

# Millennium Technology Project between Ysgol Gyfun Aberaeron and Eaglecrest High School

**Siôn Walker**

*Ysgol Gyfun  
Aberaeron,  
Ceredigion*

## Abstract

Over the last three years, a successful pupil exchange program between Ysgol Gyfun Aberaeron, Ceredigion, UK and Eaglecrest High School, Denver, Colorado, has been established. It is now felt that both parties are ready to move on to activities that will broaden both the educational and social experiences of its students.

## The schools

Eaglecrest High School is a mixed non-selective high school situated to the Southeast of Denver. It serves the rapidly expanding conurbation of Aurora and has approximately 2,500 pupils. It is one of four such schools in the Aurora area, with a fifth school planned for construction in the next 12 months to cope with the area's rapid urban growth. The school district is known as Cherry Creek. The age range of students is 15-18 years-old and the school has both a broad curriculum and excellent facilities.

Ysgol Gyfun Aberaeron is also a mixed non-selective secondary school, situated in the small coastal town of Aberaeron, 18 miles south of Aberystwyth in West Wales. It has a student population of 755, aged 11-18 years-old. The Local Education Authority is Ceredigion. It is predominately a rural area with the majority of students being brought in by bus from as far as 18 miles away. The school has a vibrant Welsh language policy that encourages all students and staff to make maximum use of the language in everyday school life. Ysgol Gyfun Aberaeron is now in the final phase of a 3.2 million-pound redevelopment programme that has extensively improved its facilities to make it one of the most up-to-date schools in Wales. This has included new technology facilities, which have improved our ability to deliver food, textiles and control technology along with a design studio equipped with 20 PCs. The latter has enabled us to rapidly adopt CAD/CAM into our schemes of work and introduce Pro/DESKTOP as the means of delivery.

## Existing exchange programme

Staff predominantly from the technology areas of both schools arranged the initial visits (Steven Smith from Eaglecrest and myself, Siôn Walker, from Aberaeron). These have comprised three visits from Eaglecrest and one from Aberaeron. The initial exchanges have focused more on the historical, geographical and social differences between the two areas. Students and staff have spent time in both schools before going on a number of external visits.

Time spent in school has led to the realisation that there are many similarities between the subject area in both schools and that this would provide an excellent starting point for a joint project. Following a short visit by Eaglecrest to Aberaeron during April 2000, it was suggested that pupils from Aberaeron might attend the three-week Technology Summer Institute held at the Lowry HEAT Centre run by the Colorado State University. Whilst it sounded like an excellent idea, there was not really enough time available to set everything up and allow interested parties sufficient time to raise the necessary funds.

It was then suggested that I might like to attend the Summer Institute to assist with student instruction and view at first hand the day to day running of the course. It would also give an ideal opportunity for us to discuss suitable projects and devise strategies to ensure the successful involvement of both schools in next year's Summer Institute.

I am therefore very grateful to The Central Bureau, part of the British Council, for making a bursary available to me that ensured that I was able to travel out to the 2000 Technology Summer Institute. The following is an account of my visit and the exciting developments that we are now striving to bring together to ensure that the Millennium Technology Project is a success.

## Main objectives of visit in order of priority (as stipulated in Central Bureau application):

1. To have time to discuss next year's project with members of Eaglecrest High School Technology Faculty without all the distractions present when accompanied by a school party, the limitations of e-mail or the cost and problems of time difference associated with telephone. This will include:
  - identifying suitable projects suited to both schools' curriculums
  - identifying dates for running the project – in particular different term dates and examination requirements
  - costing and suitable organisations to approach as supporters of the project.
  - To investigate and evaluate the Eaglecrest/Colorado University, Denver/HEAT Centre Summer Institute with a view to:
  - Aberaeron pupils attending the July 2001 Institute
  - establishing such an Institute at or near to Aberaeron.





Figure 1: Design teams using Pro/ENGINEER.

