

Session#

The Engineering Design Experience (EDE) and Kids At-Risk

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“The modern boy and girl have an impetuous lust for quick results. A job of skill demands victorious patience. The young of today have protracted and painful effort. A love of slapdash has grown up and found a philosophy behind which to entrench itself--.” Kurt Hahn, in an address to the Cathedral Company, Liverpool, England, Dec 22nd, 1940.
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Kurt Hahn, one of the moving forces in Outward Bound saw this over sixty years ago, and along with others was moved to found an organization which would address the needs of young people in an ever changing world. In order to achieve this Hahn sees the need to reinstate the opportunity for young people to find that inner strength which sees them through hard times and inspires them to go beyond what is expected by society.

But, it was more than that. It was an instinctual response to a need in society, to bring back a feeling of pride in a job well done and a feeling of social responsibility... an attempt to expand the “me” into “we”. This is as true today as it was in 1940.

In July 1, 1999 Dr. Renee Lerche, the director for workforce development for the Ford Company, in an address before the committee on Education and the Workforce, U.S. House of representatives on Business community views on reform of the elementary and secondary education act, stated:

*“The education system is our pipeline, and we have a vested interest in how well it operates and in the quality of its output. Since the groundbreaking “Nation at Risk” report was published in the early 1980s, business leaders have continually been sounding the alarm that graduates of our nations schools, at all levels, are not fully prepared for the rapidly changing world of work. Investing in systemic education reform is, therefore, not a peripheral issue, but instead a critical activity that lies at the core of our mission and strategy.”*²

From both the above we could say, all kids are at-risk. And from this perspective they are. I work with kids who have been diagnosed as “at-risk” by a society which itself is at risk. These are the kids who have been thrown out of regular school because they cannot be contained or educated by the system. They have failed academically and

socially in a system which has failed them, and to a large extent seems to have failed you, the business community also.

The Spurwink School in Auburn, Maine is a Private Special Purpose School with 40 students sent to us by five sending school districts. These students receive both academic attention and therapeutic intervention. These students are not stupid, or unable to grasp complex ideas, but they have never been able to fit in. That is why we have them. Students stay with us for anything from 1-4 years and range in age from 7-19. Half our population is living in our Group homes, they have been removed from their own homes because of neglect or abuse and 80% of them are under the poverty level.

According to the government report in Education World issued by a collaborative effort of 20 federal agencies. U.S. Secretary of Education Richard W. Riley stated,

“... Although most of the report is positive, we still have our work cut out for us. We still have millions of young people living in poverty, and poverty makes it so hard for a child to get quality education.”³

I began work with Spurwink last Feb 2003, and before that I spent 20 years taking kids to sea for anything from 1- 8 months on traditionally rigged schooners. We ran three different types of programs, one for private schools, one for University students and one for Kids at-Risk. The program for the private schools ran for 3 months, the university program also ran for 3 months. The program for the Kids at-risk ran for 8 months. These students were from Group Homes and they were different. Although the results were the same, the intensity of the work was different. I came ashore to see why, and was hired by the Spurwink School as an Associate Program Director for Education in Auburn, Maine

The Spurwink School has an extended school year: seven weeks in the summer, four days a week and 6 hours per day. I looked through the records of previous years and could see little to motivate me to want to be here during the summer. If I did not want to be here why would the students want to be here? We had to come up with something meaningful.

Several years ago I had been involved with training for the Society of Automotive Engineers (SAE), in Warrendale Pa. with their A World in Motion (AWIM) program. I was able to get Challenge I, which has three components, the Skimmer Challenge, the Jet Toys Challenge, and the Coffee Can Rover Challenge. These are designed for the elementary level grades 4, 5 and 6 respectively. In Challenge II, for the middle grades, students must research their potential customers, design a car, which will travel a certain distance in a given amount of time and climb a given incline in a set amount of time. Challenge III, involves the principles of flight, and although geared towards the middle grads, we gave it to our high school students. Each company must design a glider which is then published in a book of gliders with a description of how to build it, and what to expect from it. This booklet is then given to the student body at the presentation.

All the above entail the Engineering Design Experience (EDE) EDE is a method of thinking which involves:

- Setting Goals
- Building Knowledge
- Designing
- Building and Testing
- Presenting

It is imperative to have an engineer involved in the process and we were lucky to find Pete Mickelson. an engineer from Portland, and persuade him to become involved. Pete is a member of the Society of Manufacturing Engineers (SME), and has his own company called TBM Associates.

