Wicked Futures: metadesign, resilience and transformative classrooms

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Abstract: *This paper presents an Australian case study entitled "Designing Futures". It examines a six month multidisciplinary design program offered by a large co-educational, inner-city state school in Queensland in 2011. The program extended an already successful and innovative school-based design curriculum and involved students in Philosophy, Science, Mathematics and English classes, as well those in Art and Design. Additionally, there were 5 full-day workshops where students combined a wide range of skills to brainstorm, design and create sustainable solutions. The design thinking used in this program was based on the concepts of metadesign, design activism and design futuring. "Designing Futures" linked over 700 middle and secondary school students and staff with nine designers-in-residence from diverse disciplines, including bio-ethics. The program aimed to empower students from highly diverse cultural and social backgrounds to engage in authentic, participatory design processes, prepare them for future social and environmental challenges, and increase personal and community resilience. The research results will inform ongoing program development and research in K-12 design education, both within the school and in conjunction with university and community partnerships in Queensland.*

Key words: *Metadesign, design activism, resilience, participatory design, social inclusion*

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1.0 Introduction

Faced with a 'perfect storm' of climate change, rising sea levels, food and water shortages, escalating impoverishment of biodiversity, and human population growth, it has to be acknowledged that John Ehrenfeld's hopes that "humans and other life will flourish on the Earth for ever" (Ehrenfeld 2008, p. 49) may well be dashed, tipping points will be passed and very few humans will survive, let alone flourish; and that the rest of the earth's biota will be left greatly impoverished for many millennia to come. With this threat comes the very real question of whether or not our future citizens are empowered to actively and collaboratively participate in refuturing our world (Fry 2009). This is qualitatively different and much more demanding than developing the general public's competence for informed decision-making.

This paper describes a project and ongoing approach to design education at Kelvin Grove State College, Queensland, Australia called "Designing Futures" (Kelvin Grove State College 2011), which reflects the accelerating concern over a future worth having, and embraces concepts including "metadesign" (Wood 2007), co-design/co-creation as part of metadesign (Giaccardi 2005), "design activism" (Fuad-Luke 2009) and "design futuring" (Fry 2009). These all call for a fundamental shift, not only in how we approach design education but also, crucially, whom we educate and what we hope to achieve with such education.

Metadesign is seen as encompassing the practical and philosophical aims of "Designing Futures" while avoiding obvious political difficulties when working within a school system. Terms such as "design activism" would not be acceptable to many educational administrators and parents, while terms such as "slow design" (Strauss and Fuad-Luke 2008) are sympathetic but do not cover the full range of project objectives. Metadesign is cross-disciplinary, holistic, consensual, ethical and transcends a problem-oriented approach (Wood 2007), providing a cultural shift from the concept of design as 'planning' to design as 'seeding' (Giaccardi 2005). Importantly, metadesign represents a shift away from "predetermining the meaning, functionality, and content of a system to that of encouraging and supporting end-users to act as designers and engage in these activities" (Fischer 2010, p. 59).

As the name implies, the "Designing Futures" program also acknowledges the design futures approach of Fry (2009). Indeed, project planners and collaborators have followed the views of Fry and others that the future is not empty, but instead cluttered with all the things we have thrown into it, and that we all need to work together to design better futures. "Designing Futures" also has strong social aims; these are inclusivity, participation and individual and community empowerment, all found to be highly compatible with the metadesign framework. The overall environmental purpose was "…the creation of new societal values to balance human values with ecological truths. In doing so design contests the notion of material and economic progress, and its inherent ecological untruths" (Fuad-Luke 2009, p. 141). The paper presents findings from three Design-All-Day workshop sessions for Middle School students and makes recommendations for a future Metadesign Education/Design Education for Resilience research agenda.

2.0 The Educational Context

2.1 Contested educational space and education for resilience

By definition, all education systems for school-aged children are designed to educate 'for the future'. Thus, priorities depend on the view/s of the future held by those who are empowered to sustain or change system priorities. Currently, across much of the English-speaking western world, including in Australia, the USA and the UK, the dominant narrative has swung back to viewing the future as 'business as usual' and the skills needed for success as being the ability to obtain good test results in the so-called core subjects of Mathematics, Science and English and a good university entrance score. The emphases are not dissimilar in many Asian education systems. Unfortunately, on their own, these core teachings of our education systems are insufficient to equip students to be resilient in the face of an increasingly uncertain future. Many of the non-core subjects taught at schools have important contributions to make here within the framework of 'Education for Resilience'. Design education under the metadesign framework is able to make an especially salient contribution in this regard. There should be no need for the educational space to be contested because metadesign embraces core as well as non-core subjects.