3. To assist in the teaching of students attending the Summer Institute and to give them an introduction to Pro/DESKTOP, the computer aided design (CAD) package used by Aberaeron. There is also a need to investigate the ability to exchange data with Pro/ENGINEER, the CAD package used by both Eaglecrest and the HEAT Centre.
4. To investigate the video conferencing facilities used by the HEAT Centre which Eaglecrest have access to and to assess its compatibility with the system used by Aberaeron technology department for the teaching of GCE A'/AS' Level electronics. We would aim to use this as a way for students to communicate during the project and to also involve Eaglecrest in a Micromouse robotic vehicle competition.
5. To visit Horizon Organic Foods with a view to establishing a joint project set by them for the initial project.
6. To investigate the resources available at Eaglecrest High School and to compare/contrast them with ours.

#### Technology Summer Institute – July 2000

The day I received confirmation of my bursary from the British Council, our summer exams were in full swing along with the need to complete student reports. I cannot remember writing such positive comments or completing everything in such a short period of time!

I arrived in Denver half way through the Summer Institute on July 19 and, fighting jet lag, met the students the next morning. They proceeded to discuss the situation, brief and specification with me and show what they had achieved to date. They had been set the following:

#### Situation

Intertech Plastics, an injection and blow moulding plastics manufacturing company, is looking for a new market for one of its existing mould designs. It has done some market research and has identified the potential for an alarm that would be of use to someone working alone in what might be a hostile environment. This might be of particular use to females working alone that might be unaware of someone trying to approach undetected.

#### Design brief

Design, make and evaluate a self-contained alarm that will warn the user of someone else within close proximity.

#### Design specification

1. The alarm electronics must fit inside the existing casing, though the casing may be modified to accommodate warning lights, switches, buzzers etc.
2. It must be easy to access and change the battery.
3. The alarm must have three stages of warning:
  - armed and on
  - detecting/working
  - warning of someone's presence.
4. The alarm must have an on/off switch.

The case to be modified was originally a prowler guard's. It had been part of a short run produced by Intertech Plastics. The idea was to give the students set parameters within which to work and by doing so, ensure that they would be able to achieve their brief within the given time.





*Above left: Figure 2: Having designed the casing, it now needed to be modified.*

*Bottom left: Figure 3: Constructing the sonar sensors for the circuit.*



They had then been broken down into four teams with two members of each team concentrating on designing the housing for the project using the Pro/ENGINEER computer aided design software and the rest of the team investigating, modifying and building the circuit to fit into the case.

At this stage, the design teams were more concerned with drawing the existing housing that would then be modified. This was by no means a simple task. As the photos show, there are many awkward shapes to replicate – all of which had to be first measured accurately. The measuring process highlighted one of the problems students on both sides of the Atlantic would have to adapt to – working in imperial and metric measurements. Will they work in both, choose one or will the CAD software convert measurements for them?

The electronics team had spent time investigating the basic components that are used to make up many circuits. There was not the time to go into enough detail to enable them to build an alarm circuit from scratch. Therefore they had gone through an evaluative and disassembly process – looking at a range of alarm systems available on the market and seeing if they could be modified to fit the project specification. Three of the teams had by this stage opted to buy kits from Radio Shack, a high street retailer of electronic products not unlike Tandy in the UK.

The fourth team had opted for attempting to modify an existing circuit. Travis and Danielle are seen here disassembling the sensing part of an infra red outside light and were in the process of identifying and isolating components that they might be able to utilise for the project (see Figure 4).

#### Field trips

As well as workshop activities, a number of relevant visits were also arranged. Students had already visited an electronics CAD company and a specialist company who design and manufacture the moulds for injection moulding. On my second day, we went on field trip to Intertech Plastics Inc.

The aim of the visit to the Intertech plant was to:

1. Spend time on the production floor investigating both the injection and blow moulding process.





Figure 4:  
Disassembly of  
circuits to 'borrow'  
ideas for the project.

2. For each team to make a 5-minute presentation to the engineers from Intertech, detailing their progress to date along with any problems encountered and solutions to those problems.

The main question everyone had to answer was 'would they have the project finished on time?' The presentations were also an

opportunity for the teams to start thinking about how they were going to present their projects in a week's time.

