers to this as our lazy mode of thinking or thinking fast.

According to Kahneman, this so-called "fast thinking" is our de facto thought system and helps us survive in an unforgiving world. He also explained that the other type of thinking, "thinking slow," takes a lot more focus and hard work and is based in making decisions by slow methodical analysis.[38]

This Type 1 thinking, or associative thinking, uses a form of metaphor to make quick connections. For example, we may jump at the peripheral sight of a stick and do so repeatedly, as we associate the stick with a snake. This hard wiring has caused us to look stupid and waste energy every time we jump, 99 times out of 100. But the 100th time we jump, when it turns out to be a snake, we've avoided being bitten.

The metaphor occurs because we substitute one thing (a stick) for something else (a snake) and make that conclusion with almost no analysis or revving up the mind to do the hard work of decision making, which by the time we've made a decision, we'd be dead if it was a snake

It's a key piece of our survival wiring and isn't exclusive to humans. Many animals carry this same reflexive-like trait and it has led to their survival as a species, as it has for us.

In today's world, we use this trait without thought to make quick decisions all the time with very little information and without doing any sort of deeper analysis. This can lead to making bad decisions over and over, and these decisions can make us look just as foolish as when we jumped at the sight of a harmless stick.

But, this trait has an upside as well.

Even though people often spend most of their time making decisions in this lazy mode of thinking, it can be used productively to approach a problem from a new angle or exercise creativity. We were given this tool as a means to survive, but we've learned to use it in other ways.

This ability to connect associatively enables us imagine, create great works of art, explore ideas, try new things and find new connections between things in the world. We have an almost limitless ability to create new metaphors and to creation relationships among things to alter our perspective and understanding of the world.

This, of course, can lead to unimaginable innovations and works of human creativity.

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37. Daniel Kahneman won the Nobel prize in 2002 for their combined research. Amos Tversky died in 1996 and wasn't awarded the prize because it isn't given posthumously.

38. Turning back briefly to the financial planners. Don't they spend a lot of time pouring over numbers and running computer programs that deeply analyze the market and companies? Yes, but. Yes, but in reality, their research looks at past trends and averages and they use those trends and averages to extrapolate what will occur tomorrow. Unfortunately, it's not that simple. The research is rarely scientifically based and usually is created with the purpose of supporting their decision processes. Second, and far more important, that research ignores outliers or unforeseeable events, which as Taleb explains, most definitely will alter and change outcomes to such a degree that no one is able to predict what they will be and when they will occur. He calls these "Black Swans." Their ability to predict outcomes is about as good as a weatherman in telling us what the temperature will be at a certain time of day in three or four months.

THINKING OUTSIDE THE BOX AND INSIGHT PROBLEM SOLVING

In the 1960s and 1970s, management consultants and business strategists used a popular puzzle to demonstrate the value of non-linear thinking, which led to the overused business cliché "Thinking outside the box."
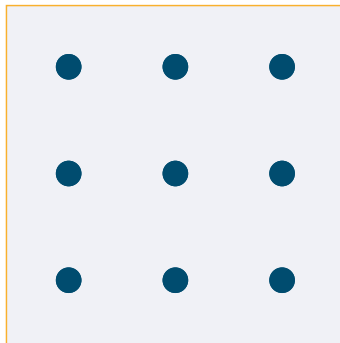
The nine-dot puzzle* featured three rows of three dots. Puzzle solvers were asked to draw four straight lines that would connect all the dots without lifting their pencils. All the possible solutions required drawing the past the box created by the nine dots. The solution was referred to as "thinking outside the box," which took a non-linear process to solve. One had to break from the constraints of the context and framing of the problem to find the solution.

This led to an increasing interest in creativity and associative thinking as part of business strategy over the last 40 years. The best ideas might not be immediately recognizable and can sometimes be discovered by going against convention and common thinking.

Part of the process of solving the nine-dot problem is related to understanding metaphors and drawing associations between things or ideas. It begins with breaking away from the logical connection or long-standing convention that has been formed in our minds about something. In this case, we

*Solution on page 60
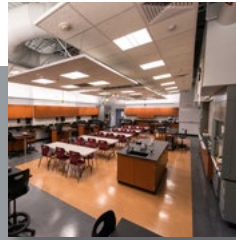
PBL, ARCHITECTURE AND DESIGN THINKING

Is PBL just another type of design thinking?

Design thinking for education?

Yes and no.

Design thinking was popularized in the mid 2000s, but its core components go back much further. In many ways, PBL and design thinking share much of the same history, though schools have only recently started using the term "design thinking."

Design thinking evolved from some of the group collaboration and innovation processes in the 1990s. In the mid 2000s, IDEO popularized the term design thinking, even though the practices were in widespread use previously. It just wasn't called Design Thinking yet.

In many ways, design thinking and innovation are two sides of the same equation. Often, the process of design thinking uses a collaborative problem solving approach to a problem. Some of the ideas come out of the fields of architecture and industrial design, where companies focused on creating work spaces that improved workplace collaboration and problem solving. This led to a whole systems approach to critical thinking and problem solving in groups.

When CART was formed, its architecture lended itself to the new identity it was trying to create.

The building was an old pump factory and didn't look like a school. In the classrooms, there weren't rows of desks facing a chalkboard. There were tables for group work and teams to collaborate.

The project based learning part is that there needs to be activity," said Susan Fisher. "When we designed the classrooms, we had tables and chairs. We did not have desks. And we chose furniture that could be reconfigured."

The furniture needed to facilitate group collaboration and problem solving. This paralleled the many approaches in collaborative problem solving in the 1990s that lead to design thinking in the 2000s.

Some schools that use PBL, such as the Nueva School in Hillsborough and charges $22,000 to $41,000 per year for students, have marketed their programs as "design thinking" schools. In fact, Nueva has partnered with Stanford's d.school to bring design thinking into the classroom.

Nueva has become a cutting edge example of applying design thinking in the classroom. They've held conferences attended by legislators and leading educators from around the world.

While schools like CART may not carry the same current notoriety as Nueva, the programs may not be that different. The foundational roots of how and what they teach share many of the same ideas and come from parallel genealogies.

Design thinking and PBL share many of the same roots and are as related as two close dialects in the same language.

automatically form the nine dots into a box shape and that frames our approach to solving the problem and it limits us.

So, the first step is to break away from our existing understanding. This is also the case with metaphors and other types of associations. To understand a metaphor, we often have to let go of the literal meaning of something. For example, we all understand what the phrase, "It's raining cats and dogs" means, but we have to set aside the literal meaning of cats and dogs to do so.

Humor often draws on metaphorical understanding, as we associatively tie two ideas together. Humor can play on multiple meanings of a word and as we make the associative connection, we understand the joke.

