


Harvester Technical College

AQUE DUX PROJECT: learning and applying water wisdom, with the assistance of the Smart Water Fund

AQUE DUX PROJECT GOALS

- The first main area of the project is the design and building of a demonstration site which shows how several trades can work together to contribute towards sustainable use of energy and especially water.

- The purpose-built, water-wise community learning ‘shed’ and integrated garden beds will be built on the campus. It will display water and energy saving initiatives, as well as showcasing the various trades available to the students/apprentices (i.e. carpentry, plumbing, engineering, electrical, automotive and commercial cookery).

AQUE DUX PROJECT GOALS

- Industry partners (especially Bell Environmental) and students/apprentices will share responsibility for designing and creating water-wise solutions for this venue. A later aspect of the project is to take similar design solutions into other sites in the local community, such as other schools.

- Secondly, the Aque Dux project aims to use the learning attained during the design, building and installation activities to produce curriculum programs and materials that can be utilised by other educational bodies in other settings.

AQUE DUX PROJECT GOALS

- Thirdly, the Aque Dux project aims to develop relationships between partners and stakeholders and to provide a model for how organisations and individuals can work together for the benefit of all. The project takes the learning out of the school and the classroom and into a series of applied, authentic situations.

- Fourthly, Aque Dux aims to interrogate the nature of the learning by involving a sophisticated action research methodology. The action research component of the project offers a framework for evaluating and reporting on cultural change, framed in terms of behaviour evaluation.

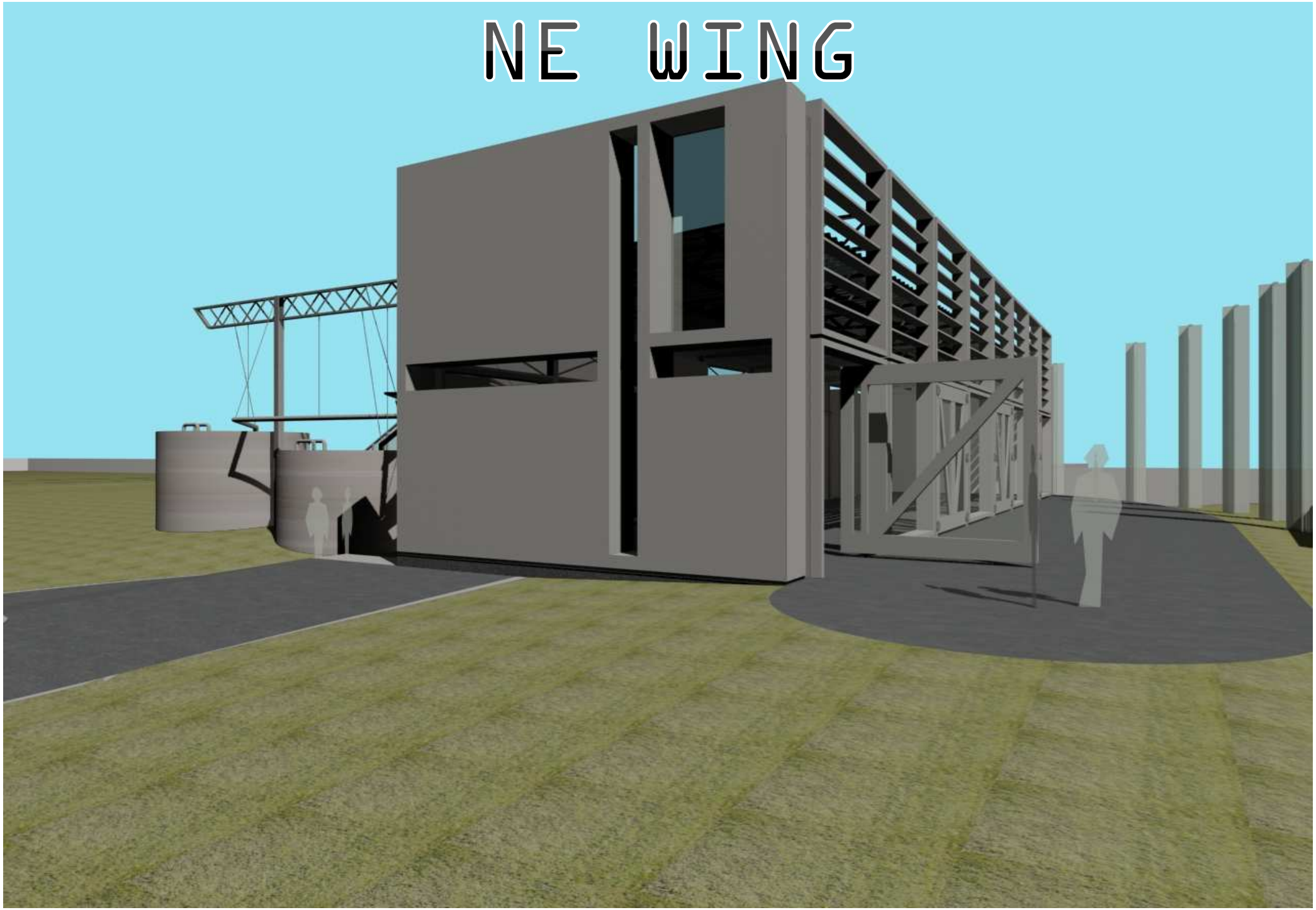
AQUE DUX PROJECT GOALS

- Fifthly, Aque Dux aims to make the most of all possible means of communication and publication opportunities, including research papers, websites and a multimedia DVD showcasing the learning from the project.

TODAY:

- THE RESEARCH CHALLENGE
- THE CURRICULUM CHALLENGE
- THE APPLIED LEARNING CHALLENGE

NE WING



OBJECTIVE & RESEARCH QUESTION

Objective

The aim of this study is to understand how several stakeholders can learn and work collaboratively to contribute towards both cultural change, framed in terms of behaviour evaluation, and the sustainable use of resources - in particular water.

Research Question

What is the awareness level of students, school educators and industry stakeholders towards environmental sustainability?

RESEARCH METHOD

Mixed methods:

- quantitative (105 surveys, regression analysis) and
- qualitative approach (19 semi-structured interviews).

Two research stages comprised of:

- stage 1 to establish current perceptions, awareness and understanding towards environmental conservation.
- stage 2 to uncover any changes in perceptions, awareness and understanding towards environmental conservation once the demo site construction is finalised.

