Building empathy through a design thinking project: A case study with middle secondary schoolboys

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Adolescents' empathy is an essential socio-emotional concept that helps mediate friendships and family relationships. Year 10 boys, aged 15-17 years, were invited to participate in a five-day experiential education program (Design Week) based on a social equity challenge using a Design Thinking concept. Students worked in small groups, mentored by experts. Student groups developed innovative solutions to support women who experienced domestic and family violence. As a key outcome, students' empathy measured by the Comprehensive State Empathy Scale increased significantly from a baseline of 63% to 75% at post-test, representing a large effect size (d= 1.06). Six empathy subscale factors were also significantly increased (p= <0.05). The program was feasible and was rated by teachers and students as engaging, relevant to learning, and learning about complex social issues. This paper presents a case study of the Design Week program, shown to be worthy of further testing with secondary school adolescents.

Introduction

Adolescence brings significant advances in an individual's cognitive development and creates challenges for young people as they approach adulthood. Adolescents gain in ability to manage more complex thinking, including abstract thinking that enables them to consider future possibilities and debate new ideas or questions (Dow-Edwards et al., 2019; Conklin, 2018; Meeus, 2016). These social and emotional changes contribute to developing an independent identity (Meeus, 2016) and assist individuals in learning to become an adult. However, adolescents still need an alliance with more mature adults who can provide guidance and model adult behaviours (Labouvie-Vief, 2015).

We address socio-emotional issues, including empathy in secondary school students, as a developmental priority in this study. The participants are boys, aged 15-17 years, engaged in Year 10 curriculum. We conduct an educational intervention and measure empathy via a self-reported questionnaire as part of an educational research design.

Empathy is a multidimensional construct with definitions offered by literature in various disciplines. Broadly, empathy involves the cognitive ability to comprehend what another person is feeling, have an emotional resonance with those feelings, and a willingness to respond appropriately to the person's needs (Marshall, Ciarrochi, Parker & Sahdra, 2020; Clark, Robertson & Young, 2018). It is also described as walking in the shoes of another person. Concepts are explained in a teaching model (Levett-Jones & Cant, 2019).

Empathy was initially considered a trait or innate virtue rather than a skill that could be taught and assessed (Heyes, 2018). Empathy is currently recognised as more than a static trait - it is a fluid 'state' or skill, which is amenable to change in response to educational and personal experiences (Seeberger et al, 2020). There has been increasing interest in school students' empathic responses within the classroom, following a link between a deficit in empathy and aggressive student behaviours (Silke, Brady, Boylan & Dolan, 2018; Kokkinos & Kipritsi, 2018). In a review of literature on school-based interventions to promote empathic responding, Malti, Chaparro, Zuffianò & Colasante (2016) reported a meta-analysis showing several education programs have successfully improved students' competence. Some that employed experiential or cooperative learning with early adolescents showed substantial improvement in their socio-emotional competencies, including significant improvement in empathy.

Additionally, a body of research supports the positive impact of empathy as a mediator of adolescents' personal and family relationships (Boele et al., 2019; Van Lissa, Hawk & Meeus, 2017). Empathy plays an integral part in acquiring social competence during adolescence and helps establish and maintain friendships (Ciarrochi, 2017). However, low levels of empathy suggest an inability to view the world from another individual's perspective or feel sympathy toward suffering. Low empathy can be a predictor of victimisation and bullying of others (Kokkinos & Kipritsi, 2018; Nickerson, Mele & Princiotta, 2008). Higher levels of empathy are positively associated with prosocial and helping behaviours in adolescents and adults (Marshall et al., 2020; Lockwood, 2016).

Longitudinal consequences have also been identified. Allemand, Steiger and Fend (2015) reported the results of a study of empathy development during adolescence and follow-up of over 1500 participants in adulthood after 23 years, at the age of 35. The level and change in adolescent empathy predicted individual differences in social competencies in adulthood two decades later. Developmental processes during adolescence are therefore necessary preparations for later life.

This study addresses educational design research. In the case of development studies, the purpose is to develop research-based solutions for complex problems encountered in educational practice. Plomp (2013, p.16) defined this type of design research as

> ... the systematic analysis, design and evaluation of educational interventions with the dual aim of generating research-based solutions for complex problems in educational practice and advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them.

Design research is an important field of investigation that ascertains how well a program functions in developing learner attributes, specifically, the strengths and weaknesses of an approach. We explore characteristics of an effective teaching and learning strategy aimed at achieving specific learning outcomes when designing a new program. This paper describes and evaluates the impact of a design thinking program for secondary-school students in Sydney, Australia.