We can actually train ourselves to improve our associative thinking abilities. There are certain problem types that require us to break convention or logic or literalness to understand and solve.

These are often called insight problems. One type of these problems uses three words and the problem solver is asked to find a word that connects them.

For example: pie, crab, sauce[39]

Often, the solution just comes to the problem solver. They can't identify the process or steps it took to realize the solution. They call this the Aha! or Eureka moment. The solution appears as a light bulb being turned on.

*Solution to 9 Dot Puzzle on page 59
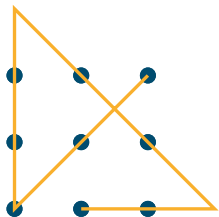
39. The answer is apple.

The same thing happens when people see the solution for the nine-dot puzzle for the first time. A new connection and an understanding about meaning is made. Actually, we don't have to solve the problem ourselves to have the Aha! moment. It's a moment when we reorganize our understanding of things. Solving the problem or even just being given the solution leads us to that new understanding.

AESTHETICS AND INNOVATION

There's a growing field in evolutionary science focused on aesthetics as part of our human hardwiring. This has been a controversial field as many people feel that aesthetics is generally cultural, where people in the Europe might like one type of music and people in India might like a different type of music. Or people in Nashville might like country music and people in Seattle might like grunge music.

While many aspects of aesthetics are cultural, some scientists believe aesthetics are part of our hard wiring.

Denis Dutton, in his book *The Art Instinct*, argued that people everywhere appreciate landscape renderings that look like African savannas. He suggested that we're hard wired to recognize the beauty in the landscape, not because it's inherently more or less beautiful than any other rendering of nature, but because to early man, such a landscape was where we found food and water and safety. We could look out in 360 degrees and see dangers approaching at a distance. There's an order to the arrangement that resonates.

That order translates as an aesthetic to us.

Similarly, we've discovered also that an elegant mathematical formula triggers the same parts of the brain as music in functional magnetic resonance imaging machines (fMRI machines).

Without going deeply into the vast field of aesthetics in this essay, we'll summarize as best we can.

The brain seems wired to find or create elegant connections and associations and seems to have the ability to differentiate the elegant from the non-elegant.

This lends itself to creating an order in the world around us and in creating a narrative about the world. Part of a good narrative is the aesthetic element. Does it seem to fit the facts easily? The more it fits the bits of data and information we have about things, the more elegant it will generally be. Expert story tellers are very good at this.

Art and new creations of any type are often appreciated because they lead us to see the world or ideas in new ways. Like the insight problems, they get us to form new associations that resonate in a meaningful or significant way and generate aesthetic harmony. And like the Insight Problems, they can get us reorganize our understanding of the world.

What does this have to do with innovation?

This speaks to our ability to dream up new ideas and find or realize elegance where it wasn't recognized before. We can experiment and create and find new associations and interpretations of the world. We can also do this with problem solving and being drawn to solutions that seem more elegant than other solutions.

Likewise, it also is part of the inner workings of the narratives and the mythologies we create. We want to find simple and elegant explanations for everything, for our business problems, for why some individuals or companies succeed, for why things happened one way or another.

To us, the search for the roots of creativity and innovation emerge from the same fabric that creates metaphors and links associative ideas and gives us a sense of aesthetics and forms mythologies and narratives.

LET'S CIRCLE BACK NOW TO THE QUESTION, WHAT IS INNOVATION?

Innovation, to us, is largely a change in thinking. It's a process for understanding the world in a new way, whether we are looking forward to create something new or looking backward and creating a narrative. Both forward and backward processes are driven by our ability to imagine a certain (and often different) reality, perhaps an even unimaginable reality.

Sometimes, an innovation may not be recognizable for a long time or may even be put into a narrative that's singularly more shortsighted. That's partly what we found in looking at some of the history of project-based learning. The story of PBL and the narrative was one of erasing and forgetting, which is part of creating any narrative or mythology.

We need to forget how we associated things before in order to come to a new understanding. This is the process we saw in solving the nine-dot problem or in understanding any metaphor.

It's also the process that organizations and companies go through as they change direction or develop a new corporate culture. This process is called *organizational unlearning*.

ORGANIZATIONAL UNLEARNING

Before we finish this section's essay on innovation, let's turn back to CART briefly.

One of the interesting things we noticed in doing this case history on CART was that many of the so-called innovative ideas that schools are implementing today have been around since at least 1990 (the year we focused on for the start of this case history) and possibly much longer. Some of the core ideas go back to John Dewey and even as far

back as The Renaissance or Plato and probably even back to the emergence of language itself.

In looking over 25 years of project-based learning initiatives, it seemed that every five or so years, there was a memory loss of what came before. Ideas were re-discovered and brought to light under a new banner or name. Or perhaps a new initiative rebranded an idea as its own, so the historical aspect was glossed over or lost.

In short, there was a memory lapse.

We believe this memory lapse is part of the process of creation, in this case creating a new organizational identity as well as a new narrative.

We saw many of the same principles recurring over the years, from 1990 onward and we're told that they existed well before then. An interesting footnote is that PBL was rarely the term used to brand any of these initiatives. PBL appeared as a singular method among other pedagogy under a brand or school of thought like Expeditionary Learning, Deeper Learning, Envision, Small Learning Communities, small classes, Design Thinking. Sometimes, project-based learning wasn't even referred to as such, particularly in the case of schools that more recently branded their efforts under Design Thinking.

The interesting part is that project-based learning and real-world learning were often the common denominator in these efforts, but it was rarely the piece that leaders and visionaries focused on.

Why wasn't PBL more prominent in these individual narratives?

Project-based learning isn't sexy. People often look for something that stands out, that grabs our attention, like

technology or outdoor expeditions into the wild. These are the pieces that we latch onto and that we base our narratives on, even if they happen to be secondary to the success of those efforts.

Some of the schools that focused on technology, like CART, found that tech really had little to do with student success and in some cases became difficult to use and maintain.

A successful narrative needs to be elegant and project-based learning doesn't lend itself into that story. It doesn't have a role in the hero myth like technology might or the great outdoors might. Even the concept of design thinking, which has become so popular in business schools today and at Stanford's d.school, is built around a great narrative, that people can unite and collaborate to solve exceptional problems, which is part of the greater American myth.

Another facet of these memory lapses is that unlearning is part of renewal and taking an organization in a new direction.

New leaders come along and they take an organization in a new direction, often erasing what came before them. Interestingly, in our interviews for this case history, we attempted to talk to people at the Autodesk Foundation but couldn't get any answers. The Autodesk Foundation was shut down for a number of years and came back as a new organization with a new mission. There was not a single mention of project-based learning or PBL on the Autodesk website. The legacy had been lost.