RELIABILITY

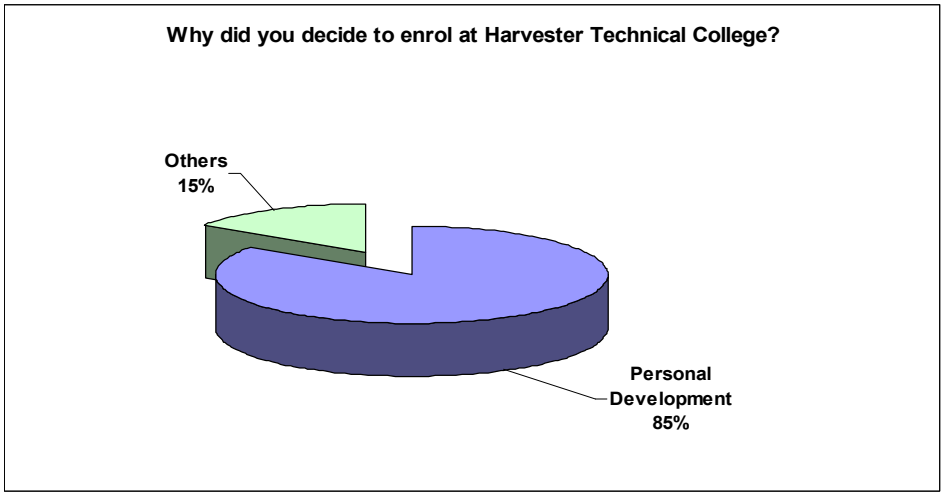
Three scales

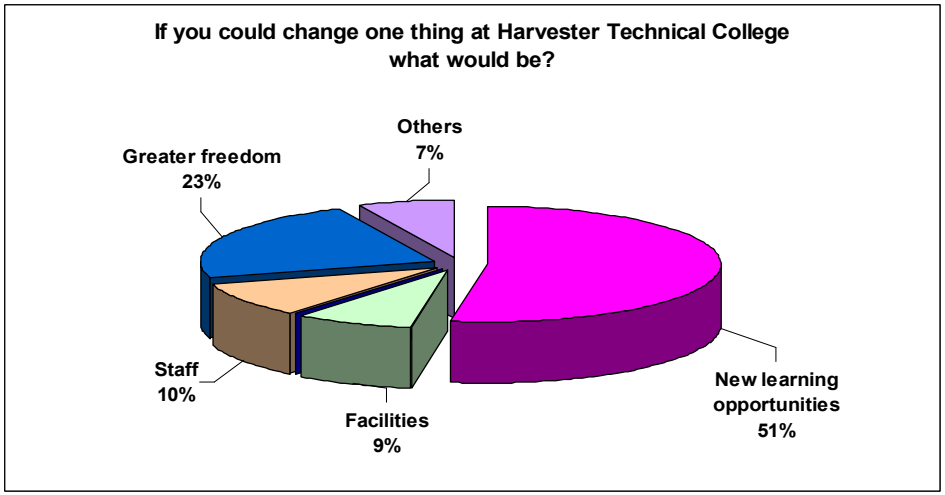
- Environment (Cronbach alpha =.7) – perceptions, beliefs and involvement
- Self Perception (Cronbach alpha =.8) – perception of other people's opinion about them
- Climate Change (Cronbach alpha =.8) – awareness

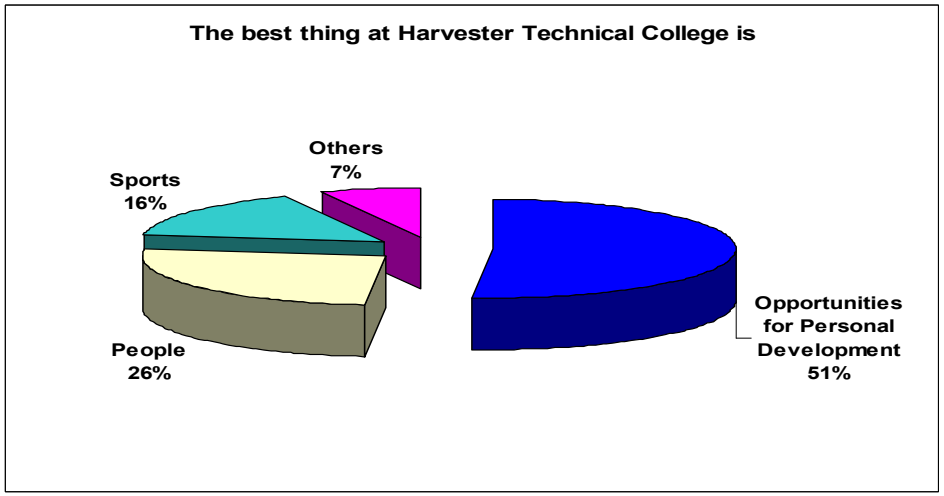
The Cronbach alpha for the three scales is above 0.7, which is consistent with the literature (Field, 2009).

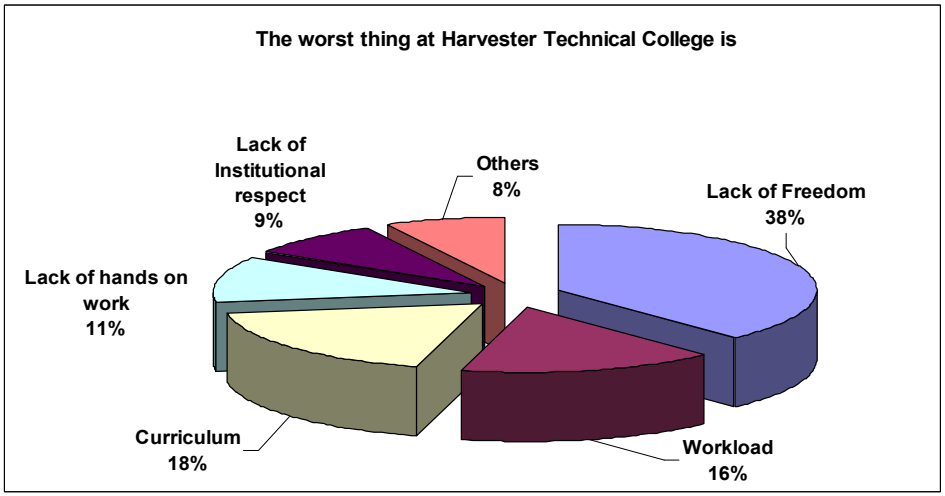
The project was formally approved by the RMIT Human Resource Research Ethics Committee.