Methods

The aim of this paper is to present a case study reporting the planning, implementation and outcomes of a social equity challenge as an educational strategy for secondary-school adolescent males. A case-study design is appropriate to describe the intervention as this method enables detailed exploration of a specific subject in its real-world context (Yazan, 2015). It addresses 'How' and 'Why' questions. In educational research, the complexity of analysing and representing practice through a case study and the connections that the reader may make between the case and their own experiences is powerful in informing everyday educational practice (Miles, 2015).

The intervention is an immersive design thinking experience for Year 10 students. During a five-day program, students work in teams of six or seven, with a mentor to design a solution to a real-world social equity challenge using the design thinking process. On the final day, groups present their solutions to a 'Shark Tank' panel of experts and submit a video of their strategy. One group is selected to submit their design proposal to the philanthropic 'Sydney Impact 100' organisation (http://www.impact100sydney.org.au) with the potential for actual funding of their proposal. The key action points are:

- The social equity problem addressed is the prevalence of domestic violence in Australia;
- The task is to improve the experience of women and their children escaping domestic violence by finding shelter in a women's refuge.

This topic focus was based on reports and research, including national statistics from the Australian Institute of Health and Welfare (AIHW) (2017) that show domestic and family violence is a leading cause of homelessness for women. The housing shortage crisis results in many women seeking refuge, including women with children, not receiving accommodation (AIHW, 2017). Further, the school had developed links with staff from a local women's refuge, a charity offering accommodation and support to women at risk. Staff were invited to advise student participants.

The Design Week program is strategic in engaging students in experiential learning. The students interact and learn through real-world experiences of experts invited from diverse professional fields. In the following section, we describe key action points and the resources necessary to conduct the program.

Evaluation

Evaluation involves judging the value of an educational program (Oermann & Gaberson, 2016), a key factor in deciding whether the program is practical and can achieve the intended learning outcomes and if further development and testing of the model will be beneficial. Educational evaluation may consider many types of measurement, including survey, knowledge tests, examinations, interview or focus-group feedbacks.

This study used a quantitative survey of students' attitudes and emotions (measured as empathy) in a repeated measure, a pre-test and a post-test at program completion. Self-reported measures were compared to determine a change in opinion directly attributed to the educational intervention. Students' quality ratings of the program and teacher feedback were sought in online end of program surveys.

Instrumentation

The participating students' level of empathy was measured by the Comprehensive State Empathy Scale (CSES) (Levett-Jones et al., 2017) administered on the mornings of the first and last days of the program (before final presentations).

Most available empathy scales measure trait empathy rather than state empathy, but the CSES adapted items from validated trait - empathy as a psychological disposition - empathy scales to more accurately measure state empathy at a point of time. (Levett-Jones et al., 2017).

Students were asked to respond to thirty questions on the CSES based on their attitudes and feelings towards the woman depicted in each scenario. For this study, the CSES comprised two scenarios with images of women with their children. The scenarios were developed specifically for this project. They described experiences women typically recount regarding family violence, experiences supported by the literature. The scenarios were reviewed by an expert panel including women who had lived experience of family violence. The questions considered Batson's (2009) eight dimensions of empathy.

1. Imaging how the other person is feeling and thinking;
2. Imagining how one would think and feel in the other person's situation;
3. Understanding another person's emotional and cognitive state;
4. Matching the neural response of the other person;
5. Experiencing the same or similar feelings as the other person;
6. Projecting oneself into the other person's situation;
7. Feeling distress for the suffering of the other person;
8. Feeling for the person who is suffering.

Each item was scored using a five-point Likert scale with response range from 1 (completely untrue) to 5 (completely true). Overall scores are obtained by calculating the sum of individual items of the CSES and subscales. Changes between pre and post empathy scores are then analysed.

The design thinking program

What is design thinking?

Design thinking is an iterative process, which seeks to understand the user, challenge assumptions and redefine a problem to identify alternative strategies and solutions that might not be initially apparent. It is based on business rules and has gained traction for

developing a complex understanding of users' needs and focused outcomes (Liedtka, 2018). Problems are reframed by developing empathy with target users and questioning problems, related assumptions and their implications. Designers explore ideas in brainstorming sessions to develop and test practical solutions in prototyping sessions for user feedback.