The validity of spending scarce time and resources on programs such as "Designing Futures" may be seen in Australia as less important than a more 'back-to-basics' approach. This is in sharp contrast to the Finnish education system that is considered to be an exemplar as measured, for example, by the OECD Program for International Student Assessment (PISA) (OECD 2010). The Finnish system places high value on the sort of skills taught through "Designing Futures" and comparatively low value on standardised testing (Sahlberg 2011). However, it is possible to balance both of these approaches and the "Designing Futures" program offers one example of how this can be approached.

2.2 Wicked Problems: employing design education to enhance thinking skills

An educational environment that requires a considerable amount of assessment unavoidably tends to favour convergent thinking over creativity and divergence, if only because creativity is so difficult to assess fairly. Assessment and the resultant accountability are crucial to our schooling system, but a balance is needed whereby students are also encouraged to extend their divergent thinking skills. The sort of complex problems with which design education challenges our students can generally be described as Wicked Problems (Rittel and Webber 1973). Frequently, the problems students are asked to address at school are 'tame' problems i.e. well-defined, subject to clear rules and having either a single goal or a very limited number of goals (Coyne 2005). However, the big issues that will dominate our students' adult lives are wicked. Wicked problems:

> …are only loosely formulated. There is no "stopping rule". (i.e. defined point where the problem is seen to be solved). Wicked problems persist, and are subject to redefinition and resolution over time. Wicked problems are not objectively given but their formulation already depends on the viewpoint of those presenting them. There is no ultimate test of the validity of a solution to a wicked problem. The testing of solutions takes place in some practical context… (Coyne 2005, p. 6)

Wicked problems are typically design problems requiring the ability to work together with a wide range of stakeholders and deal with high levels of complexity and uncertainty. Participants in

programs such as "Designing Futures" get the opportunity to practise this kind of authentic, integrated and connected thinking leading to practical outcomes—whilst also having fun!

2.3 Metadesign and Designing Futures

The evolving concept of metadesign (Attainable Utopias Ltd 2011) is seen as the overall framework for "Designing Futures". Metadesign constitutes an overarching narrative rather than a single story. The following three principles and aspirations are especially relevant to the "Designing Futures" story. Firstly, belief in the validity of co-creation underpins the whole project framework, including the chosen research methods:

> …metadesign has been conceived as co-creation: a shared design endeavour aimed at sustaining, emergence, evolution and adaptation. According to this development, the operational terms and potential of designing at a higher-order level must be joined to a more reflexive and collaborative practice of design. (Giaccardi 2005, p. 347)

The emphasis falls on facilitation, consensus-building and ongoing process rather than immutable designed outcomes. For this reason, visiting designers from various disciplines were invited to collaborate in these processes with students and staff, thus playing a mentoring, rather than simply an expert, role. Secondly, the project was consciously situated at the interface between art and science: "Rather than a new model of design, metadesign represents a constructive mode of design: an enhancement of the creative process at the convergence of 'art' and 'science' " (Giaccardi 2005, p. 348). Thirdly:

> Metadesign represents a cultural shift from design as 'planning' to design as 'seeding'. By promoting collaborative and transformational practices of design that can support new modes of human interaction and sustain an expansion of creative process, metadesign is developing towards new ways of understanding and planning with the goal of producing more open and evolving systems of interaction. (Giaccardi 2005, p. 348)

"Designing Futures" and other continuing design-based education at the school aims to 'seed' the awareness, skills, confidence and resilience required by all students who wish to take part in (co)-creating the future. Without this education they will be severely disenfranchised.