QUANTITATIVE ANALYSIS – EXPECTATIONS

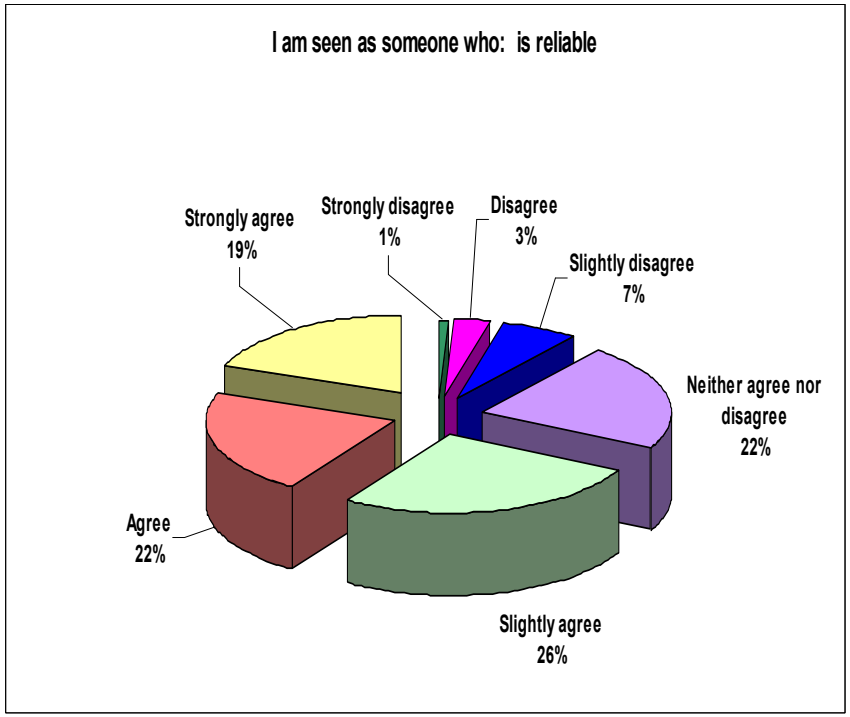


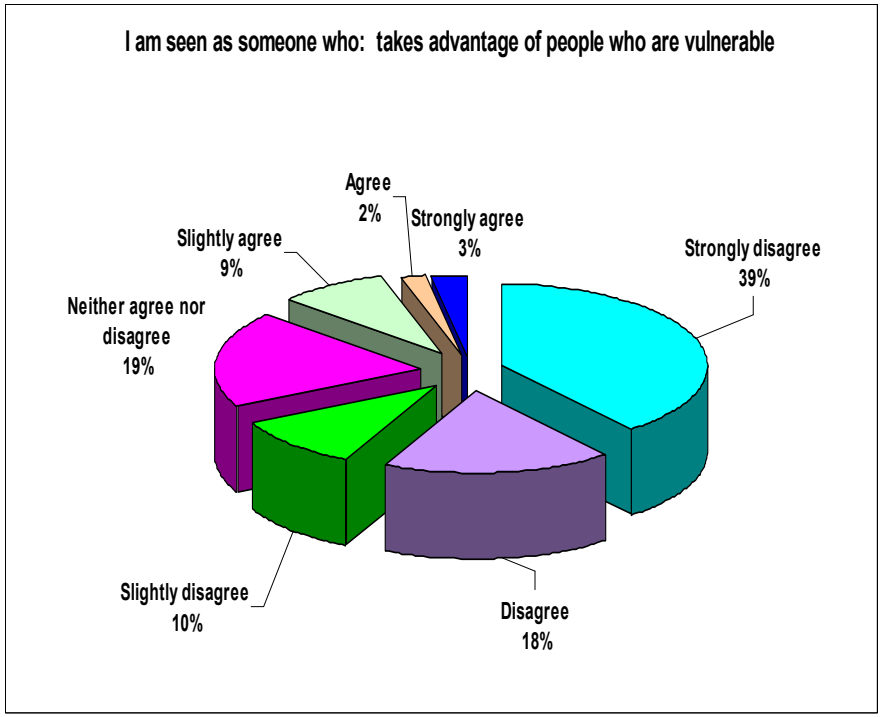




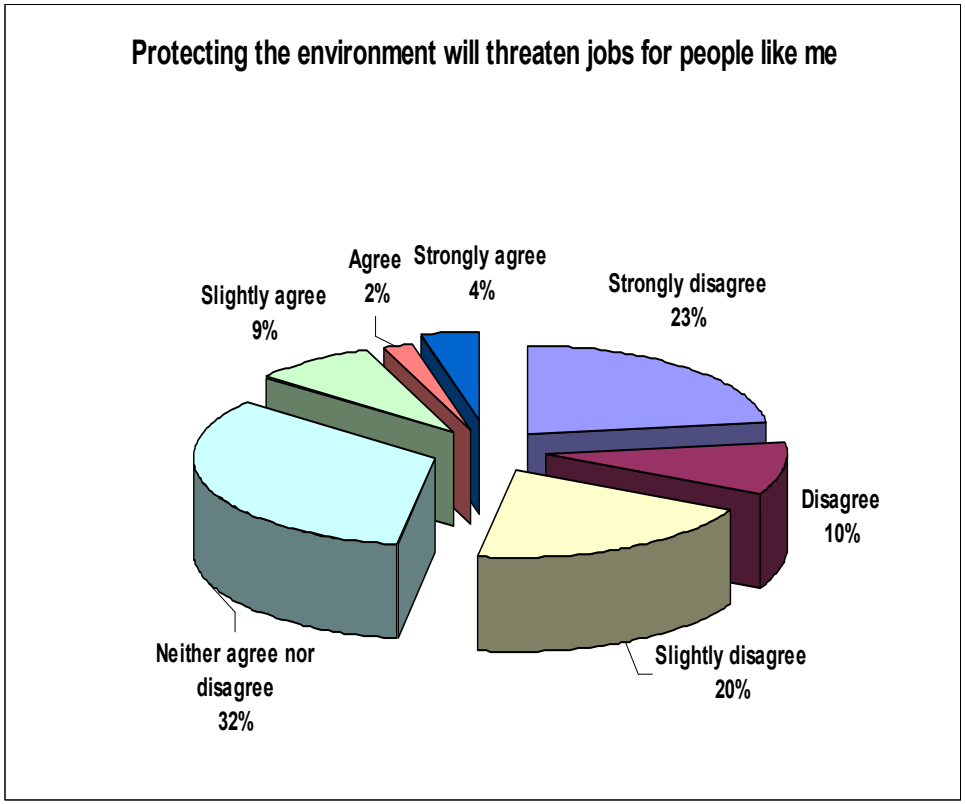


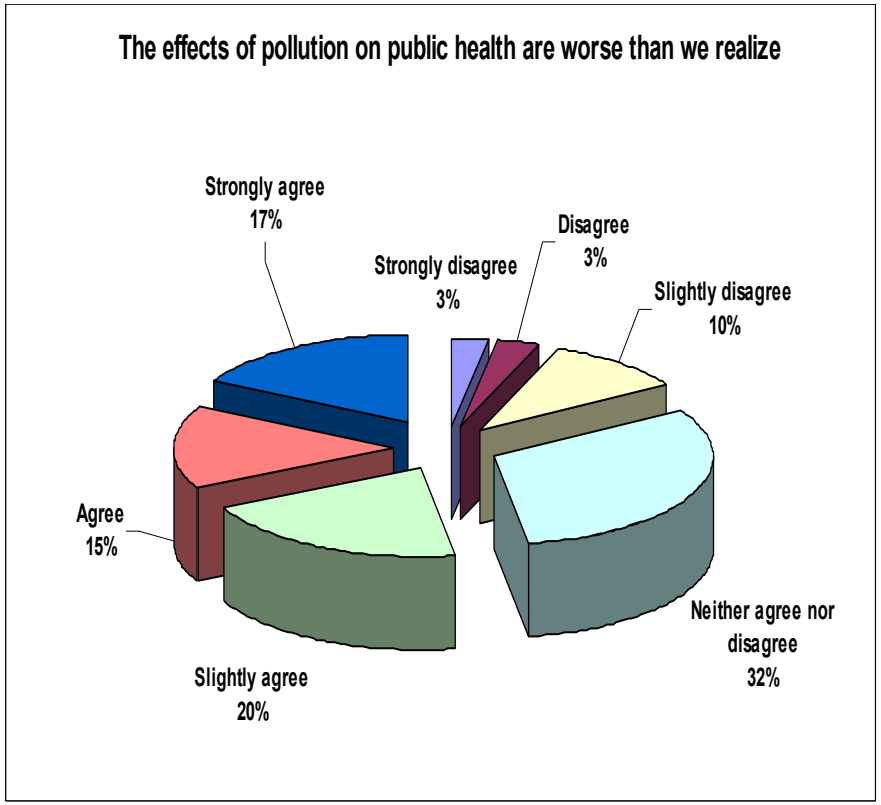
QUANTITATIVE ANALYSIS – SELF PERCEPTION



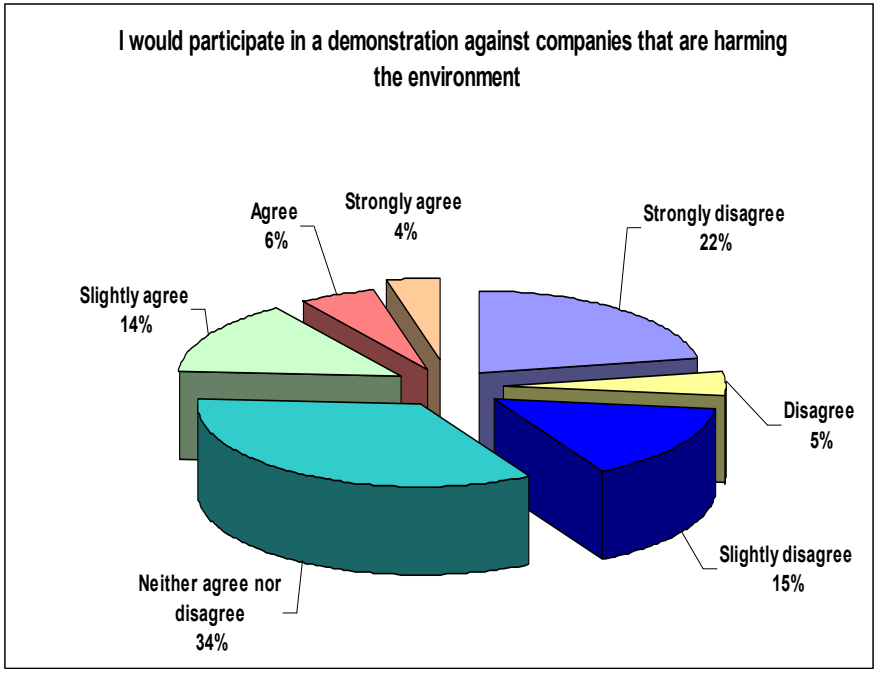


QUANTITATIVE ANALYSIS – ENVIRONMENTAL CONSERVATION

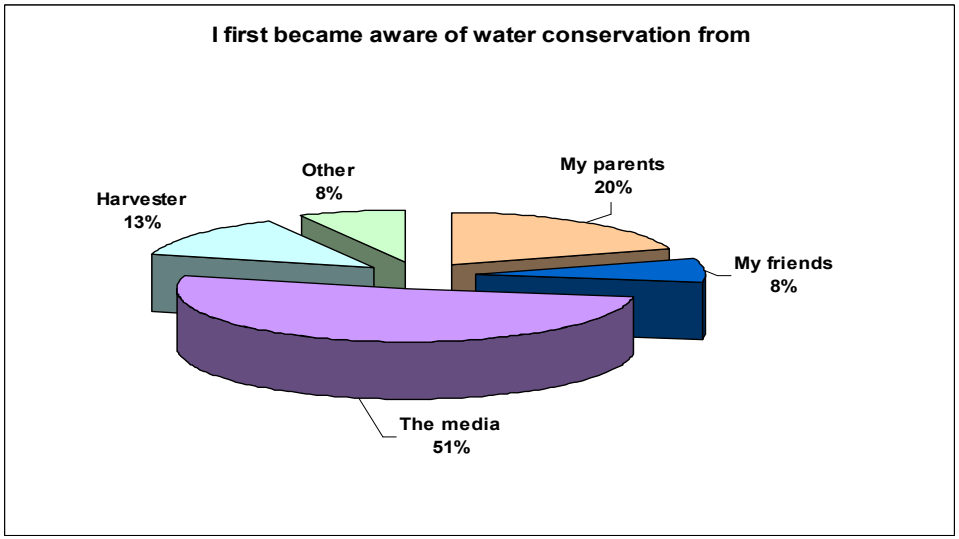


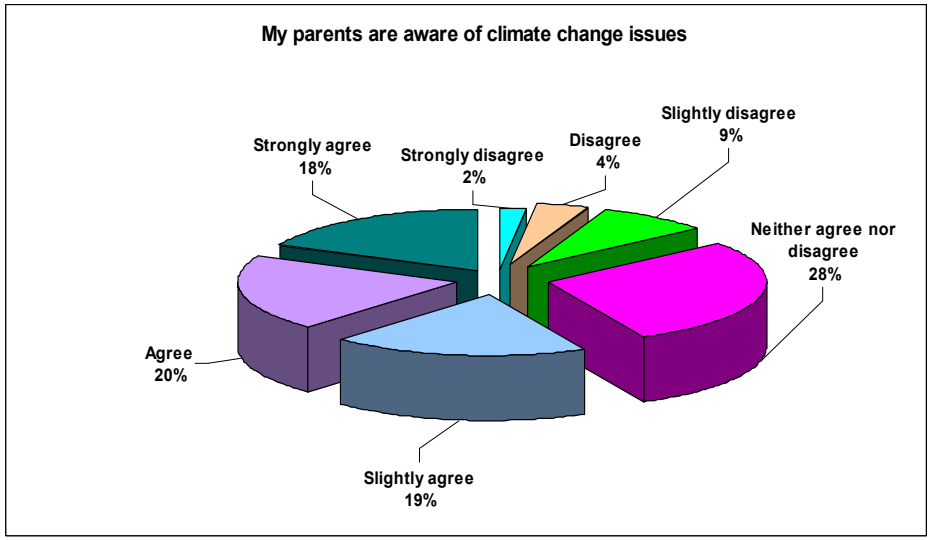


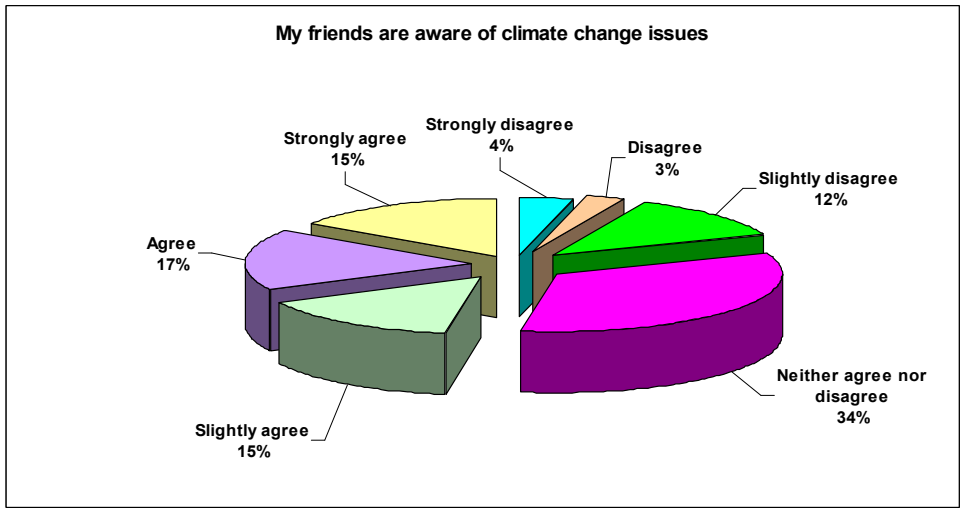
QUANTITATIVE ANALYSIS – ENVIRONMENTAL CONSERVATION

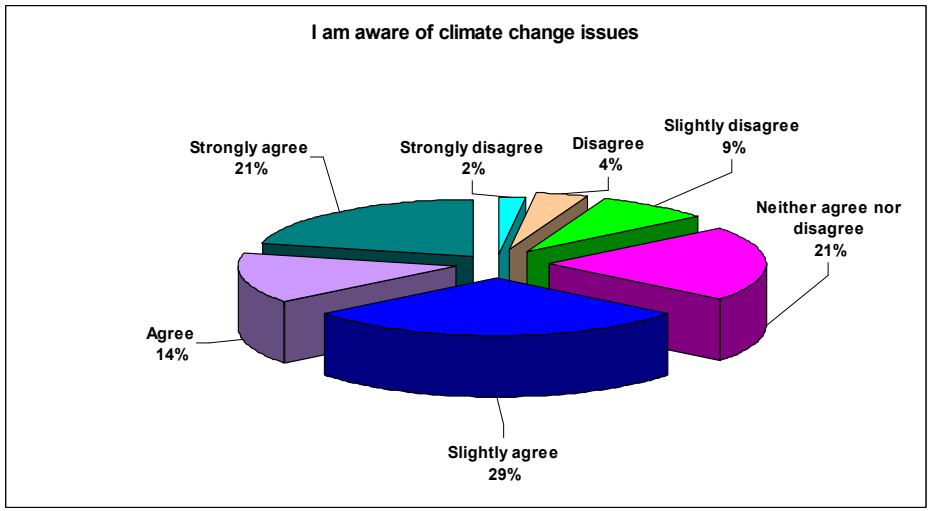


QUANTITATIVE ANALYSIS – CLIMATE CHANGE AWARENESS









QUANTITATIVE ANALYSIS – RELATIONSHIPS

Self perception-Environmental Conservation

	Environment Conservation (aggregate)		
	ß	**t-value**	**p-value**
Simple Regression Model			
Self-perception (aggregate)	2.81	2.97	*.004*
R^2	.79		
Adj R^2	.70		
F-Ratio	8.8		

Self perception-Climate Change Awareness

	Climate Change awareness (aggregate)		
	ß	**t-value**	**p-value**
Simple Regression Model			
Self-perception (aggregate)	2.62	2.76	*0.007*
R^2	.069		
Adj R^2	.060		
F-Ratio	7.61		

The regression analysis results are statistically significant.

There is a positive relationship between self-perception and the perception of environment conservation. In other words, the better the student's self-perception, the greater his/her favourability towards environment conservation.

There is a positive relationship between self-perception and climate change awareness. In other words, the more positive the self-perception, the greater the awareness towards climate change.