Tim Ruybal, the Tooling Sales Manager and Chairman of the Society of Plastic Engineers (SPE), Colorado, met us. He took us straight onto the factory floor where they were preparing to make a trial injection for a



Figure 5: Reviewing  
the lid of a battery for  
the US military.  
Figure 6: Blow  
moulding machine  
making nappy  
changing units for  
MacDonalds.







battery top to fit a special order for the US military. The students were asked to look closely at the mould and evaluate it – picking up a fault straight away. The finished battery top had a curve to it – so the Intertech engineers had to go back to the customer to clarify whether it would meet their specification. Two weeks of accurate measuring and disassembling had obviously honed the students' eyes.

We also saw the blow moulding process where they were producing the pull down baby changing units found in all McDonald's the world over! These units are produced in two halves and then assembled on site before dispatching directly to the restaurant site.

The other main product was a plastic food container as used by Burger King into which the various ingredients were put, e.g. onions, salad etc. In Figure 7, Tim is seen stood next to their autumn product run, a blow moulded case to hold snowboards.

Whilst talking to Tim, we discussed our approach to teaching technology in Britain and the aim of my visit and the project. He was most excited about the idea and was sure he would not be out of line by offering both Intertech's engineers help and use of facilities.

We then moved to a boardroom and each team had to make its progress presentation to Tim and his team. All did well – especially as for many it was their first time in front of such a group of people. Constructive comments were made with a view to next week's end of course presentations. The group also received a presentation on the company's philosophy toward both its customer and workforce, which centered on the idea that both needed to feel wanted and appreciated – essentially very similar to the **Investors In People** scheme that many organisations in Britain (including Aberaeron Comprehensive) are currently adopting.

#### Conclusion to Intertech visit

The visit proved to be both very interesting and rewarding. I gained a lot more in depth knowledge on both blow and injection moulding. Intertech Plastics personnel – especially Tim Ruybal – were most supportive. All questions were rapidly answered and the students' attention was held for the whole duration of the visit. I feel that next year's project should definitely involve plastic injection or blow moulding, simply to tap into such an enthusiastic company that is so prepared to invest its time with young students possibly interested in an engineering career.

#### Final week

The last week of the Institute was very similar to those days immediately before GCSE and A' Level project work deadlines, as the students worked hard to produce a prototype (preferably working) and a 25-minute presentation. The presentation was to be made to a panel of dignitaries that included:

- Mr Bruce Jansen – Eaglecrest's newly appointed Principle
- Dr Jim Gredene – Chair of Mechanical Engineering at Colorado University, Denver
- Mr Noel Ginsburgh – Owner of Intertech Plastics Inc.



- Tim Ruybal – Sales Engineer with Intertech Plastics/Chairperson
- Valerie Dobbs – Student Enrolment and Relations, Colorado University, Denver.

I also found time to sit down with Dave Robinson to compare and contrast Pro/DESKTOP with Pro/ENGINEER. Dave is the Colorado University, Denver, Pro/ENGINEER lecturer. One of my aims was to investigate the ease of transfer of information between the two packages to ensure that we could transfer students' ideas back and forth across the Atlantic as they developed their designs.

Both packages will transfer data with ease and then allow designs to be opened up and modified further. Students will not have a problem transferring designs. One area that will require further experimentation is the conversion of units. Pro/ENGINEER will convert millimetres into inches, but we could not get Pro/DESKTOP to convert inches into millimetres. This very problem caused the downfall of the Mars Voyager!

On comparing the two packages, Dave was of the opinion that American schools would be better off with the Pro/DESKTOP package, as it was easier to use for the type of prototype work school students were involved in. Having tried both packages, I am inclined to agree. Since returning to Britain, DATA have been involved in a pilot project to allow American schools to benefit from Pro/DESKTOP in the way that British schools have.

#### Meeting with Mary Ann Rowe, Director of Manufacturing Technology at the HEAT Centre

One of the most constructive meetings Steve and I had involved Mary Ann Rowe. Mary Ann has a wealth of experience dealing with outside agencies in the everyday running of the HEAT Centre. (For a detailed description of the HEAT Centre, please visit their web site). For example she is currently negotiating the use of the Centre by INTEL to train personnel for a career in the semiconductor industry. We therefore wanted to make use of her experience to guide us through our proposed idea.