All of this would seem to be easy. However, to get this type of program into an environment where hands-on education is a foreign language, is not easy. Teachers were scared and reluctant to be part of it. They had never done anything like this before, and I thought we were in for a tough time. Luckily, I never told them this was not meant for special ed students. I had done the same thing in Western Pa. and I knew it would work here.

Six weeks before the summer session was to begin we were able to get the final manual from SAE and we started to train the teachers. Of the six teachers, four came regularly, and the other two were reluctant. We went ahead with the hands-on training, I remembered from my days in Pa. that most teachers have a hard time putting the kits together, and did not know what to do with the engineer in the classroom.

We spent half of the training time showing the teachers what was in the kits and how to assemble the models, the other half was spent going over the manuals and explaining the terminology. Two questions, which surfaced at the beginning, were, “How does this fit in with education? What does industry have to do with us?” It was not until it was pointed out that everything in the classroom had been not only made by someone but designed by someone, an engineer, that the light went on. They saw we were trying to put into place a program which would place our students in the same position as regular school students, as far as learning about the world of work was concerned.

How do you put these things together? You do it and fail and try again. Then one day it works. Or you do it in a systematic way. You do the research, you understand the principles and you make notes on everything you do. The teachers all did what most kids want to do first. Take out the materials and play with them. We did, and after we managed to get the glider, the car and the skimmer to work we sat them down and we went over the process. What did we just do? What did you learn? What do you think is important in what we just did? Why do you think we are doing this for the summer program?

I explained to them we were not trying to just produce models of cars, or planes, or boats, but putting into place a system which would teach the students how to think in a systematic way and how to approach problem solving in a systematic way. This was an opportunity to get these students to have fun while learning and to have success in academic and social activities, something they had never been part of.

I could feel the apprehension and realized I would have to do more than present this; I would have to lead them through it. We met every week and as many times after school as they felt they needed for 6 weeks. During this time Pete Mickelson came to visit and was able to talk to the students and to the teachers. When they knew Pete was going to be a part of the program things relaxed and they began to feel, "This might work". They were not familiar with the concepts in the material; they felt apprehension about presenting material to the students about which they knew little or nothing. Pete made them feel at home with it and helped them to understand that they did not have to know everything.

The summer program started and the teachers introduced the AWIM challenges. Four of the teachers had attended all the training; two attended less than half. During the seven weeks we saw an increase in the participation of all students in the academic aspect of the class, with a cumulative increase of over 100% in the four classes whose teachers had attended all trainings.

We have two high school classes, two middle school classes and two elementary school classes. Each classroom divided the students into groups no larger than three. Each group became a company, with their own logo, company name and business card. Each member of the company had a specific task and the tasks rotated each week.

Both elementary classes had 7 students, all ADHD, (Attention Deficit Hyperactive Disorder), which means you have a classroom full of human humming birds. Some students with multiple disorders, all were on medication and all had entered the room hating summer school and determined to make sure it would not work. Not an easy nut to crack.

The Elementary School

In classroom A, we had a teacher and two Edtechs, (educational technicians who are there to help the teacher implement the lessons). All three of these adults had bought into the program and all were engaged in making sure they produced the best they could. This was also one of the most difficult classes in the school. The attention span of these kids was slightly under 15mins on a good day. During the school year there would be an average of two therapeutic holds per day for this room. This meant that twice a day some kid or kids would be removed from the room and held to keep him or her from hurting himself or herself or another.

During the summer we had one hold. This was at the start of the summer. For the rest of the time not one kid was held, or removed from the room. They were engaged not only in the academics, but also in being part of their company. They worked not only hard, but they worked together to get results. They presented at the final day like

professionals. When one presenter forgot his lines his classmates gave him the words. Before the summer program, they would have made fun of him.

Classroom B did not do as well. This teacher had attended little of the training and did not read the manual until the last minute. This classroom showed minimal gain academically, and continued to have therapeutic holds during the summer, on a regular basis.

Two weeks into the summer program we accepted a new student in this classroom and this student was assigned a one on one support. A one on one means there is an adult with the student for every minute he/she is in the school. The entry into the program was difficult for this student who would revert into the fetal position when asked to participate in anything. The first week was spent in the life space room. The life-space room is a room with one door where the students can go to calm down or to talk about their feelings or where they can be taken without disrupting the rest of the class.