All types of organizations can struggle with hanging onto institutional knowledge. People retire or change jobs. New leaders come in and take their organizations in new directions. After several iterations, there might not be anyone left in an organization 25 years down the road. This

is more common than we might think. Unless an organization has a historian or a librarian, then they'll probably forget their internal history over time. There was a segment on PBS a number of years ago about NASA engineers rummaging through a space junkyard to backwards engineer a rocket that could go to the moon. Surprisingly, they had forgotten how to go to the moon.

UNLEARNING AS ORGANIZATIONAL STRATEGY

Unlearning can also be a strategy to change corporate culture or tradition because those traditions may have become old or stale or are keeping an organization from realizing its potential. The narrative needs to be changed and often, the only way to realize a new narrative is to start over, to create something entirely new.

Sometimes this can be done throughout an organization, though it usually takes strong leadership up and down the organization. Other times, organizations will create an incubator that's safe from the social, cultural and political pressures throughout the rest of the organization.[40]

That's what happened with CART.

In looking at CART, part of its success was that it was formed as a nearly completely separate entity from the other schools in the two school districts. It was able to invent itself anew, to become whatever it could imagine of itself. If CART had to follow tradition and adopt the same organizational cultures from the home schools in Fresno and Clovis, it would never have become what it is today.

Instead, it was inspired by other schools like the Saturn School, Drake and New Tech High, and leaders like Joe Oakey and Walt Buster and Michelle Swanson and Arthur Costa.[41]

This is part of what makes it innovative. It was able to become something new with its own historic narrative separate from every other school in Fresno and Clovis. It

broke the rules of what a school is or could be, and created a new narrative of what education can be, at least in the context of Fresno and Clovis.

CART demonstrated a change in thinking that goes beyond novelty or discovering a new market niche, as so many of the organizations recognized by *Fast Company* are known.

In the next section, we'll look much closer at some of the aspects of CART that drew our attention and that either lended themselves to CART as an innovation or to CART as a model of organizational and visionary excellence, which isn't necessarily an innovation but should be appreciated all the same.

INNOVATIVE PEOPLE AND COMPANIES

Finally, as we wrap up the essay in this section, let's talk broadly again about innovation. In the popular and business media, we often use the word "innovative" to describe the character of successful companies, products, people and ideas.

It's so broadly used, the word itself is almost a cliché and likely will become one in the not too distant future.

I turned on the television last night and was watching an episode of a reality competitive cooking show. During the episode, the word "innovative" was used to describe food and methods of making food more than a twenty times.

This term has wormed its way into just about every facet of our culture. It's nearly impossible to get through the day without being lambasted by a description that calls some product, person, company, process, or idea "innovative." Marketing vice presidents have decided that consumers want to know that the products they're buying are innovative.

Which begs the question, Why then are we writing an essay on innovation?

Partly to own some of the underlying themes and ideas that we find important and interesting in how we understand organizations, behavior, and the world around us.

While we may lose innovation to the graveyard of business clichés eventually, we can still extract what's important about innovation and why there are facets of it that can guide our understanding of the world and of human and organizational behavior.

Some of the underlying parts of innovation are the very things that make us human, that guide our thinking and problem solving, that lend to our great capacity to be creative. These are all important reasons to study and understand innovation as well as we can.

SO NOW, LET'S LOOK AT THE CART NARRATIVE

We've presented an historical accounting of CART and project-based learning. Our story has heroes like Joe Oakey and Walt Buster and Michele Swanson and Steve Ward and Susan Fisher and the CART teachers and CART students and many, many others, but we can also look at the CART narrative as the unfolding of educational ideas in practice, some ideas going back to John Dewey or even to The Renaissance or further back.

We're not sure if this is the story of ideas or the story of people or both. What Bruce Goldberg said about some of the PBL schools actually rings true for the history of ideas in general.

"It's hard to separate out the contextual environment in which innovative PBL efforts are launched from the efforts themselves. Each has a different context in which to grow (or not), and these educational ecosystems, which include soils rich or poor in policy, economic commitment, technological infrastructures, etc., have a lot to do with eventual success or failure of attempts to reach scale."

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40. Startups and entrepreneurs often operate in a relative, self-created vacuum. They have the luxury of creating something from a blank slate. They aren't restrained or influenced by an existing organizational culture.

41. Arthur Costa never worked directly with CART, but his Habits of Mind influenced the values that were nurtured at CART.

Looking at CART or any case history on innovation, we find that "innovation" starts to muddy a little as it can't be pinned down to a distinct point in time. It resembles a process of evolution and change and adaptation that occurs, trial and error and luck. It's a perfect storm that converges in a way that something new and novel is created, and moreover, is able to adapt to the changing environment and even thrive, and ultimately changes the way we think, changes a cultural narrative. The CART story was remarkable in this way.

But often, as the stories are told about innovators or innovations, the historical context gets washed over or fuzzied, such that innovation stands out better against a whitewashed backdrop or put into the context of a hero myth.

We found it almost impossible to pinpoint when the catalyst of change occurred. The more we peeled back, the more we found the same ideas retold and reinvented again and again. We seem to have a tendency to organize the world into these pre-existing mythologies and retell them over and over, only with new heroes and new obstacles.

Maybe that's okay. We can understand these tendencies and accept them.

LEADERSHIP

Management and leadership are often misunderstood within large organizations. One of the biggest problems that organizations face is creating and sustaining a culture that focuses on the front line work.

Why?

Because many managers don't understand the basic aspect of business or organizational success.

When we turn to CART, one of the most immediately noticeable things that attracted our attention was that the managers are good managers. They understood the importance of organizational culture and worked hard to embrace a positive and supportive work environment.

They also understood that a big part of their role as an administrator was to give teachers the tools and support they needed to deliver the best educational experience possible.

There's no labor-management strife at CART. There wasn't a division between the worker and the manager that often is a symptom of a dysfunctional organization.

Terry Bradley said that he knew an administrator who could walk into any school office and know within 15 seconds whether the school was alive or not, whether it was delivering an excellent education. The labor culture cannot be hidden.

To just about any outsider, such a culture is visible from a mile away. You don't need metrics or analysis ad nauseum to recognize the internal health of an organizational. Bring in any sort of outsider and that person will often be able to tell at a glance if a school is alive and if it's having a positive impact on the students.

Every single teacher we talked with spoke about how much they loved working at CART, how they woke each morning inspired to go to work. How often do you hear this about a company? Almost never.

The Great Place to Work® Institute actually tries to measure this value and creates an annual list of the best companies to work for. We'd like to see them look at schools across America and find the ones with the best work environments. We believe CART would be on that list.