QUANTITATIVE ANALYSIS CONCLUSIONS

- Main reason for selecting Harvester Technical College is Personal Development ("*to get a trade, to get a job, to get an apprenticeship*").

- There is a positive relationship between self-perception and the perception of environmental conservation. In other words, the better the student's self-perception, the greater his/her favourability towards environment conservation.

- There is a positive relationship between self-perception and climate change awareness. In other words, the more positive the self-perception, the greater the awareness towards climate change.

QUANTITATIVE ANALYSIS CONCLUSIONS (CONT)

Concern about the environment:

- In general, students are somewhat conscious of the importance of environment conservation. However, they are **not** convinced to invest resources into this cause and are **not** strongly committed to activities that would benefit the conservation of the environment.

Level of awareness of climate change and water conservation issues:

- There is overall awareness of the importance of water conservation. However, increased level of knowledge regarding ways that could contribute to water conservation is needed.

Main sources of environment conservation issues information:

- Media (51%)
- Parents (20%)
- Harvester Technical College (13%)

QUALITATIVE ANALYSIS

- 19 semi-structured interviews were conducted
  - 10 with Harvester Technical College students
  - 5 with industry stakeholders and
  - 4 with Harvester Technical College staff.

  Sample profile:
  - Gender distribution: 84% male-16% female
  - Age:

    Students: 50% were between 15 and 17 years old- 50% between 18 and 24 years old.

    Majority of school educators and industry stakeholders (56%) range between 45 - 54 yrs; 22% range between 35 – 44 yrs with 22% between 55 -64 yrs.

QUALITATIVE ANALYSIS
Students' understanding about Environmental Sustainability

PARTICIPANT	COMMENT
Participant 1	*"I am not really sure about that"*.
Participant 2	*"I do not know that much about that, but I know the earth it is getting hotter, and global warming and the ice caps are melting and it is creating problems for arctic animals".*
Participant 6	*"My understanding is that the world is going through some hard times at the moment as far as water and other resources we are running out, and we all as a community, and as a school we all have to work towards saving some water, try to, as far as Aque Dux goes this is how we are helping the environment, make safe and happy building, it would save water".*
Participant 8	"Very basic, I have done one or two unit or modules here on environmental sustainability, basically being like solar power".

Overall, the students do not have a clear understanding about environmental sustainability and are concerned about the future environmental problems until certain point. Further work needs to be done to increase understanding.

Quantitative analysis suggest greater understanding, but no willingness to commit money and effort to sustainability issues.