One of our main objectives in establishing a joint project was that it solved a real design problem for a company that had links to both countries and preferably both counties. I had already identified one such company – Horizon Organic Dairy, based in Boulder, Colorado and now the owners of Rachel's Dairy of Aberystwyth.

We discussed what we expected from Horizon. Mary Ann stressed that this was important, as many companies do not want to merely hand out cash donations and receive little in return.

We felt that it was difficult to say exactly what we wanted, without first having talked fully to the company about our proposal to see if they could do anything for us. We agreed that we had to have more direction though and be prepared to answer some direct questions very quickly. Mary Ann, Steve and I then brainstormed and came up with the following.

Horizon could benefit from the project in the following ways:

- publicity – would enhance company web site to talk about project
- improved sales – as publicity would undoubtedly appear in sectors not associated with the dairy industry
- a product designed by a group that are the next generation of earners and so purchasers of their products – continued marketing for company
- a product designed by a group of designers with no inhibitions and limited prejudices.

Students will benefit by:

- having a real project overseen by outside agencies or corporations that will give students the experience of working to a prescribed brief within a given time
- having to brief line managers on progress and problems
- being resourceful
- having to work as a team
- participating in project related visits, which will broaden their knowledge of the industrial world
- being able to discuss their experiences at interview, especially in the world of engineering.

In addition, students could gain:

- credits from Colorado University Denver, which could be used to gain entry into post high/secondary school education in both countries
- the key skills of problem solving, communication and working as a team that have been introduced into the new Key Stage 5 syllabus (16-18 year olds)



- if students wish to study A\*/AS' Level technology, the project will count as one of the modules.

Their knowledge and understanding of each other's culture will also be broadened, which will make them better ambassadors for each other's country.

The project is achievable by our students because:

- they are keen, talented and enjoy a challenge
- they have been taught about the design process and have been designing solutions to problems since the age of 5
- they have had experience of using either Pro/ENGINEER or Pro/DESKTOP CAD packages
- they have had basic instruction in plastic technology and for the project will be helped by Intertech Plastics
- they will have the use of the HEAT Centre's manufacturing technology resource centre, which will include both machine and human resources.

Other important factors that need discussing are:

- the issue of royalties
- start date and completion deadlines – will they coincide with the Summer Institute?
- does the company have an educational foundation programme in either the US or UK?
- will the UK arm of the company be able to help in isolation of the US parent company?
- how can our proposal be best presented to the company to illustrate the long and short-term outcomes and what are the learning outcomes and the product outcomes?
- what other agencies might be able to help – Dairy Association, Mid Wales Tech, etc.
- if outside agencies are currently used – will the company be able to influence them to include us in the product development?
- what sort of market research will students require – e.g. product target age, use of marketing icons, importance of recycling
- how can the HEAT Centre further help us?

It was a most productive meeting and Mary Ann was very enthusiastic about what we

were seeking to do. The facilities of the HEAT Centre were again made available to the Summer Institute for next year – though with further areas to be included, in particular:

1. plastic injection moulding area
2. CNC machining area to include rapid prototyping.

The meeting was concluded with her offering to also accompany us on any future meeting with Horizon and if this link did not work, to help us come up with another project idea – possibly with Intel.

### Meeting Horizon

Having identified Horizon as a suitable company with interests in both the Denver and Aberaeron area, one of the objectives of my visit was to meet a member of the company and discuss the Millennium Technology project. The aim of the visit was to establish whether or not it would be possible to involve Horizon in it.

Unfortunately, it was not possible to make contact with anyone prior to my departure to Denver. Steven Smith made great efforts to arrange a visit, as did Tim Ruybal from Intertech Plastics. It was unfortunate that the person we needed to see – Kevin O'Rell, the company Vice President and person responsible for R&D and QA, already had a full schedule that involved his travelling to other parts of the States and not returning until after my departure back to the UK. In our telephone conversation, he sounded most interested in what we were proposing, but wanted to meet to discuss the idea in much more detail before he committed the company to anything, an understandable request. Steve and I produced a brief (Annex A) to present to Horizon at a future meeting.