Various design thinking models are derived from the Nobel Prize laureate Herbert Simon, in *The Sciences of the Artificial* in 1969, with a five-phase model proposed by the Hasso-Plattner Institute of Design at Stanford University, known as the 'd.school' (https://dschool.stanford.edu/). The five phases are:

- Empathise – with users;
- Define – users' needs, problems and design insights;
- Ideate – challenge assumptions and create innovative solutions;
- Prototype – create solutions;
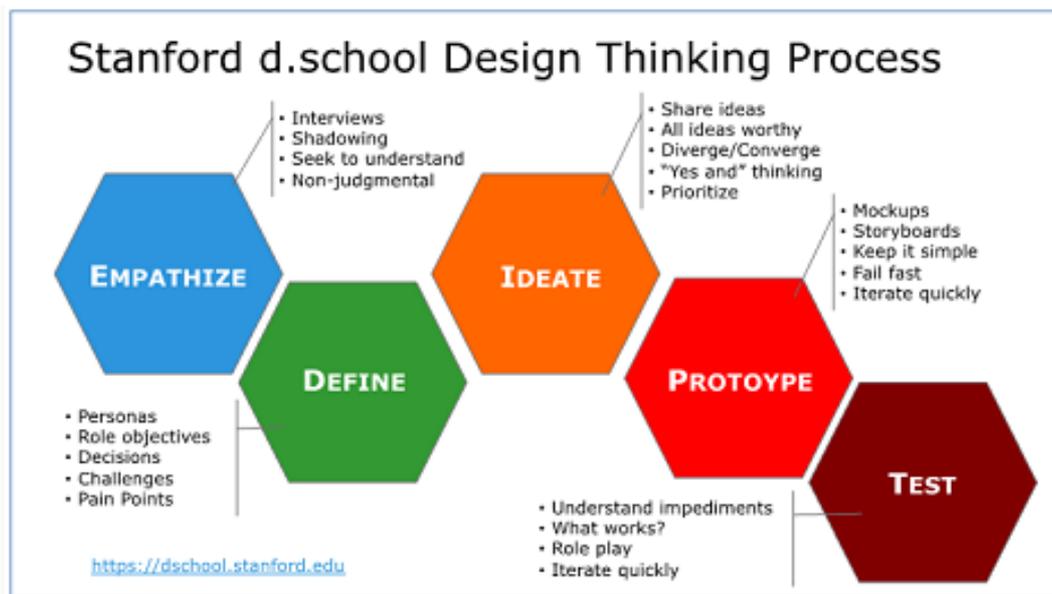- Test – evaluate.

Figure 1: Five-step Design Thinking process of Stanford d-school
(use 'zoom in' function with PDF reader to facilitate reading)

In Figure 1, this is viewed as a linear process. However, it is often a circular process as the steps can be revisited and completed many times to achieve an innovative solution.

The program plan

The Design Thinking program was developed as an elective five-day workshop for the end of the school year (end of 2019) for 30-40 Year 10 students at an all-boys private

school. Monday and Tuesday sessions were conducted off-site in a conference centre with seminars from 8:30 am-12:00 pm, group activities between 12:00-2:30 pm and reviews between 2:30-2:50 pm. Wednesday and Thursday sessions were conducted at school to develop project proposals. Friday was held off-site for final presentations. The week was highly structured and interactive. Students, staff, mentors and experts collaborated on specific activities to build skills and test ideas each day.

Facilitation

Four school teachers facilitated the program with a counsellor present for off-site days. Teaching strategies were multiple: seminars, storytelling, presentations and Q&A type discussions, followed by small-group work with empathy interviews and a design challenge for groups, supported by mentors.

Students were mentored by a mix of peer and expert mentors. Each student group of 6-7 was allocated a 'peer' for the day - invited males and females of university-age, selected from several fields: ex-students with proven leadership skills, current students from a Creative Intelligence and Innovation university course and current students/graduates from a private design education company. Expert mentors roamed the room, offering feedback and guidance when required. The 'expert' mentors were of various ages from diverse professional fields, including architecture, service design, business, graphic design and professional coaching. Students were allocated specific team roles to ensure varied and focused design responses. These roles included team leader, digital marketing manager, project manager, graphic designer, finance manager and product engineer.

The first step on the first day was to conduct the pre-test instrument *Comprehensive State Empathy Scale* pre-test. A short introductory pre-reading was provided to students: a case study described 'Marianne', a young mother with two young children who experienced threats of physical harm from her partner and had escaped to a women's refuge with her children. Students completed the pre-test based on this scenario.