3.0 The "Designing Futures" framework

3.1 A Practice Framework

"Designing Futures" was premised on metadesign, partnerships, authentic experiences, inclusivity and participation. Many of the values espoused were embedded in the teaching/learning processes used, rather than addressed overtly. As such, the project was offered to a diverse group of students in terms of English-language skills, educational attainment levels and backgrounds, and the contributions of all students in the groups were supported and valued. In the words of one of the planners, "which design thinking strategies were used…and which terminology was applied were of less importance than providing a palette of strategies to be employed (in different parts of the design process)." Our approach was partly modelled on IDEO's version of design thinking, because this is human-centred, collaborative, experimental and optimistic, and provides a useful structure to the students' design learning (IDEO 2012). The program's practical aims, as described on the website, start with this overview:

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The 2011 Designing Futures program… puts the spotlight on design pedagogy at a time when design practice around the world is rising to the challenge of change. It's a timely reminder that our College, in preparing students for the new century, needs to encourage flexible, connected and, sometimes, unorthodox ways of thinking. Design offers powerful tools for doing this kind of thinking, and this program set out to road-test many of them. (Kelvin Grove State College 2011)

The "Designing Futures" program provided a lot of inspirational, alchemical moments that are hard to describe theoretically—times that transcend the sum of the parts when the students' learning and excitement are palpable to all participants. As depicted in the reflections of one of the planners: "…all three events (the Design-all-Day events for Middle School) were high energy, high output and high on affirmation of teamwork and thinking power. Excellent models to build on."

The "Designing Futures" project was undertaken under the auspices of the Visual Arts Department at Kelvin Grove State College, a large (approximately 1300 students) inner-city school in Queensland, Australia, over a six-month period during 2011. It was funded through the Artist in Residence (AIR) program, which is a collaboration between the Australia Council for the Arts and Queensland Government Arts Queensland and Education Queensland. The Artist in Residence program recognises good practice and encourages innovation in arts and education programs in Queensland (The State of Queensland Arts Queensland 2012). The school is a co-educational state school catering for 13 years of schooling (Kindergarten to Year 12). The student population is highly diverse and includes a large number of international students, Australian students from non-English-speaking backgrounds, and indigenous students. The Visual Arts Department has very high participation in arts and new media, and a history of innovative leadership and creative partnership building in design-based learning programs.

The project was extensive, rich in variety and highly participatory, engaging with over 700 students, representing more than half of the school's population. These students were from across the full school age range and came from a wide variety of academic, cultural and language backgrounds. Adult participants included more than 20 teachers, some of whom were student teachers, and nine designers and artists taking part in the Designers-in-Residence program. The designers' specialties encompassed various branches of design and future-oriented art including product and interior design, urban planning, origami, ecology and bio-ethics. Despite this diversity, all the participating designers and artists shared strong values in relation to social and environmental sustainability. Students engaged in the design process were also enhancing their overall education by tackling complex problems involving multiple stakeholders, integrating theory from a range of different subject areas with hands–on design practice, and working together in teams where everyone had their disparate contributions valued.

"Designing Futures" consciously adopted the approach of inclusivity and therefore of providing design education for non-designers. The project was trans-disciplinary and involved students and teachers from the following subject areas: Art and Design; Biology; Chemistry; English; Mathematics and Philosophy. It was also trans-disciplinary in that participants used and integrated a wide range of skills, such as Mathematics (measuring and spatial); Visual Arts (drawing, model making/prototyping); English (written and oral communication); working effectively in multiskilled teams; brainstorming; Physics of structures, practical Chemistry (extraction of DNA from fruit as part of the Bio-Art program) and ethics (relating to environmental and social concerns and, in the case of the Bio-Art section, relating to the implications of biological research).

3.2 The Case Study

3.2.1 SIX-MONTH PROGRAM OUTLINE

The six-month program included the following elements:

- An extensive integration of Origami programs in Science, Mathematics, problem solving, prototyping and design, across the full school age range;
- Two off-campus design days for senior students - a Zero-waste Fashion workshop and a Slow Food workshop;
- Three Design-all-Day programs for Middle School students (details below);
- A visiting designer with a wide range of expertise who gave extensive in-class presentations and mentoring to students in the last four years of schooling. Design mentoring was also provided to Visual Arts staff;
- A Bio-Art/Ethics program targeted at Visual Arts, Philosophy and Chemistry students.

3.2.2 THE DESIGN-ALL-DAY SESSIONS

Three fully funded full-day workshops were held for self-selected Middle School students. Thus the sole criterion for entry to the program was that the student wished to take part. No one was excluded on the grounds of ability or aptitude and no cost was involved for participating students. Students were divided into teams of five, carefully structured to include diverse talents. Teams were monitored throughout the activity to make sure that everyone had a chance to participate fully. The Designers-in-Residence delivered short presentations to the students, but for the majority of the time, adults participated as mentors and facilitators of practical, enjoyable and authentic design experiences.