That meeting finally took place on Friday August 20th. Steve and Mary Ann Rowe, from the Lowry HEAT Centre, met with Kevin O'Rell, Laura Coblentz, (Director of Marketing) and David Morton, (Package Design), at Horizons HQ just outside Boulder. The revised project idea as stated in Annex A was discussed and then brainstormed with the commitment to do some kind of project together.

At the time of writing this article, Laura Coblentz has recently contacted Steve and proposed that the students design packaging for a plastic bottle that will contain an organic milk drink and which will appeal and encourage youngsters to consume more milk. We have still to run through a number of specifics with her to enable us to write a detailed design brief and specification, but will be aiming to do so during January and



February. The proposed format of the project will then be as follows:

- March – Steve will visit Aberaeron with a party of eight students; we will pair up the trans-Atlantic teams and set the brief
- March – June, students investigate the problem in each other's countries and relay that information to each other using e-mail and either a web cam or video conferencing
- July – Aberaeron travel out to Denver and participate in Technology Summer Institute.

Even after my return to the UK and as I compile this report, the project continues to develop and gain momentum. I aim to make the summer school open to all regardless of financial situation and to this end have made a detailed application to run the project as an after school activity under the umbrella of the Young Engineers scheme to gain funding through the New Opportunities Fund. The school has recently learnt however that individual school applications are not now being accepted and a county-wide one has to be made. We might therefore be eligible to assistance in the future, but I am now having to look elsewhere for funds to ensure that it is possible to make the opportunity of travel to Denver for next year's Summer Institute financially possible for all students in Year 11 at Aberaeron Comprehensive. If anyone reading this report has ideas for funding the project, then please do not hesitate to contact me. A possibility for some funding might come from my qualification as an Accredited Pro/DESKTOP trainer. PTC have been most impressed with the way the CAD/CAM in Schools Initiative has taken off in Britain and would like to introduce a similar scheme in America. It might therefore be possible for me to act as a Trainer for the Cherry Creek district schools during the period of the Summer Institute.

The first objective of my visit was to have time to discuss the Millennium project without any distractions or restrictions. Steve and I made the most of my visit to discuss a broad range of topics that revolved around our two schools and not just the project in isolation. Both systems have their good and bad points and at the end of the day, it is a pity maybe that those who make the seemingly constant changes to the education systems of both countries do not go for a compromise and integrate the good bits of both. (If only they had had the opportunity to study design and technology at school and so become proficient at problem solving!). I personally liked the idea of starting early,

finishing early, running extra curricula activities without impinging on lesson time and the credit system of building up points by opting for shorter modules rather than relying on the GCSE examination system that we have. School for staff also starts a week before the students, giving ample time for preparation, INSET etc., without then having to disrupt the rest of the year. Teachers do not lose any holiday I should hasten to point out, and students are also required to enrol during this week of preparation. I would still want our more structured curriculum though and this was something that American teachers would also like to see out there. There are few differences between the subject area in both schools and it would be very easy for Steve and myself to 'swap jobs'!

Much of our time was spent working on and developing the project. A lot of what we discussed has already been included in the rest of this report. We also discussed the future development of the project and made the decision to run the Summer Institute on alternate years in both countries. This would benefit both schools by:

- taking some of the organisational pressure off staff involved
- reducing the burden on an area to provide suitable project ideas on an annual basis
- schools would also possibly find it easier to raise funds to support the travel costs if the exchange was done on a biannual basis.
- both schools would be able to promote the subject area further and work toward raising standards
- the exchange programme would be run during the summer break period of both schools – so limiting the problems of supply cover costs and students missing school.

There is also a need to involve more members of staff from both schools. They will benefit in the same way that I feel I have in having my horizons broadened. It is also unlikely that the initiative would survive for long if Steve or I were expected to maintain the programme on an annual basis. We both have young families and other commitments.