Step 1 'Empathise'
This comprised multiple face-to-face presentations over the first morning, addressing domestic and family violence problems for women in Sydney with students. Local women's refuge caseworkers, police offices from the Domestic Violence squad, a female teacher from the school who had aided the escape of a friend from a violent relationship, and representatives of social enterprise charities including 'Impact 100' Sydney presented their experiences of working in the field.

Together, students were introduced to empathy interviews and strategies on how to conduct them effectively. In small groups, they planned their interviews by defining their research focus, and what questions to ask and what techniques they would engage. The groups conducted their interviews with people from the morning session to understand domestic violence from diverse perspectives. Groups then placed their findings on empathy maps to synthesise information gathered and separate what was observed and inferred from the interviews.
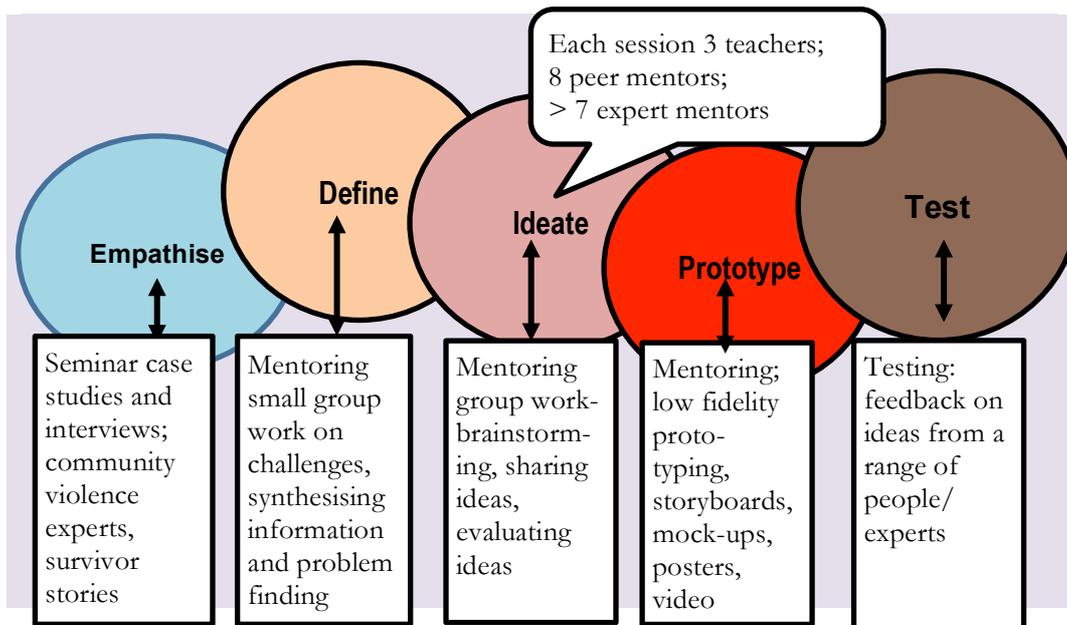
Figure 2: Five-step design thinking model and educator/mentor resources applied to experiential learning (use 'zoom in' function with PDF reader to facilitate reading)

Step 2 Define
Students synthesised and analysed discoveries from the empathy stage. This stage involved students working to establish a problem or 'point of view' statement to drive their project and involved framing and reframing ideas, beliefs and questions.

Step 3 Ideate
Student groups worked with mentors to develop a range of possible solutions for their innovation. They prioritised options through design thinking activities to select the most appropriate idea for further development and testing.

Step 4 Prototyping
Students created mock-ups of their ideas, including storyboards and paper/cardboard prototypes.

Step 5 Testing
Testing was completed by students engaging with feedback on their designs from experts: caseworkers, psychologists, mentors and school staff.

Finally, on the morning of the final day, students were asked to complete the second *Comprehensive State Empathy Scale* post-test. They read a one-page case study of 'Sarah', a young mother who experienced verbal and physical abuse from her partner and had escaped her home in a taxi with her young children. Students completed the paper-based *Comprehensive State Empathy Scale*.

The program objectives

The Design Week program's multiple learning objectives are summarised in Table 1. These were based on increasing students' understanding of domestic violence and their level of empathy for others' well-being, while developing creative solutions to a social justice problem. Not all of these learning objectives could be measured as outcomes, but they have the potential for exploration in the next iteration of this program.