The reason?

Because the leaders and managers and teachers and stakeholders all share a unified vision for what they are doing.

Leadership is a key aspect of any innovation success. Though we believe outcomes are often wholly unpredictable, good leadership will lend itself to creating and sustaining a healthy organization that will have a greater chance to succeed in its mission.

Specifically, CART's leadership had a vision, had the guts to initiate and try to realize that vision. Further, they had the constitution and stamina and to survive many of the hurdles and setbacks the school faced in those early years. It would have been easy for the districts to shut it down.

Second, those leaders were proactive in pursuing ideas and thinking about education in new ways, exploring the possible instead of focusing on their limitations at the outset. This meant thinking about teaching systems in new ways, thinking about operational systems in new ways, about exploring possibilities, even ones that seemed unlikely.

Part of taking that kind of risk is understanding that not everything is going to work out. Two of the school's initial administrators brought extra baggage to the relationship and didn't put the school's core mission above their own visions and agendas. The school, remarkably, was able to survive this.

Timing is also part of it. Bradley said that if Walt Buster showed up a year earlier or a year later, CART probably wouldn't have happened. We agree. This is part of that perfect storm that's required for innovation to happen.

ADAPTABILITY

One of the most interesting aspects of CART is its adaptability.

The program was beset by at least a half dozen major hurdles and any one of those hurdles could have derailed or killed the effort entirely. We'll highlight a few of the more extraordinary ones:

1. The first CEO focused on using CART to create a franchise business model. He wasn't successful in selling the business model and left CART in the second year. Also, in that first year, the principal was fired.

   The school's leadership, the board and superintendent, and other administrators had to scrap his vision and find a way to survive without the funds that had been built into the CEO's original business plan. They had to figure out what it would take to keep the school open and find a way to make it happen. This meant trying to find other funds, but it also meant that teachers chipped in to help recruit students. If the student population dropped, the school wouldn't have been able to justify its costs.

   The teachers were somehow able to stay focused on teaching with all the distractions. The CEO didn't know any of their names. The CEO and the principal didn't speak to one another. The principal was lobbying half the teachers to help get her job reinstated. Yet, somehow, the teachers believed in the product in the classroom to such a great degree and they had such enthusiasm for teaching that they didn't let the noise distract them.

2. The technology failed to deliver on its unattainable promises and cost the school a ton of money. The first CEO had this vision of implementing cutting edge technology, none of which had been tested in schools at the same level previously.

   The hard lesson they learned was that the technology didn't live up to the billing and the school had to eat the cost.

   As Steve Ward noted, schools don't need cutting edge technology. They need technology that has been tested and proved for that environment. Further, schools can't afford to stay on the cutting edge with technology.

What added insult to injury was when people from the Gates Foundation visited and the technology didn't work that day. This could easily have taken the wind out of their sails, but the teachers kept their focus on teaching and rolled with the punches.

3. The school was launched without any furniture. Later, the CEO was able to get furniture donated or purchased at a discount. The furniture actually turned out to be one of the innovations. The classrooms looked more like conference rooms or work areas with students gathered in groups around tables instead of in rows of desks. Some of the approaches to collaborative problem solving over the last 20 years have used the same type of architecture and design in creating spaces that invite participation.

   How do you open a school without furniture? Well, CART did it. In a startup, people find a way to rise to the daily challenges and do whatever's necessary.

4. The two districts had a long history of bad blood and represented virtually opposite ends of the socioeconomic spectrum.

   No one was sure that students from wealthier neighborhoods and students from poorer, urban neighborhoods would get along in this environment. It was an experiment and not only did they get over the hurdles, the school found that bringing students and these two communities together was part of the magic that was created at CART.

5. One school district was unionized and one wasn't. This created an additional barrier between teachers initially. In the beginning, the Fresno teachers were in labs with other Fresno teachers and the Clovis teachers were in labs with Clovis teachers. They self segregated, but as they developed trust in the school and the other teachers, this dynamic disappeared.

It's rare for union and non-union organizations to work together with a shared goal. We would typically expect a relationship like this to force the issue with union leaders and school district managers. But it was really a non-issue. The teachers all wanted to be at CART and both the school districts and unions, to their credit, stepped back and let CART evolve on its own, more or less.

6. Getting Fresno kids to come to CART without much support at Fresno home schools

   It's still an ongoing issue to get an equal number of kids from both districts. Its location makes it tougher on Fresno kids who have take a longer bus ride. This is an issue that will likely require year in and year out attention and effort, particularly as contacts at the home schools (counselors, teachers, administrators and others) turn over. Because there will always be new people in jobs at various schools and in the school district, CART will always need to make its case. It can't afford to sit back and expect students to come.

Despite these and other hurdles, the teachers taught classes and the high school persevered as a high school.

CART will have to continue to adapt to the needs of students, parents, government standards, and two school districts in order to survive. The current leadership is focused on looking forward and identifying new opportunities to try new things, to improve upon the program, to impact the lives of more students.

This harkens back to the Japanese term, "kaizen." The current leaders have good ideas for trying new things and experimenting and they are constantly looking for ways to make the school even better and more accessible to more students. They may not use the term "kaizen" but the idea of continuous improvement is in the school's DNA.

At a time when schools around the country were starting to focus on standardized test scores following the passage of No Child Left Behind, Walt Buster and Terry Bradley and the school's administrators remained focused on education, not scores. They knew that scores had little or no relation to student outcomes and success. But scores couldn't be completely ignored, since funding was tied to them. The school found a way to adapt, by incorporating test objectives into the core student projects.

The school's ability to adapt is one of the things that makes it innovative. Innovation is often about the process of change and if an organization isn't able to adapt, it will like become extinct.

BRIDGING TWO COMMUNITIES

Like some of the other successes of CART, this one wasn't necessarily ever envisioned, but it was a true after effect. Clovis couldn't do CART without Fresno and it's likely Fresno couldn't do it without Clovis. The school brought together two widely disparate school districts and demonstrated that not only can the school districts collaborate, but that the students from the two districts, despite the wide economic and social divide, can be friends and project partners and see beyond the racial and socioeconomic differences that many adults let taint their view of the world.

The teachers, likewise, learned to work collaboratively, even though half came from non-union Clovis Unified and half came from unionized Fresno. The first year presented a problem as they got used to the new environment, with many of the labs separated into Clovis teachers and Fresno teachers. When Steve Ward took over, he managed to get the teachers to come together. Of the teachers we interviewed, we couldn't tell which ones were from Clovis or Fresno. They all seemed to love what they were doing, which we believe creates a lively and upbeat classroom for the students.