Having been introduced to the day's topic, teams engaged in brainstorming and mind-mapping, then the results were shared and discussed with the larger peer group. A considerable amount of experimentation took place and students were encouraged to question the brief and rethink the parameters within a wider context, echoing the concept of the redirected brief [Fry 2009]. When groups had explored and decided on the underlying problems they wished to tackle, i.e. problem-finding (Getzels and Csikszentmihalyi 1976; Runco 1994), they made presentations to 'pitch' their ideas to a team of designers, and constructed prototypes. All students, as well as teachers, planners and designers, were asked to fill in written feedback questionnaires at the end of the day. A 100% response rate was obtained for feedback from the adults who took part in "Designing Futures". The volunteer researcher was present each day, and the web designer attended to video proceedings as frequently as possible.

Day 1: Designing Edible Futures
Participants: Teachers 4, Designers 3, Students 31
Age of students: 10–11 years
Activity:
Food Miles: A practical exercise discovering the origin of different food items provided to each group.
Edible Bling: A practical design exercise using food miles items to prepare a dish that could encourage the consumption of healthy, local food. The results presented to the designer mentors and peers took many forms, including song and dance, new packaging ideas, posters, a healthy

pizza and healthy iceblocks (prepared from unlikely ingredients and later consumed with enthusiasm).

Day 2: Safe Landings for Soft Bodies (Saving Humpty)
Participants: Teachers 4, Designers 3, Students 30
Age of Students: 11–12 years
Activity: *Saving Humpty* - Rationale/Redirecting the Brief
This activity challenged student teams to design and construct ways of protecting an egg from breaking before it was dropped from a height. Teams considered whether they should redirect their briefs from designing personal safety gear to ways of altering spaces and atmospheres within the city. In the words of one of the organising team, "Is it about harder hats or softer landings?" The prototyping was facilitated by designer/mentors, one of whom has particular expertise in origami and another in the sustainable use of bamboo. A wide variety of imaginative prototypes were presented to the panel of designer mentors.

Day 3: Zero-Waste Chair (Somewhere to sit and chat that doesn't cost the earth)
Participants: Teachers 4, Designers 3, Students 50
Age of students: 12–13 years
Activity: *Zero-Waste Chair*
This was the last of the three Middle School Design Days, involving the oldest and largest group of students. A particularly important change to the program based on previous experience, was that student teams received designer mentor feedback prior to the construction of final prototypes. These prototypes were made from one 2 ply cardboard sheet measuring 3m by 1.4m and a limited palette of other materials such as tape and glue. Once complete, the prototypes were (gently) tested by a teacher to the delight of the assembled student audience at the end of the day. The concepts of minimising the use of materials, design process, sustainability and user empathy were emphasised. Each team's impressive seating prototypes followed a unique approach, both in concept and in form development. Final prototypes included, amongst others, an empathetic mood chair, planned to change colour according to its occupant's frame of mind; a welcoming chair with a smiley face on the back and open arms with hands forming the sides; and a Yin/Yang chair. All seating had a strong relationship to the idea of community.
As it is impossible to provide detailed information on all of the above in a short paper, the detailed findings will focus on the three Middle School Design-All-Day sessions.

4.0 Methodology

4.1 Participatory Action Research

The program included Participatory Action Research procedures where planners, teachers, designers and students were all encouraged to voice and reflect on their experiences. "Designing Futures" was an internally-based action research project initiated within the school rather than being a product of external research conducted, for example, by a university, as is the case with many comparable projects. As such, "Designing Futures" was run with comparatively low funding, including a volunteer researcher, large stakeholder input, and a high level of commitment to authentic collaboration. "Designing Futures" was multifaceted, explorative and wide-ranging with large numbers of participants. Also, some aspects of the project, for example the Bio-Art section

were controversial, even confronting. For these reasons, it is crucial but challenging to give a picture of the range and individual narratives of as many participants as possible. As such, this project cannot be written about both authentically and with unequivocal research questions and outcomes. Where choices have been made in writing this paper, validity and presenting as many genuine voices as possible have been the guiding principles.