QUALITATIVE ANALYSIS

Students' Perception about the Aque Dux Project

PARTICIPANT	COMMENT
Participant 3	*"I believe it would give me a fairly knowledge on construction and like saving water, and just being more energy efficient and stuffs like that.".*
Participant 4	*"it can make a difference, by building Aque Dux thing we can actually save some more water and learn more. I think it is a great idea because it is going to help our school"*
Participant 10	*"you learn a little bit more about save water and how you can help the environment, and you can pass that knowledge on to other people".*
Participant 5	*"I am participating in this cause I am interested in new technology, new learning and because it is hands on and I like to learn about new ways of doing stuffs and I want to help the environment because reuse stuff and we rebuild into other stuff and all that".*
Participant 6	*"I think it could be very good for experience for hands on working, learning about the different trades, it is going to be fun because we get to work with our friends, and learn together and help each other learn and at the same time we are helping the environment, save water and just you know, making a nice building. It is just looking forward to the future, we are bettering our selves".*

In general, the students perceive Aque Dux as a great opportunity to learn new skills and to learn about environmental issues, and to apply their skills in a hands on project.

QUALITATIVE ANALYSIS
Climate Change Awareness among Students

PARTICIPANT	COMMENT
Participant 2	"Probably yeah, like having shorter showers, save water"
Participant 3	*"Probably instead of driving around, riding a bike or something like that".*
Participant 5	*"Probably recycling, using water, cutting down the green gas emission catching the tram instead of driving the car".*
Participant 1	*"Some, some of my friends are. But in general you will see that not, no really"*
Participant 2	*"I do not think anyone is like really interested in like the environment, but I do think that people have a general understanding of how to save water by taking shorter showers, and, stuff like that. But I do not think they have a great knowledge about environmental issues"*

These findings are consistent with the quantitative results and suggest a need to increase the awareness about climate change issues among students at Harvester Technical College

QUALITATIVE ANALYSIS

Industry Stakeholders' understanding and Concern about Environmental Sustainability

PARTICIPANT	COMMENT
Participant 12	*"It is an enormous issue and we actually employ a number of environmental specialists here at this organization and the industry is trying to come to terms at the moment that we need to be more sustainable at the practices, to minimize the use of energy, to minimize the use of water, to recycle what they can. It is an enormous issue for the whole industry" (participant 12).*
Participant 13	*"I think the best description of environmental sustainability was the developed by the Natural Step in Sweden which broken down to the system condition for environmental sustainability and then you can apply that as a tool for businesses and organizations to work with it. It breaks it down to the system condition, so for example for system to be environmentally sustainable it needs to reduce its dependency on fossil fuels"*
Participant 14	"My understanding is that it is a major of an environment ability to sustain itself, so could be in reference the ocean that sustain itself or the atmosphere, water, land, animals, humans, food, energy. It is a transfer that is sort of my understanding, it is very simple"

The findings show a clear understanding of sustainability and a real concern about the main issues impacting on the environmental sustainability.

Through the Aque Dux project, the industry stakeholders knowledge could help increase the Harvester Technical College students' awareness and knowledge of environmental sustainability.

QUALITATIVE ANALYSIS

Skills transferability according to School Educators

PARTICIPANT	COMMENT
Participant 11	*"All trades skills involved with construction, services and infrastructure. Like housing construction being part of conservation and environmental sustainability and also by demonstration hopefully learn about it".*
Participant 14	*"I think it is a very important thing to be doing what they are doing at the Harvester College, so I have put down some. Have skills such as, sustainable water use principles, plumbing skills, water conservation skills, water recycling, sustainable energy -know how-, understanding of building and construction, plumbing, engineering, electro technology and also they need to understand the link between energy and water. But obviously these are students so maybe this is just an initial understanding of bigger things"*
Participant 15	*"I am not sure that there is so much skills that they need. I think it is just understanding of what the issues are because again it is minimization of impact, so is understanding how the particular materials might have a better environmental impact than others. Understanding the methodology that they are taking, you know they can understand the differences between two methods and what the relative benefits are. So I think beyond the actual skill of making things happened is an understanding, it is more a sort of issue understanding of how the whole system fits together"*

The findings indicate that in addition to technical skills, the students need to gain a complete understanding of different construction methods and their impact on the environment.

An understanding of the big picture is advisable.

QUALITATIVE ANALYSIS

Industry Stakeholders' Perception of the level of Awareness about Environmental issues among Students

PARTICIPANT	COMMENT
Participant 13	*"I do not know. I would say that their awareness of water conservation is very hard since the mid 2000, you know when we had the water restrictions and until water restrictions I do not think there was any awareness of it. I think there is a bit of an abnormally between the theory and the practice. I think some students are very responsible and some are very irresponsible. I think that younger generations are more aware though"*.
Participant 14	*" I do not know. I imagine that it would be a need for all the skill that I have mentioned before to be developed into these graduated students. I imagine that this is something that should be definitely included in the curriculum"*

Overall, industry stakeholders believe the level of awareness regarding environmental issues, among students, is increasing due to water use restrictions.

There appears to be a disconnect between the industry stakeholders and the students.

QUALITATIVE ANALYSIS

Industry Stakeholders' Strategies to benefit Industry-Educational Institutions Environmental Sustainability Projects

PARTICIPANT	COMMENT
Participant 11	*"I believe they need more practical skills in the schools. Demonstration sites are probably the best ways they can do that. I believe they need more hands on training, or practical training, and placing the student in the work place to help them get more practical knowledge. We currently have four students from the Technical College at the moment"* .
Participant 12	*"I am not really sure. There are engineers that can learn the practical applications, more than theoretical and that would be useful. What the industry values is that these projects are really relevant to their work, so if there is a practical skill and it would be relevant to what they are looking for them it would be value"*
Participant 5	*"The Aque Dux project is a great example of how the industry can contribute to the implementation of environmentally sustainable projects, together with education and institutions. They are working with a number of key stakeholders such as: Bell Environmental, RMIT, Harvester –the College- and the Smart Water Fund, are there also potential side holders that would come across through the project, master plumbers, funding (plumbing) union, funding industry commission and so and so, it is a really good example".* The industry stakeholders also suggest the need of large companies in investing more resources in education, to make a real positive impact in the education system, as can be concluded form the following quote, "I *know the industry has the resources, specially some of the largest companies, have the resources to contribute to education and institutions at a minimum cost for themselves but in a way that could really have a tremendous impact on the education system"*

Industry stakeholders acknowledge the need for increasing the contribution towards collaborative projects and the need to focus those efforts on projects that have practical applications

QUALITATIVE ANALYSIS
School Educators' Understanding and Concern about Environmental Sustainability

PARTICIPANT	COMMENT
Participant 16	*"My personal understanding of it, is that it is crucial that we do something about it. I think I know as much as the average person will know about it. I have done some trying in something called the closed system which looks at sustainability in a broader sense, business sustainability; economic sustainability and I can see how all of the concepts are connected"*
Participant 19	*"I think it is about, as humans leaving the less trace possible. I think it means we all produce less scars in our environment, so the using the goods and properties of the earth in a practical way better for us without degrading the environment and in a way trying utilize the nature trying to replenish, and just awareness and encouragement of the life style that is less and less dependent on the industrial complex I think"*

The findings suggest a clear understanding of environmental sustainability issues among school educator stakeholders.