During the second week his one on one took him on a visit to classroom A, during their AWIM time. The student became excited and ended up going to classroom A every day for AWIM. He not only participated but also became one of the stronger participants. Challenge I explores kinetic energy and friction. Four weeks into the program he came to my office and standing outside the door rubbed his sneakers on the tiled floor producing a squeaking sound. I looked up and he smiled and said “friction!” Not only did he understand the concept, but also he was engaging with another human being! Something he had not been able to do before being exposed to AWIM.

The remainder of classroom B was taken on a trip to classroom A and was astounded to see what was happening. They saw graphs; diagrams and posters of the different companies the students had produced and listened to them explain what they were doing. On return to their classroom the teacher was impressed enough to set things in motion. They were behind everyone else but they were able to become excited and motivated enough to finish the project in an appropriate way. Even though their presentations were weak in comparison, they were able to do it.

The Middle School

In the Middle school we introduced Challenge III, the principles of flight. In this the students formed companies in which they explored flight and each company produced a glider with instruction on how to build it, launch it and what to expect. The teacher in one of the rooms had attended all training and had also been involved in Project Based Learning in another setting. Project Based Learning at its best involves a seamless curriculum where all subjects are used to create a given project. This classroom started out with three companies and went through the EDE in a systematic way. Again, during the regular school year, the attention span of these students was around 15mins before self-destruct took over. Self-destruct is something these kids do to avoid making a mistake. They will do this rather than admit that they do not know how to do something. This room had an average of one therapeutic a day until the summer. No holds were necessary for the entire summer.

During the course of the program two students from this classroom came to me to complain about the third member of their company. “ He is just not pulling his weight, we don’t know what to do, except to fire him! Can we do that?” I referred them back to their teacher and told them if that did not work, then come to me. The teacher told them about expectations of performance and that they would really have to lay out in writing what they expected and give him a time line for improvement. They did and with the teacher as mediator they were able to resolve this conflict in a business-like and impartial way. They produced the best glider. A month before the program they would have thrown everything out the window and said “ to hell with this stupid thing.” This stupid thing would have been anything they were not used to, anything different, anything that threatened them.

The other middle school classroom did a good job considering that the teacher only attended one training. She did read the manual but saw no benefit in the program. The students did what they could but did not do a good job at the presentation. However, again there were no holds for the entire summer.

The High School

The High school rooms were similar. One teacher attended all trainings and bugged me to explain everything she did not understand. This room did an outstanding job with the program. They were engaged with Challenge II, the kit, which explored gears and how to get a car to go 3 meters in a given amount of time, and go up a 30-degree incline. They also had to produce the body for their cars. Again they formed three companies. Each company concentrated on a specific design and did their research. They produced cars to meet all specifications and presented in a professional manner. They also used PowerPoint to demonstrate their reason for their choices. Once again the classroom had no therapeutic holds, no one removed from the room and no one missed any days.

The second high school room had a different blend of students and the teacher had attended some of the trainings, (3 of 6). The room was smaller and because of the trepidation of the teacher about the material, and her timidity towards the students, it was hard to manage. After some weeks, we found we were going to have to lower the expectations. We reduced the amount of time for gaining knowledge, and the amount of time for paper work. The students protested but rose to the occasion. They also finished their products and presented in a professional manner. Although they did not use PowerPoint they did come up with some fine posters and graphs to back up their choices. They did bend one of the axels, the only destructive action during the entire summer!

During all of this we had Pete Mickelson, the engineer. Pete came to the school as a volunteer, and at his own expense. Before the program started Pete talked to all classrooms on what an engineer does and what they, the students, were going to be doing and how this correlated to the real world. During the summer Pete came three times to check the progress and spent the entire day on the presentation day. In Pete’s words:

“ At the end of summer, the final day, each Corporation made a final sales demonstration, explaining why they’d selected their final design, why customers should find it the optimum choice among many, and what they had learned along the way. The

audience was rapt, applause rang throughout the building, and guess what.... self-images were polished and bright gleaming off of beaming smiles. Even hooded sweatshirts were down! Engineering is an amazing thing!"

The "hooded sweatshirts down" is quite significant. These students are not the most social beings in the state of Maine. They have been rejected by their parents, society and have been left behind by every adult they have dealt with. The hooded sweatshirt says, stay back, leave me alone and don't get into my space. They came down because of the summer program and the way it was presented.

What did we learn from the summer program?