The "Designing Futures" program can be described in terms of action research as it pertains to a situation in which participants reflected about, improved and developed, their own work while also making the experience public. This model of action research values was chosen as it is:

- Practical
- Participative and collaborative;
- Emancipatory and egalitarian;
- Interpretive - a strong emphasis on authenticity is integral, and the researcher/s interpretations of the results need to be recognised and validated by the participants;
- Critical - participants look for practical improvements in their own work and learning, they also act as critical change agents by sharing this learning with others (Zuber-Skerritt 2012, p. 8)

Events were observed and progress monitored and reflected upon through formal and informal meetings. Video and still photography provided a visual record. The questionnaires constructed for each group of participants were worded differently so that they were clearly relevant to the particular activity that had just been engaged in and quick to complete (Bradburn, Sudman and Wansink 2004; Frazer and Lawley 2000). Formative and summative information was obtained from the teachers. The designers/artists and teachers involved provided written feedback and, finally, the information was shared with all these participants, as well as all other Middle School teachers, and a report was prepared for the funding body. Unfortunately, it was not practical to share the final information with the students. A website has been constructed to share information about the project with other schools across Queensland and beyond, and also, importantly, with parents and prospective students.

The participatory action research spiral was especially relevant to the adult participants who were able to contribute to and benefit from the feedback cycles. Alice McIntyre describes it in this way:

This process of questioning, reflecting, dialoguing and decision-making resists linearity. Instead, PAR is a recursive process that involves a spiral of adaptable steps that include the following:

- Questioning a particular issue
- Reflecting upon and investigating the issue
- Developing an action plan
- Implementing and refining said plan

…various aspects of the PAR process are fluidly braided within one another in a spiral of reflection, investigation and action. (McIntyre 2008, p. 6)

As well as describing the research process, this spiral neatly reflects the recursive design processes that students were engaged in learning about.

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4.2 Findings

This paper reports on the combined findings of the three Design-all-Day activities for Middle School students, derived from written feedback and supplemented by observation and records of formative action research. Information on the other aspects can be obtained from the website (Kelvin Grove State College 2011). Results focus on what the students learnt during the Design-All-Day sessions as this is seen as the most salient information when evaluating whether this part of the "Designing Futures" program fulfilled its aims and objectives. The learning questions were:

Designing Edible Futures

- ▪ "One thing I learned today about food is?"
- ▪ "One thing I learned today about design is?"

Safe Landings for Soft Bodies

- ▪ "One thing I have learned today about safety design is?"
- ▪ "One thing I have learned today about design in general is?"

Zero-Waste Chair

- ▪ "One thing I learned today about seating is?"
- ▪ "One thing I learned today about design is?"

Out of a total number of 111 students who participated in the three-day program, 84 students (76%) responded to the questionnaire. The 84 students were encouraged to nominate more than one response to the learning questions and this resulted in a total of 136 responses. Only one student gave a negative response to these questions. This student claimed to have learned "not much." As there was a wide range of responses, they have been grouped according to the most commonly mentioned themes, as discussed below.

4.2.1 DESIGN PROCESS / DESIGN THINKING

A total of 56 students (representing 41% of the 136 responses) commented on design process and thinking. There were various strands to this conversation. Students wrote about learning to use their creativity and "use our imagination and turn it into something real". Also, "you can be really creative with it (design) and express your feelings when you set it out on a plate". An understanding of the processes by which ideas turned into good designs was demonstrated in comments such as: "A lot of ideas are put in and rejected"; "It takes a long time to find a proper idea"; "You can change designs to make them better or simpler"; "It is important to plan everything that is to occur"; and "It takes time and thought to create or pitch an original idea". The younger students remarked on design being easy; the older students were more likely to describe it as difficult, but this was not generally seen as a negative, more as a challenge. One student commented, "Sometimes to win you have to think hard", and another, "If you put your mind to it and stick with it, it will come out the way you want".

4.2.2 DESIGN FOR HEALTH AND SAFETY, AND THE ENVIRONMENT

A total of 38 students (representing 28% of the 136 responses) responded to questions regarding design for health and safety and the environment. Students from the *Designing Edible Futures* day remarked on how design could make healthy food look good and persuade people,

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especially young children, to make better food choices. Students from *Saving Humpty* learned that good design has the potential to make public areas, especially busy streets, safer for pedestrians. One learned *"how to think about ways to make public areas safer".* Designing public seating during the *Zero-Waste Chair* day taught students that this carried a big responsibility to make the seating safe. A major theme of their responses was the importance of load-bearing internal structures. Balancing the needs of people and the environment was also a strong emerging theme, with one student learning "that people come first…and it's not just about designing individual things, you need to think about the environment as well", and another commenting, "I could put my ideas into something that didn't destroy the planet".