Willingness to investigate and gain further understanding to get the message across to the students.

QUALITATIVE ANALYSIS
Skills transferability according to School Educators

PARTICIPANT	COMMENT
Participant 16	*"Well I think that the greatest skill is in being adaptable to change, and being open to innovation and new ideas in their particular trade areas, is being willing to experiment with new products and new techniques"*
Participant 18	*"Well for me is a learning tool, the Aque-Dux thing, and the environmental thing, is learning. Also all sort of things you can apply the learning, to organization, then the thinking and then the creativity, the design, the reflection, there is just so many things that you can apply by learning through this project, so first of all I would say trades. Well the first thing is safety, once that whole thing has been completed and running, then it leads itself to students using it to teach to other students and then furthering and developing, taking into the community, and then from the community back into it. This is a whole range of things, but really the only thing I could think they really need to know is how to be safe".*

Overall, school staff suggest that an openness to change, through learning, may have a positive impact on environmental sustainability.

QUALITATIVE ANALYSIS

School Educators' Perception of the Level of Awareness about Environmental issues among Students

PARTICIPANT	COMMENT
Participant 19	*"I think this building itself could teach the students a lot about vary of recycling water. I do not think that the society is conscious I think there is not community awareness, so I suppose the students have not more concern about it than they have about any other things"*
Participant 17	*"I think it is getting better and better, there is still a lot of education that needs to be put out there, to make everybody, not just students, but everybody be aware of sustain environment. Still needs a lot of work"*

There is a consensus among school staff regarding the need to increase student awareness about environmental issues.

QUALITATIVE ANALYSIS

School Educators' Strategies to benefit Industry-Educational Institutions Environmental Sustainability Projects

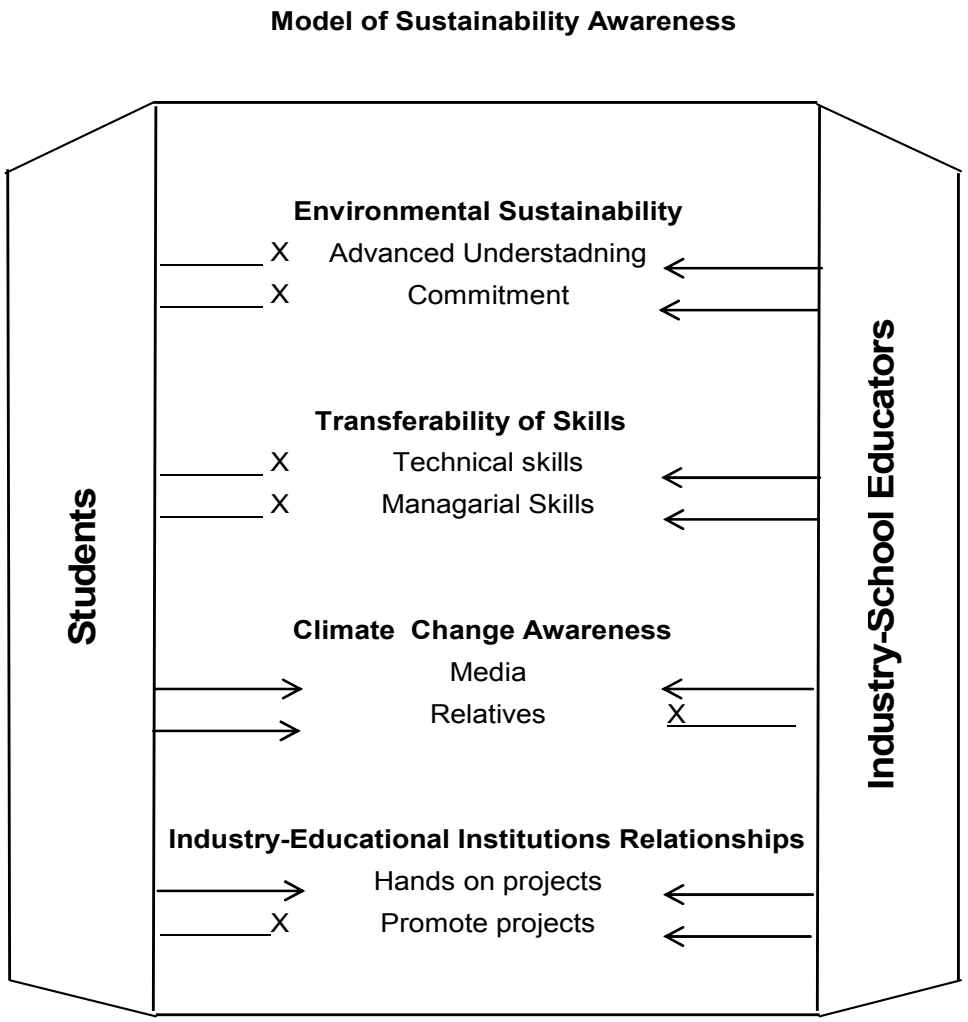
PARTICIPANT	COMMENT
Participant 17	*"I think that a place where they can see what is real, and they can do real things is what needs it. So they can visualize the result, and actually do the result"*
Participant 18	*"I think things like this, like the Aque-Dux project. That is why this is such a great idea; because it is a working model"*

In general, the school stakeholders believe there is a need to increase the number of collaborative projects between schools and industry, where students can apply their knowledge though practical experiences.

QUALITATIVE ANALYSIS CONCLUSION

Stakeholder	Environmental Sustainability Concern/ Understanding	Transferability of Skills	Awareness about environmental issues among students	Strategies to benefit Industry-Educational Institutions Environmental Sustainability Projects.
Students	Basic	Current Skills	Basic	Need for hands on projects
Industry Stakeholders	Advanced	Technical and managerial skills	Basic	Need for increasing the contribution towards educational projects and in particular projects that have practical applications
School Educators	Advanced	Technical and managerial skills	Basic	Agree with industry stakeholders about the need for contributing towards educational projects and in particular projects that have practical application This type of project should gain further attention from the media

INTEGRATED MODEL



CONCLUSION

Understanding of Environmental Sustainability

- Students have a limited understanding of environmental sustainability
- Industry and School Educators have an advanced understanding of environmental sustainability and are interested in research about it.