Team teaching also seems to lend itself to the energy in the classroom. We would agree with Drake teacher Mary Kitchens' assessment as to many of the values of team teaching, wherein the teachers actually spend time talking with one another about each of the students. Students are much less likely to slip through the cracks or just coast through school.

ACADEMIC RIGOR, PROJECT-BASED LEARNING AND CRITICAL THINKING

While some of the criticism of project-based learning says that it creates a learning environment that is more fun, but is less rigorous. We're not sure "fun" needs to be offset against "rigor." Many people we talked with said that just because it's fun doesn't mean it's not rigorous. That was one of the goals in developing the program, to make it academically rigorous. The fun element makes it more accessible to more students.

If we consider for a moment the interests parents have in AP classes for their kids, we believe it's not that they think those classes are critical for educational purposes, but they are an almost necessity to get into the best colleges and universities. Parents understand the game. Unfortunately, having tunnel vision over things like AP courses can take away from a well-rounded education that prepares kids to be successful in life.

We think AP classes are important. We also think they can be delivered in a project-based environment at CART, which would widen the school's appeal.

We believe schools like CART can incorporate an AP curriculum without changing the dynamic of the existing labs, simply by allowing students to take an AP track in those labs and perform extra research and extra deliverables. One of the academies at Drake used this method successfully.

ECONOMIC IDENTITY, CART AND THE DEVELOPMENT OF AN "INNOVATION CLUSTER"

Innovation clusters often are anchored by collaborative relationships among non-profits, education institutions, developers and a mix of mature and young companies.

Bitwise Industries is trying to create a new economic community in Fresno by focusing on the young people already in Fresno and giving them the tools not only to advance their careers, but to build companies and organizations and industry.

Although this model can be found in industry hot spots around the world, what's really interesting is that Bitwise and CART are choosing to partner. We've seen economic communities partner with universities before, but few have taken this approach to a younger generation of high school students, who are still formulating their ideas of the possible and the imaginable.

We believe that high schoolers often are driven by an unrestrained vision of the future, of the possibility of their lives ahead and of looking for and embracing the unimaginable.

That's why we think CART's participation with Bitwise, in this "experiment" as CART CEO Rick Watson puts it, may change how economic development researchers understand how economic communities can be created.

In the past, researchers perhaps have overlooked perhaps the most important part of the economic engine, what we'll call "the future" and what most people call "children."

It's one thing to speak rhetorically about children molding the future and it's another to put it into practice, as Bitwise and CART are doing.

Although CART is not a college or university, its role will provide a channel for young people from both Clovis and Fresno to mix with individuals across entrepreneurial organizations.

We at IngenioMind have worked on economic development efforts in the U.S. and abroad, including high profile projects in San Francisco and Beijing.

We believe wholeheartedly in the bottom-up approach to economic development. So often, communities look outside for help and outside for others to come in and save their community. They grovel and compete with one another for large companies to move to their city. They offer massive tax incentives or underwrite the development and building of an organization's facilities. They give away the store.

This would be the silver bullet approach, or wishing for a miracle. Often, these approaches fail to meet the levels of hope that communities put on them.

Each and every community has all the tools it needs to build an economic engine and economic identity: People. We don't want to say it's that simple, but it is. If you can give people a sense of place and a grounding to inspire the best in them, to enable them to believe in their own future, then the economic community and engine and prosperity will follow.

In many ways, this is something that can be learned from the kids at CART or young people anywhere. Kids aren't restrained by the same boxes and closed thinking as many adults. Often, we adults think we know better, that we are seasoned and understand the world in ways that kids don't. We're fooling ourselves and that's largely a result of the narrative we've created about our lives and about society. Kids can envision any imaginable future and if that vision is embraced, that future can become reality. They aren't constrained by any narrative and can imagine and create

42. We will say that we're generalizing about adults and that there are many adults who are highly creative and can approach the world and the future with an open mind toward the possible.

one that's wholly unimaginable to adults.[42]

The idea of consumer confidence is distantly related to this idea, mostly in that change and growth are stunted only by how we perceive our potential. Consumer confidence is often an economic indicator of the collective mindset and feelings about the future. Any community anywhere can become what it believes it can become.

ARTISTIC MANIFESTOS, TECHNOLOGY COUNTERCULTURES, INNOVATION AND THE SOUL OF ECONOMIC IDENTITY

Creative industries and people also play an important role in creating and nurturing an economic innovation cluster. They help get people to break from convention and fixed ideas. They help those communities look for different possibilities.

Back in the early days of Apple and Autodesk, as Steve Jobs once reminded us, many of those programmers were artists and dancers and writers and musicians, that they identified with a non-corporate counterculture, that to break the rules was part of the way to move forward, to discover and create.

Today, many of the technology communities of practice and hubs of innovation overlap and merge with artist and writing and music communities in large cities.

We'll even see a merging of creative industries with tech industries as artists become user experience designers and writers become content creators.

To us, this attitude embraces the spirit of the Saturn School of Tomorrow's manifesto. Like many of the manifestos that were tied to artistic, literary, music and other creative and cultural movements, Saturn's manifesto was fueled with passion and love and big ideas and a sense that they could create any future they could imagine. We think more schools and administrators and policy makers and politicians should embrace the idea of experimentation and the idea of a

revolution instead of framing solutions in terms of reactions to what they perceive as failures or in terms of ideological points of view (conservative or progressive).

The people at and around Bitwise are developing a Fresno tech hub and innovation cluster organically, without a master plan. They studied the history and growth of famous tech clusters, such as in Austin, Silicon Valley and Route 128 in Boston.

CART's participation goes far beyond prepping students for college and their careers. The impact of a downtown campus would help dissolve any divisions between Fresno and Clovis, help boost the urban economy in Fresno. While this perhaps wasn't an initial goal ever envisioned at CART, the leadership's willingness to explore new ways to deliver education has opened up doors for both their students and the community at large.

The city of Fresno may want to support and/or join this effort in any of a number of ways:

- Develop a master redevelopment plan for downtown Fresno, using some of the ideas of a technology cluster

- Solicit potential developers and investment partners to help create and develop an economically vibrant community around a shared vision

- Work toward a local identity that incorporates some of the entrepreneurial spirit exhibited by Bitwise and CART

For CART's part, the school may choose to explore and develop a model of using a career tech school to help anchor an economic cluster and a local community, based on the needs of local industry. The focus doesn't have to be on technology. For example, a school that offers student labs in fashion design could be a way to create an economic community in a fashion district. Economic communities are developed by merging community identity, industry, education and culture into a shared vision.

"Education is one of the dinosaur institutions in this country, with many of the practices the same now as they were 100 years ago."