4.2.3 TEAMWORK FOR DESIGN

A major learning theme for the three days was teamwork. Students were specifically asked whether they enjoyed working in a team. 89 students answered this question. 63 students (71%) enjoyed working in a team, 24 students (27%) sometimes enjoyed working in a team and 2 students (2%) did not enjoy working in a team. Even where there were some teamwork challenges, most students acknowledged the importance of teamwork to the design process. One student noted that "I learnt to communicate with members of the group better to get good ideas and to discuss" and another responded, "I learnt that in a design team everyone has their strengths and the team works best if you work with them".

The following comments from three of the Designers-in-Residence are in accord with the overall impression of enthusiasm and learning:

> My own personal view and experiences…were that many of the students left inspired and enthusiastic about how they could apply these experiences to current and future learning tasks, whilst inspiring fellow students about their own ideas and the importance and merit of these ideas, not just within their educational environment, but also outside within the wider community. The unexpected outcomes generated during the workshops meant that students had to let go of preconceived ideas and adapt to group-led discussions whilst discovering a more additive or evolutionary solution was as important as a definitive resolution. (Designer Participant 1)

> These kids are my super-heroes…I watched them grapple with food miles maths, an edible bling dinner party, blenders and fusion icy pops before getting down to the stuff of redesigning what we can do to green our food systems. Move over food monopolies…the kids are coming…and they are good! (Designer Participant 2)

> The input of an industrial designer, interior designer and origami artist into the design evaluation process allowed students to see that the design of products is not just an exercise in form, but requires an ability to empathise with the user and client, to create an emotional connection with the product and user, a succinct visual and verbal communication of ideas, an ability to respond to a diverse range of challenges during construction, and an appreciation of the larger world around us. The depth and complexity of the thinking behind the design was revealed. (Designer Participant 3)

The picture is also reinforced by this summative statement from the Visual Arts staff:

> The Middle School Design-All-Day program provided a laboratory to test the effectiveness of design approaches, as well as the 'futures' framework. It was clear that with the activities

framed in an appropriate and engaging way, students worked with confidence and responded imaginatively to these quite challenging themes. Again, the opportunity to work with design mentors provided an authentic context. Success was measured by the effectiveness of teamwork and the quality of the ideas generated in a comparatively short time rather than by the usual 'performance' values. This was a model that could be applied in our practice in many other contexts.

5.0 Summary & Recommendations

The findings indicate that programs like "Designing Futures" can make a major contribution to educating students towards individual and community resilience and empowerment, and working together to help design and construct viable futures. The program has been shared with other schools and this paper represents a continuation of this sharing process. The desire is to let others know about the possibilities, demonstrate what a program of this kind can look like, and inspire other schools to run their own metadesign-based programs in their own way.

The feedback for "Designing Futures" indicated a powerful desire to see similar programs in the future. Sadly, it is becoming ever more difficult to obtain funding or class time for such projects. Whilst the Visual Arts department of the host school continues to run innovative and inclusive design programs, it is unable to extend these to the large numbers of students who are not actually studying design at the school, as achieved with "Designing Futures". At the same time, the incoming National Curriculum in Australia reduces the availability of class time and resources for perceived 'extra-curricular' activities. This situation is made more difficult by the previously discussed emphases on testing around the core subjects of Mathematics, Science and English. Thus the sort of teaching and learning espoused by "Designing Futures" and similar programs is increasingly seen as expendable. This is unfortunate for our communal future, especially in terms of equity. Students who are currently not performing academically are unlikely to benefit from more of the same programs they currently struggle with. In contrast, programs such as "Designing Futures" offer students the chance to integrate and enhance their skills, gain confidence and thereby also improve their academic results. Programs seen as 'extra-curricular' are available to, and valued by, those families who can afford to pay for them. They are highly likely to improve the life chances of those who can participate and disadvantage those who cannot. This is against a background of increasing economic and social inequality in Australia and other countries such as the USA. Therefore, it is recommended that:

- Metadesign education/design education for resilience should be offered to as many students as possible, not solely to specialist design students, as it offers a powerful way of equipping students to tackle future challenges in an ethical and co-operative manner and it has a symbiotic relationship with other segments of education whereby both design and general education are enhanced.
- Active school and community partnerships, employing the skills of a diverse external network including design professionals and artists, need to be encouraged to enhance education opportunities for school students from Kindergarten to Grade 12. This includes valuable links between the tertiary and school education sectors in order to both articulate student pathways, and to facilitate and document ongoing research in the area of design education.