Transferability of Skills

- Students do not identify the skills needed to contribute towards environmental projects
- Industry and School Educators suggest the need for:
  i) Technical skills: electrical planning, design, engineering, carpentry, landscaping and plumbing

  ii) Managerial Skills: Time management, adaptability to change, being open to innovation and new ideas, willing to experiment with new products and new techniques

CONCLUSION (CONT')

Climate Change Awareness

- All stakeholders (students, school educators and industry) acknowledge the importance of the media and its role in increasing environmental issues awareness
- Students highlight parental and relative's influence in raising their awareness of climate change

Industry-Educational Institutions Relationships

- All stakeholders (students, school educators and industry) suggest the urgent need for hands on Industry-Educational partnership projects to enrich the student learning experience
- Industry and school educators highlight the importance of promoting this type of project in all contexts eg internally and externally to Harvester Technical College

NEXT STEPS

- Develop set of recommendations
- Disseminate findings and recommendations
- Conduct stage 2 to uncover any changes in perceptions, awareness and understanding towards environmental conservation once the demo site construction is finalised

Curriculum Research

- **Whole-school approaches to sustainability: An international review of whole-school sustainability programs. A report prepared by the Australian Research Institute in Education for Sustainability (ARIES) for The Department of the Environment and Heritage, Australian Government.**

- Traditional approaches to environmental education (EE) saw students as needing to have positive experiences within the environment and learn values to appreciate and protect the environment2. At the same time it has been increasingly recognised through research and educational literature that awareness raising and experiences in nature is not sufficient in itself to lead towards a more sustainable future3. An extension of this interpretation of EE was to view the school as not only as training grounds for environmental management, but to showcase it as a site of good practice in EE for the community4.

Curriculum Research

- Action on issues of ecological significance often requires changes in personal behaviour and political consensus on technologies to support these changes. For example, current education for sustainability is at a turning point where the focus is shifting from an understanding of the scientific and technical issues to a more holistic approach where the tools for cultural values and behaviour change are being explored.
- A recent online pamphlet for the National Centre for Sustainability's Vocational Certificate in Education and Training for Sustainability paraphrased Al Gore's statement that in order to transition to a low carbon sustainable future we need to know more about facilitating people to make those changes.

Curriculum Research

- The Sustainability Curriculum Framework: A Guide for Curriculum Developers and Policy Makers (2010) states that “education for sustainability is not simply the acquisition of knowledge or skills, but a total approach which generates motivation and commitment to take sustainability action for improved outcomes for a sustainable world.”
- Similarly, the National VET Sector Sustainability Policy and Action Plan (2009-2012) clearly identifies skills for sustainability as both “those technical skills applied in both existing and emerging semi-skilled, trade, para-professional and professional occupations to achieve a sustainable work outcome” and “generic skill areas such as sustainable approaches, innovation and problem solving”.

Curriculum Development and Applied Learning Pedagogy

- The assumption underpinning the curriculum design was that students would be more engaged in learning about sustainability principles and practices if involved in “hands on” projects supported by industry partners and linked to an authentic outcome, where students could see the results of their learning, “own” the product and feel connected to the world of work and the community.
- Applied learning pedagogy, which includes a strong emphasis on work-based, or at least work-like, learning, informs the VET and VCAL curriculum design and delivery in a post-compulsory senior secondary setting.

Applied Learning Pedagogy

- The Victorian Curriculum Assessment Authority (VCAA) refers to the fact that applied learning is an approach where there is a shift to an emphasis on ‘real life’ and ‘real world’ situations outside the classroom. Applied learning in VCAL is not simply ‘hands on’ learning but equal importance is placed on theory and application where “the theoretical understandings and knowledge required to complete a task will be drawn out from the context, which also provides the opportunity to use and apply what has been learnt” (VCAA 2006).
- Principles such as ‘Start where learners are at’, ‘Connect with communities and real life experiences’, and ‘Build resilience, confidence and self worth – consider the whole person’ are salutary given the context of this paper. Much innovative practice has emerged from the application of applied learning principles, however there is still a lag between theory and practice and a there is lot more to be learned about effective delivery, particularly given the challenging backgrounds and behaviours of some of the students (Blake 2006; Harrison 2007).

AQUE DUX CURRICULUM

- **Internal Driver:** Need of the Project to deliver a teaching curriculum and learning materials that can be used by HTC, VU and other organisations

- **Core Function:** Provide models for how current curriculum structures and units of competency can be interpreted through a sustainability lens and/or packaged to deliver sustainable outcomes in the pre-vocational/trades area

- **Curriculum Driver:** Need for vocational training to build-in and adopt more sustainable training for trades that contribute to better economic, social and environmental outcomes

- **Other Drivers:** Education for Sustainability agenda, Green Skills agenda, Resource Smart AuSSi Vic program, applied learning pedagogy, need to develop VCAL teaching and learning resources

CURRENT SITUATION

- MPMSAA Green Plumbers - post Cert IV, qualified tradespeople

GAP which needs to be filled: Senior secondary, pre-vocational, Cert I-III

- can be informed by inputs from existing courses such as VCE Environmental and Outdoor Studies and courses in other states or countries
- can draw on resources from above and below (eg Green Plumbers have offered that we can modify their courses for our students, resources designed for primary and middle school students can be modified too)
- can tap into sustainability units already in training packages (such as the Business unit *Participate in Environmentally Sustainable Work Practices* and/or look at existing units through a “green” lens, such as certain plumbing units)
- can take advantage of the flexibility and non-prescriptive nature of VCAL units

- Middle School
- Primary School

INPUTS

- Green Plumbers courses (free) and certificates , curriculum and advice
- Green Plumbers facility (field trip) and example for our own demo site
- Home Sustainability Assessment course training
- Other VCAL curriculum projects (eg Youth Eco-Challenge and Frankston High School)
- Other VET projects including “Green” units and communities of practice
- VCE Environmental and Outdoor Studies
- Industry-produced curriculum such as Water-Learn it! Live it! (CityWest Water)

OUTPUTS

- Policies and processes (including a hybrid model)
- Resource Smart AuSSi Vic certification example including mapping to curriculum
- Example of teaching using Certificate I in Water Sustainability as a base qualification relevant to all vocations, including the use of the online toolbox Splash
- Mapping the curriculum to a list of units of competency, VET certificates and VCAL subjects relevant to the project
- Producing Actual Lesson Plans mapped to Learning Outcomes
- Sourcing and Developing Teaching & Learning Resources
- Producing an Interpretative Learning Plan and Excursion Package for the Demo Site
- Website and DVD production including the storytelling of the project and the learnings

CURRICULUM VEHICLES	PROJECT/MODULE (KEY CONCEPTS)	CURRICULUM MAPPING
VCAL VET	Resource Smart AuSSI Vic Modules: • Core Module • Water • Waste • Energy • Biodiversity	VCAL Intermediate and Senior Units: • Literacy • Numeracy • Work Related Skills • Personal Development Skills VET Business units • Participate in environmentally sustainable work practices • Identify suitability for micro business
VCAL VET	Aque Dux Demonstration Site: • Design • Foundations • Frame • Materials • Roofing • Water harvesting • Irrigation • Landscaping • Site Interpretation • Landscaping • Planting • Harvesting *Splash* online course plus practical projects, including vegetable gardens project	VCAL Intermediate and Senior Units: • Literacy • Numeracy • Work Related Skills • Personal Development Skills Certificate I In Water Sustainability units: • Investigate sustainable water cycle management • Design a basic water system model • Demonstrate care and safe practices • Sample and test water sources and quality • Draw and use simple maps, plans and drawings • Create and use simple spreadsheets • Participate in environmentally sustainable work practices