-Bruce Cuthbertson, IngenioMind

The school is taking a real world, real stakes approach to producing forward thinking students and doing it in a way that puts them right in the middle of economic community development.

CONCLUSION

The people we interviewed, the administrators, business partners, teachers, parents, students, board members, past superintendents and PBL experts and outside consultants, all of them praised the program directly or their educational philosophy.

Education is one of the dinosaur institutions in this country, with many of the practices the same now as they were 100 years ago. Change has been painfully slow, as generation after generation comes and goes. Parent advocates move on as their children graduate and the cause is taken up, briefly again, by new parents, but often this means that things rarely change. There's little sustained pressure from the real stakeholders, the parents and the kids.

Instead, change is driven by traditional educators and professionals and bureaucrats and politicians, and for the most part, there's been little agreement about how to change and sometimes, if change should even happen.

It was a novel idea to take an R&D approach to education in the early 1990s. It's unfortunate that the President's vision of creating 535 new, innovative "break-the-mold" schools across America didn't happen. But the legacy of some of those ideas and experiments were realized in the Saturn School of Tomorrow's revolutionary manifesto, in the passion and drive from project-based learning evangelists like Joe Oakey and Bob Pearlman, in superintendents like Walt Buster who weren't afraid to try new things, in some of the early adopters like Drake and Expeditionary Learning and Co-NECT. All of them helped and continue to help change the face of education.

They thought education could be better and that by experimenting and trying new things, innovative new schools would change and dramatically improve student outcomes. They were right.

Perhaps CART's lasting legacy won't be that it was an innovative school so much as it's taught its students to think critically, to explore their passions and ideas, to imagine different futures for themselves and for the world. As we get older, we adults often forget the world we once lived in as children and teenagers. Perhaps we get wiser, but we also lose that sense of eternity and magic and adventure of a life ahead. We lose the ability to imagine a different world because we're so tied up in this world (with bills and mortgages and life's many decisions). That's not to say childhood is without its own challenges and some kids, of course, grow up in very tough environments. But perhaps even they can find potential and future in their ability to imagine a different world.

If innovation ultimately is a paradigm change in how we think, the process of casting off convention and seeing the world differently, then CART has produced, in its students, the very potential and essence of innovation. It has given many students the ability to imagine futures that were unimaginable before they came to CART and it's given them the ability to harness and shape the tools to create their own potential in life.

APPENDIX I

Parent survey

We surveyed 30 parents of former or current CART students online and these are some of the findings.

We believe parents are the primary customers of education and that what they think and how they decide where to send their kids is important, more important even than state standards testing as a metric of a school's success.

Parents can see a school's impact on their kids over time, which generic routine testing of 10th and 11th graders, year over year, can't.

This was a non-scientific survey because the sample of parents was self-selected and we also didn't test it against parents at other schools in the Clovis and Fresno school districts. Further, the sample size was relatively small. Nonetheless, we believe it highlights some of the positive attitudes that parents have regarding the CART program.

Here are some of the parent survey highlights:

MINDSET OF THEIR CHILDREN

· Your child has shown an increase in positive attitude since attending CART
> » 89.65% Agree or Strongly Agree

· Your child has taken more initiative in seeking out new challenges and responsibilities
> » 89.65% Agree or Strongly Agree

· You feel more in the loop about what your child is studying at CART or about what is going on at CART
> » 82.76% Agree or Strongly Agree

COLLEGE AND POST-SECONDARY EDUCATION

· Did your child attend college or post-secondary education within two years of graduating?
> » Yes, 94.2%

SELF CONFIDENCE

· Self confidence level of your child before attending CART

  » 58.34% Low or Very Low

· Self confidence level of your child after attending CART

  » 87.5% High or Very High

GRADES

· Grades before attending CART

  » 54.17% had high or very high grades

· Grades after attending CART

  » 87.5% had high or very high grades

SOCIAL SKILLS

· Had high or very high social skills before CART

  » 33.33%

· Had high or very high social skills after CART

  » 83.34%

ENGAGED IN SCHOOL

· Engaged in school before CART

  » 37.5% were highly or very highly engaged

· Engaged in school during and following CART

  » 87.5% were highly or very highly engaged

PERSISTENCE TOWARD ACHIEVING GOALS

· Persistence toward achieving goals before CART

  » 37.5% were highly or very highly persistent

· Persistence toward achieving goals after CART

  » 86.96% were highly or very highly persistent

PUBLIC SPEAKING AND MAKING PRESENTATIONS

· Speaking in front of small or large groups before attending CART

  » 20.83% were highly or very highly comfortable making public presentations

· Speaking in front of small or large groups after attending CART

  » 87.5% were highly or very highly comfortable making public presentation

COMMENTS MADE BY PARENTS:

· My child was always smart before CART, but lazy and unmotivated by anything. He went to CART, found what he wanted, and has been the most driven person I know since.

· I was truly impressed with CART. The hands on real life applications really brought a spark into my child's eyes when she talked about what she was learning in CART. Yes, she actually talked about school. The days the students had to dress professionally were one of the most applicable to the real world. I would drop my child off at CART and as the year progressed I saw the attire the students wore on those days change drastically from night club to professional.

· It was very positive and professional. The administration and teachers are all there to talk about your child, and help in any way possible.

· That the course load of CART and regular school course load would have been too much. But my child loved the material being taught at CART that she said it didn't feel like work.

We would recommend future surveys that can start to peel back the layers of long-term success at CART and other schools. How do you really measure success? What long-term indicators can we explore? These are questions that very few schools anywhere understand. At the college level, experts have been able to look at long-term outcomes. One important metric, though it seems innocuous, is the percentage of alumni who make a donation back to their school. It's one of the indicators used by many organizations in ranking the best schools and shows that if someone is making a donation, one, they feel good enough about their college to want to give back and two, they have the means to give back. That's partly why the big Ivy schools always rank so highly every year. Of course there are other metrics, but this one reveals one way to measure long-term success.

At the high school level, educators need to look for metrics that can accomplish the same goals.

APPENDIX II

Q&A With CART CEO Rick Watson

IngenioMind: What does it mean for the kids (and for the Clovis and Fresno communities) that kids from two diverse socioeconomic areas can come together and work alongside each other at CART? What do the kids learn? What do we learn from them?

Rick Watson: Students come from 15 different high schools across two districts at CART. Students come from some of the lowest socioeconomic neighborhoods in Fresno and Clovis as well as some of the highest socioeconomic neighborhoods in Clovis. From neighborhoods with the highest level of poverty in Fresno County to neighborhoods with extreme wealth. Students coming to CART from such vastly different backgrounds and experiences provides for a wonderful social experiment.