- Ongoing design education programs in schools in Queensland, such as "Designing Futures", "goDesign travelling workshop program for regional secondary school students" (Wright et al 2010) and "Living City" (Verge Pty Ltd 2013; Wright, Hooper et al 2010), receive continued and increased support from local and state governments to ensure sustainability for continued design education research.
- To extend "Designing Futures" and complementary programs, into an international community, a metadesign schools network should be established to allow increased sharing of ideas and resources and mentoring between schools. This network could also be influential in encouraging much needed policy reforms in design education.

6.0 References

Attainable Utopias Ltd. 2011. *Metadesigners Open Network* 2011 [cited 21 October 2012]. Available from http://metadesigners.org/tiki/tiki-index.php

Bradburn, Norman, Seymour Sudman, and Brian Wansink. 2004. *Asking questions: the definitive guide to questionnaire design*. San Francisco: Jossey-Boss.

Coyne, Richard. 2005. "Wicked problems revisited". *Design Studies* 26(1): 5–17.

Ehrenfeld, John. 2008. *Sustainability by design: a subversive strategy for transforming our consumer culture*. New Haven USA: Yale University Press.

Frazer, Lorelle, and Meredith Lawley. 2000. *Questionnaire design and administration*. Brisbane: Wiley.

Fischer, Gerhard. 2010. "End user development and meta-design: foundations for cultures of participation". *Journal of Organizational and End User Computing* 22(1): 52–82.

Fry, Tony. 2009. *Design futuring: sustainability, ethics and new practice*. Sydney: UNSW Press.

Fuad-Luke, Alistair. 2009. *Design activism: beautiful strangeness for sustainable world.* London: Earthscan.

Getzels, Jacob, and Mihaly Csikszentmihalyi. 1976. *The creative vision: a longitudinal study of problem finding in art*. New York: Wiley.

Giaccardi, Elisa. 2005. "Metadesign as an emergent design culture". *Leonardo* 38(4): 342–349.

IDEO. 2012..*Design Thinking For Educators* 2012 [cited 21 October 2012]. Available from http://www.designthinkingforeducators.com/

Kelvin Grove State College. 2011. *Designing Futures* 2011 [cited 21 October 2012]. Available from https://resources.kelvingrovesc.eq.edu.au/visart/index.html

McIntyre, Alice. 2008. *Participatory action research*. Los Angeles: Sage.

OECD. 2010. "PISA 2009 results: Executive summary". Paris, France: OECD Publishing. [cited 15 July 2012]. Available from http://www.oecd.rg/edu/pisa/2009.

Rittel, Horst W.J. and Melvin M. Webber. 1973. "Dilemmas in a General Theory of Planning". *Policy Sciences* 4(2): 155-169. http://link.springer.com/article/10.1007%2FBF01405730?LI=true.

Runco, Mark (ed.). 1994. *Problem finding, problem solving and creativity*. Norwood, N.J: Ablex.

Sahlberg, Pasi. 2011. *Finnish lessons: what can the world learn from educational change in Finland?* NY: Teachers College Press, Columbia University.

Strauss, Carolyn and Alistair Fuad-Luke. 2008. "The Slow Design Principles". *Proceedings of Changing the Change*. http://www.slowlab.net/slow_design.html

The State of Queensland (Arts Queensland). 2012. *Artists in Residence program* 2011 [cited 12 February 2013]. Available from http://www.arts.qld.gov.au/policy/artists-residence.html.

Verge Pty Ltd. 2013. *Living City* 2000-2013 [cited 12 February 2013]. Available from http://www.livingcity.net.au/.

Wood, John. 2007. *Design for micro-utopias: making the unthinkable possible*. Aldershot: Gower.

Wright, Natalie, Les Hooper, Peter Boyle, and Genevieve Searle. 2010. "Living City 2010 Workshop". Brisbane: Queensland University of Technology. [cited 5 November 2012]. Available from http://eprints.qut.edu.au/47765/.

Wright, N., K.P. Jerome, J.M. Franz, M.J. Berry, A. Wigg, A. Scott, P. Crowther, and L. Hooper. 2010. "goDesign Travelling design workshop program for regional secondary students". Brisbane: Queensland University of Technology. [cited 5 November 2012]. Available from http://eprints.qut.edu.au/47747/

Zuber-Skerritt, Ortrun. 2012. *Action research for sustainable development in a turbulent world*. Bingley UK: Emerald Group.