Even though much of the contact with Horizon has been done since my return, I feel that I achieved everything that I set out to do as Steve and I planned much of what was discussed at the meeting before my departure. I feel very positive about the project and its success.



If anyone reading this document would like to comment on it, ask questions or make suggestions for its further development, then please do not hesitate to contact me at [sion.walker@btinternet.com](mailto:sion.walker@btinternet.com). I look forward to receiving your comments.

### **Annex A: Millennium Technology Project: A Joint Initiative between Eaglecrest High School and Aberaeron Comprehensive**

#### **Introduction**

The Trans-Atlantic exchange programme that has been run successfully between Eaglecrest High School, Denver Colorado and Aberaeron Comprehensive, Ceredigion, Wales for the past three years, now needs developing further.

#### **Aim**

Our aim is to set up joint technology projects that will be both attractive and feasible for 15/16-year-old students on both sides of the Atlantic.

#### **Possibilities**

To this end a suitable design project needs to be 'real'. It would be best set by a company that has interests in both countries or better still, in both states/counties. One such company would be Horizon Organic Dairy, Niwot, Colorado. They have a British arm to the company, Horizon UK, based in Bristol that has recently acquired Rachel's Dairy situated at Aberystwyth, Ceredigion.

#### **Suitable design brief**

A suitable design brief could be:

Design, make and evaluate a plastic yoghurt container that will encourage young children to consume Horizon Organic Dairy yoghurt.

#### **Student benefits**

- Having to solve a 'real' problem as set by an outside agency/corporation.
- Having to solve a prescribed brief within a given time.
- Having to communicate with peers and line managers and work as a team.
- Having to be resourceful and being able to broaden their technological skills.
- Gaining an increased awareness of industry through visits to a range of associated companies – e.g. Rachel's Dairy, Intertech Plastics.
- Gaining credits from Colorado University, Denver, that can be used to gain entry into post high school/secondary education in both countries

- Being able to discuss their experiences at interview, especially in the engineering world.

#### **Horizon benefits**

Access to a superb marketing story that will appeal to the press in all areas that the company has production plants and markets.

- Use of an imaginative design resource that is close to the targeted market group.
- Make use of involvement in initiative to add to an already excellent web site.

#### **Project structure**

- Students set brief in spring of 2001 and put into transatlantic design teams.
- Investigate situation in relation to their country and report back to rest of team. Use e-mail and video conferencing to talk to each other.
- Welsh students travel to Denver in summer 2001 to attend Eaglecrest Summer Institute. Meet partners in flesh and proceed to realise their designs before presenting them to a panel of guests.

#### **Cost to participating company**

Whilst no financial cost is anticipated, we would measure any contribution of personnel time and give that a cost which we would use to bid for match funding from other organisations.

If Horizon felt that they would like to make a contribution toward the project, this would be more than welcome especially as we are seeking to make the Summer Institute affordable to all who want to participate.

#### **Conclusion**

Whilst students undoubtedly benefit from conventional exchange programmes, our initiative takes the visiting of each others homes and schools a stage further and would without doubt be of much greater value to all involved – students, teachers, schools and companies.

#### **Web sites**

To find out more about Eaglecrest, please visit [www.ehs.ccsd.k12.co.us](http://www.ehs.ccsd.k12.co.us).

To investigate Ysgol Gyfun Aberaeron further, please visit: [www.lineone.net/~aberaeron.school/index.ht](http://www.lineone.net/~aberaeron.school/index.ht).

For more information on the HEAT Centre – please visit their web site at [www.heatcentre.org](http://www.heatcentre.org). There is also a link to the Lowry development site, which explains the ethos behind this high technology area – well worth a visit.

For more detailed information on both Horizon and Rachel's Organic dairy, go to their respective excellent web sites at [www.horiznorganic.com](http://www.horiznorganic.com) and [www.rachelsdairy.co.uk](http://www.rachelsdairy.co.uk)

To contact the author, e-mail him via [sion.walker@btinternet.com](mailto:sion.walker@btinternet.com)