- These programs work for kids at-risk.
- Train the staff,
- Involve an engineer or someone in the profession
- Cooperation among administration, staff and students is essential.
- Enthusiasm for the project is essential

The results of this summer were:

- Students are now more involved in academics.
- Students know they can succeed.
- Students have better self-images.
- Students want an after school pre-engineering program!

All of this came from kids who have been kicked out of regular schools, have never succeeded at anything but getting themselves into trouble and creating chaos for the system. One of the social workers told me:

"Jim, we tried to start a life skills class to teach these kids how to get along socially. It lasted two weeks before we had to abandon it. This program has them doing all the things we could not get them to buy into. It really is something to see."

One of our secretaries who has been with the school for 10 years told me:

"In ten years I have never seen any of the students here excited or involved in learning, this is what we should have been doing all along."

What has happened since the summer? Was there any carry over to the regular school year? Yes and no. There has been carry over in the fact that the teachers all see the value in getting out of the box they were in and becoming involved in more creative thinking. We are already geared up for next summer and we have a pre-engineering program in place for after school. Four of the older students took on the renovation of an old shed under the guidance of our Transition Specialist, and we now have another classroom, fully finished, insulated, and with heat and light. It is our art room.

The pre-engineering program is in place and we were able to beg some small engines from friends and get a grant for tools. We are also implementing a fuel-cell component. This is all after-school work. Kids have volunteered to be part of it! The majority has improved academically and socially. However this will not last unless we

can get the sending schools to allow us to implement more of this hands-on, experiential programming for our kids.

Summary

Are our kids going to become engineers, or technicians? I don't know, but I do know they are more aware of what is out there and what they are capable of. They know how much work it takes to get what they want, and they are willing to do it.

It does not matter whether they become engineers or not, what is important is the fact they now believe they can be more successful than ever before. Kurt Hahn tells us the story of Dr. Reinhardt, from the Salem school, who in talking to a teacher about a particular student was told "He is no good, I have no faith in him" Dr. Reinhardt replied, "Sir, then you have no business teaching him."⁴

So it goes with us all, we cannot reject part of our students while we look at only the best and brightest. My kids are bright, creative, with many survival tools, however they have not conformed to the norms of educational society. If we want people in society who can think out of the box, my kids are it. They defy all boxes and in some cases have tried to bring about the destruction of boxes built for them.

Programs like AWIM are only the start of what we could be doing for our kids. The percentage of kids in state care who stay in the state system after graduation is staggering, almost 50%. These remain in the state system as adult offenders, and cost society \$60,000 per person per year to keep them in prison. If we can change how these kids look on life, how they view society, change their expectations of what they can expect, then we can change the system. If we can teach our teachers to buy into a different approach to education, we can change the system.

New paradigms are needed but they must be something teachers see value in. Business leaders know what they need in the work place and can let the academic world know what and why they need it. Schools really are, as Dr. Renee Lerche states, your pipeline, that is where you will recruit your employees; that is where, as Gm states in its education policy,

"At GM, we depend on an educated work force in order to succeed in an increasingly dynamic, technologically complex and competitive environment. If today's youth do not succeed in school, we cannot continue to succeed at business..."⁵

We can no longer afford to have different levels of society pushing against each other. We need to bring the kids who are lucky enough to have their homes intact and the kids who have no homes to go to, together. Only when we can look at kids and see the potential in them, and be willing to reach out and show them what that potential can be, to stop saying "oh he/she can't do that," only then, after great effort, can we hope to change what we have, into what we want. We all become what we dream. Dream well for our kids, and they will become our dream.

Bibliography

1. <http://www.kurthahn.org/writings/writings.html>
2. <http://edworkforce.house.gov/hearings/106th/fc/esea7199/lerche.htm>
3. http://www.education.world.com/a_issues/issues109.shtml
4. <http://www.kurthahn.org/writings/writings.html>
5. http://www.gm.com/company/gmability/edu_k-12/?section=Company&layer=GMAbility2

Biographical Information

Jim Corr received his B.A. in theology and philosophy from St. Peter's College in Wexford, Ireland, and his M.Ed. from the University of Pittsburgh, in Pittsburgh Pa. He has spent 30 years in experiential education with kids at-risk and the last 12 years taking these kids to sea on traditionally rigged schooners for periods of up to 8 months. At present he is the Associate Program Director for education at the Spurwink School in Auburn, Maine.