We believe the students learn to breakdown stereotypes. Students from FUSD find out that the "rich snobby" student from CUSD are just students like them. The CUSD students find out that the "low class gang affiliated" students from FUSD are students just like them. Students from both districts all come here for one purpose: to learn about a career of their choice in a learning environment much different from their home school. They learn to tolerate students with different cultural and socioeconomic backgrounds and experiences. They eventually learn that they can work side by side with anyone regardless of their background.

What we learn from the students is:

We are amazed at the level of tolerance the students have of one another. We learn that when you provide an environment where students are treated like adults and have the freedom to explore solving problems creatively and to do real world projects that the way they respond is by developing the skills to work alongside other students at CART without concerns about their background or where they come from.

Rick Watson, CART CEO

IngenioMind: How does the leadership at CART and in the school district affect students?

Rick Watson: It is important that the leaders at CART and our feeder home high schools from both districts are seen as partnering by having the same goals in mind for all our shared students. CART has always predicated itself as an extension of the student's home school. To consistently reach out to all 15 home high schools is sometimes quite a bit of work but it is important to us. Because we provide such a different learning environment here at CART than the students' home schools' we work hard at minimizing negative comparisons in favor of describing how CART is different. As leaders at CART, we also try to participate in leadership activities in both partners' districts so we can stay abreast of the trends and expectations in both districts.

IngenioMind: Why is CART important to the Fresno and Clovis school districts?

Rick Watson: CART represents one of many college and career opportunities that students have in both Fresno and Clovis Unified School Districts. Students can choose from robust Career and Technical Education pathways and academies in both districts as well as numerous Regional Occuopational Program (ROP) classes. Both districts also offer robust college readiness programs such as Advanced Placement and International Baccalaureate, and a large percentage of courses that are UC "a-g" approved.

CART however, provides a nationally recognized education reform model of education. To our knowledge, there is nothing exactly like CART anywhere else in the world. For two vastly different school districts to come together and partner around such an innovative all be it risky venture is unprecedented. That would be one of the reasons that CART is important to CUSD and FUSD. Around many other aspects of education, CUSD and FUSD are fierce competitors but CART is a program where they must work cooperatively together in order to make it work successfully. CART is truly a joint venture where half of the teaching staff and students come from each district. The classified and administrative staff also come from both districts. The operations and maintenance is also shared by both districts. Our two partner districts support CART's ability to continue striving for innovation in college and career readiness. In turn we are able to continue to strive towards creating and maintain a cutting-edge model of reform education.

IngenioMind: Can CART influence or impact the traditional classroom in Fresno and Clovis? What practices at CART could be used in some of traditional schools?

Rick Watson: CART has always been open to providing the expertise our staff has gained over 15 years in the area of project-based learning, integration of rigorous academic curriculum with relevant career experiences, team teaching, and the creation and maintenance of business partnerships. Unfortunately much of what we do is often seen as only

doable at CART. As we understand that the replication of the complete CART model would be difficult to accomplish, we do believe that the curriculum and the learning strategies can be applied through various means at traditional high schools and in traditional classrooms. Project-based learning that is relevant and incorporates creative thinking and problem solving can and should be incorporated in all traditional classrooms.

IngenioMind: What advice do you and CART have to offer schools and administrators that are thinking about doing something similar?

Rick Watson: It's important to surround yourself with forward-thinking people who are willing to take risks and work hard, especially at first. Get local businesses involved. When they find out that you are thinking of creating a model of education where the product (graduates) are confident individuals who have work-based skills necessary to step into a career or be successful in college, they will aggressively get behind you. I would also suggest that they find a group of innovative teachers that are willing to be creative and implement a different model of education.

IngenioMind: What are the biggest challenges that today's kids face?

Rick Watson: Kids face a host of personal and academic challenges. All challenges affect a student's ability to concentrate and learn. At CART, we work with students

whose personal issues range from the loss of loved ones, to divorce of parents, to teen pregnancy, and a variety of issues in between. Some of our students also have a wide-range of learning challenges that can affect their ability to process and retain information. In general, we believe that students as a whole struggle with learning how to problem solve, think critically and identify a plan for their future. At CART, we believe we help students meet these challenges head-on by orchestrating learning activities that allow them to problem solve and recognize the relevance that their work has in relation to the world of work.

IngenioMind: What makes for a great school and educational experience?

Rick Watson: Relationships. The relationships that the students have with their teachers and their peers will have the greatest impact on the educational experience. When students are in an environment that supports personal and academic growth, are able to work with individuals who care about their success, and take pride in their school and their learning, students will excel. They will believe in themselves and their abilities because the environment around them promotes personal and professional growth.

IngenioMind: This report is largely about innovation and in it, one of the things we recognize in CART is that it's teaching students to think creatively and critically about solving problems. Why is this important for kids (as well as for all of us)? What's the societal need?

Rick Watson: If education is truly intended to prepare students for life after school, teaching students to think critically and creatively is imperative. Creativity allows individuals the ability to break down and restructure knowledge in order to gain new insights and perspectives. If every problem only had one answer, there would be no need for creativity. But because there are multiple ways to get from Point A to Point B, it is necessary to break down issues into their component parts and look at problems from a variety of angles in order to identify the best solution. In an age when things happen quickly and clients want solutions yesterday, creativity and problem solving abilities will help employees meet the demands of any industry.

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Partnership for 21st Century Learning, p21.org

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Swanson & Cosgrave, swansonandcosgrave.com

ABOUT US

We at IngenioMind are creating case histories of innovation projects. Through the IngenioMind Project, we and our partners hope to better understand how innovation happens.

The IngenioMind Project will study and document the entire life cycle of partner innovation projects.

In addition to the art of innovation, we will be looking at the science of innovation, talking to scientists, psychologists and other experts. Some of the questions we hope to answer are: Where do ideas come from? Why are some good ideas not accepted in organizations or what prevents their acceptance? Do efforts like employee freedom or organizational structure lead to more or less successful innovations? Or do people or organizations create better ideas when their backs are up against the wall (e.g. Necessity is the mother of invention). We hope to begin to answer these and other questions along the way.

Our efforts will help deepen the body of research on innovation and provide guidance to organizations. Further, we hope our research sheds some light on human thought, free thinking and organizational dynamics that affect creativity and innovation.

You can stay up to date with Ingeniomind at ingeniomind.org.

BRUCE CUTHBERTSON

I've been interested in creativity and innovation for years and hope this project helps answer some of my questions: Where do good ideas come from? Do groups or individuals create better ideas? How do organizational dynamics and social structures support or hinder new ideas? Is the DNA of a visionary any different than that of the rest of us? Can we learn to think freely and listen to new ideas with an open mind?

My interest in innovation and ideas goes back to childhood. We all remember asking wondrous questions and finding a fascination in the world's mysteriousness. To me, understanding free thinking and where ideas come from and how they grow and even become contagious has been a life-long passion. But when I look at the business world, strategic efforts and new business models often amount to throwing mud at the wall to see what sticks. I think we could do better. I know we can. By understanding ourselves and our ideas better. By understanding how people get along. By unlearning and rethinking our assumptions. By fearlessness and learning to see the world as a children again.

In my early adult life, I worked as a strategist on marketing and political campaigns, often finding that new or fresh ideas change outcomes. Years ago, when I ran my first political campaign, I had no idea what I was doing. Nonetheless, I was fortunate enough to beat a seasoned pro who hadn't lost a campaign in 25 years. Why? Because I didn't know better. Because I didn't know that I wasn't supposed to win. Because I tried the unconventional. The discovery of new ideas in practice is partly what drives me to understand creativity and innovation.

My interest in the mind, innovation and organizational ideation also led me to study mindfulness and Buddhist tradition at Wat Pah Nanachat monastery in northeastern Thailand.

I'm equally interested in two sides of innovation: First, what I call micro-innovation (business models, creativity, group process, and brain science) and second, macro-innovation (economic development, innovation clusters, and community identity).

I've been fortunate enough to work with some outstanding individuals and organizations. I organized and hosted an economic summit in San Francisco with politicians, business executives and community leaders in the mayor's office. I advised on the development of a 55-square-kilometer technology business district and innovation cluster in Beijing. I've consulted and collaborated with organizations from Stanford to the China Investment Corporation, from Microsoft to Oracle to AT&T and Sprint, from the China Sustainable Energy Program to the Climate Works Foundation, from research think tanks to politicians and government agencies to startups and tech businesses, as well as with a number of vacation, resort and real estate developers interested in community identity.

In my work as a strategist and management consultant and through my research with The IngenioMind Project, I'd like to better understand the art of innovation as well as the science of it. And I hope to be able to share what I learn along the way.

You can contact me by email: bruce@ingeniomind.com or brucecuthbertson84@gmail.com.

SEAN O'HOLLAREN

What do we know about innovation? To me, as I stroll the business aisle at Barnes & Noble, the books on innovation are not unlike the many self-help books a couple aisles over. Managers are obsessed with innovation and design thinking, searching for some secret elixir that brings business and personal success.

The books offer solutions and ideas on how to innovate and how to succeed. Many draw on popular team-building tactics that go back long before the terms innovation or design thinking were in vogue.

Many of these books tell us that if we put a group of diverse people in a room and look at a problem from diverse perspectives, we have a better chance at solving the problem that's vexing us.

Sounds easy enough. Right?

I think the group dynamic is fascinating for a whole variety of reasons, but I'm not sure innovation or group process are so easily understood. If innovation was so easy, every manager at every organization would be doing it. Many are trying, but successful innovations seem few and far between.

Why do organizations choose to innovate? Is it even a choice or does it just happen? Are some organizations put together differently in a way that helps them innovate better? What about leadership?

These types of questions have captured my fascination with innovation and design thinking.

To me, leadership may be the defining factor. For example, who hasn't spent time at the table where an enthusiastic employee wants to do something different, something special, something innovative. Only to have those daring ideas pulled back and made safe. All of a sudden we need to run ROI analysis on everything we are doing to be sure we aren't taking any risks.

We've all seen a bad manager kill a good idea because it threatened him or her in some way. Maybe, it came from a rising star in the company and the manager wanted to put her in her place. Or maybe the manager was afraid to take a risk, even if the potential returns far outweighed the minimal risk. Good corporate policy is undermined every day by bad managers.

This is a failure of leadership.

I'm a baseball nut. I can't think of a better example of an innovative organization than the Oakland A's, led by general manager Billy Beane. The A's have consistently had one of the lowest payrolls in baseball, yet they compete nearly every year. They have repeatedly won the American League West Division.

The leadership of the A's has created an atmosphere where doing things differently can happen. They aren't driven by ROI analysis ad nauseam or forming committees to analyze (and kill) ideas. They take chances. They experiment. They test and question common perceptions about their business. And they believe in themselves and their methods from the very bottom to the very top of the organization.

So, the question I need to answer is this: What does an organization need to look like for innovation (risk taking) to happen? I hope that the IngenioMind Project will start to answer this.

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We'd like to thank CART and especially the administrators for opening their school up to our analysis and critique. We thank in particular Rick Watson, who energetically responded to my inquiry almost immediately when I sent it to him. His responsiveness reminded me of my late grandfather who was the city editor at a large metro newspaper. He once said, "There's never a better time to answer the phone than on the first ring. A second ring may never come and you'll never know what you missed." There are professionals and there are professionals. Rick is one of the true professionals I've had the pleasure of ever meeting. As a writer and researcher, I've learned that some people are slow to respond and often there's an analytical moment when they size you up and decide if you have any value for them or not. Rick was not like this. He welcomed us and our project with open arms, knowing that the outcome was unknown. We also thank Beth Garoupa, who is the Dean of Curriculum and Instruction at CART. She is excited about the school and trying new things. Her passion is contagious and she's a natural leader for directing CART in the years to come.

We thank Bob Pearlman, Bruce Goldberg, John Mergendoller for laying out the fascinating history of project-based learning and their own roles in education through the 1990s and 2000s, as programs like CART were growing in popularity. They are all at or near retirement age and the interviews were like oral histories of the U.S. educational system in the 1990s.

We thank the business mentors who shared their experiences in opening their places of work up to CART students and how those experiences were mutually meaningful for students and mentors alike.

We also thank all the teachers we interviewed or met. Some of them made it into this report and others did not, though all of them were energetically helpful in answering our questions and telling their own stories about how they came to CART, what it means to them, and why they became teachers. Every single one of them pointed to the CART program as exemplifying the essence and spirit of why they pursued a teaching career and why they love teaching.

We thank the many parents we met or interviewed on the phone. All of them could talk for hours about their kids (as every parent knows). Moreover, we were taken by the genuine gratitude that many of them expressed toward CART, in helping their child grow and mature and become a young adult.

Finally, and perhaps most importantly, we thank the students who were open and flexible and agreeable to our intrusions into their classrooms and lives. We talked to several students on the phone and we also did any number of video interviews with students in the middle of their classes. We walked around the school and entered classrooms up and down the halls. All the classrooms have windows onto the main corridor so we could watch and observe. The classroom interviews were impromptu and not facilitated by administrators or teachers. All of students we met were thoughtful and well-spoken and open and remarkably mature. We thank them for letting us observe and learn from their experience.