Table 1: Learning objectives for the Design Week course

Learning objective	Example
1. Increase understanding of empathy.	Help to build boys' empathic skills and knowledge.
2. Develop an understanding of what domestic violence is and its prevalence.	Understand various forms of domestic and family violence and its prevalence in Australia; Develop an understanding of how DV affects people's lives; Help the development of positive attitudes towards relationships with women (to prevent future DV).
3. Build a range of life (soft) skills such as teamwork.	For example, teamwork, problem-solving, creativity, communication, collaboration, project management.
4. Equip boys for work type projects with tangible objectives and timelines.	Build confidence in creativity; Learn to plan and manage time pressures; Improve presentation skills through practice and feedback.
5. Help boys to envision future employment skills based on interactions with mentors.	Peer mentors and expert mentors act as role models.

Impact of the Design Week program on students' empathy

Forty-three students participated in the Design Week program. A quantitative evaluation of the program measured participating students' empathy using the *Comprehensive State Empathy Scale.* There were 34 surveys returned at the start of the program (pre-test) and 34 at the end (post-test), which were paired for analysis. Six surveys were not paired and were omitted from the analysis. A summary of response scores is presented in Table 2. The CSES scale was reliable for use with the current cohort (Cronbach's alpha = .923 at pre-test; post-test alpha = .948).

A Wilcoxon signed ranks test for two related samples identified a statistically significant difference between the overall scale scores at pre-test and post-test ($z= -4.335$, $p= <0.001$). The mean value for pre-test total scores was 94.7 of a possible 150 points (63%; median 94.5, SD 17.1) and for post-test total scores, mean 112.8 (75%; median 115.5, SD 18.3), confirming that post-test scores were higher. The standardised effect size of this improvement difference was $d = 1.06$, which is interpreted as a significant effect (Becker, 2000). On an interesting note, every one of the 30 items in the scale received a higher rating at post-test. The results suggest that the design thinking intervention was effective in helping to improve participating students' empathic state.

Table 2: Summary data for the Comprehensive State
Empathy Scale at pre-test and post-test (n=34)

Subscale factor	Item	Pre-test mean	Post-test mean
1. Empathic concern	1. Compassionate	3.53	4.00
	2. Moved	3.12	4.03
	3. Soft-hearted	3.38	3.82
	4. Sympathetic	4.12	4.26
	5. Tender	2.71	3.24
	6. Warm	2.32	2.76
	Subscale 1 mean (SD**)**	19.20 (3.97)	22.12 (4.62)
2. Distress	7. Distressed	3.15	3.76
	8. Disturbed	3.24	3.94
	9. Grieved	2.56	3.38
	10. Troubled	2.88	3.74
	11. Upset	3.18	3.79
	12. Afraid	2.03	2.76
	Subscale 2 mean (SD)	17.03 (4.72)	21.32 (5.27)
3. Shared affect	13. I found that the scenario affected my mood	3.09	3.85
	14. I was very affected by the emotions in this story	2.76	3.71
	15. I actually felt Sarah's distress	2.85	3.79
	16. I experienced Sarah's feelings as if they were my own	2.56	3.44
	Subscale 3 mean (SD)	11.26 (3.60)	14.79 (3.36)
4. Empathic imagination	17. I found myself imagining how I would feel in Sarah's situation	3.74	4.09
	18. I found myself imagining myself in Sarah's shoes	3.56	4.03
	19. I found myself trying to imagine how things looked to Sarah	3.35	4.03
	20. I found myself trying to imagine what Sarah was experiencing	3.76	4.12
	Subscale 4 mean (SD)	14.41 (3.13)	16.23 (2.76)
5. Helping motivation	21. I would really focus on Sarah's emotions if I was caring for her	3.62	4.00
	22. I experienced a strong urge to help Sarah	3.62	4.21
	23. I would get really involved in trying to help Sarah	3.71	3.97
	24. I found myself thinking about what could be done to help Sarah	3.94	4.21
	Subscale 5 mean (SD)	14.88 (2.83)	16.35 (2.95)
6. Cognitive empathy	25. I feel confident that I could accurately describe Sarah's experience from her point of view	2.82	3.44
	26. I found it easy to understand Sarah's reactions	3.62	3.94
	27. I found it easy to see how the situation looked from Sarah's point of view	3.18	3.82

	28. Even though Sarah's life experiences are different to mine, I can really see things from her perspective	3.06	3.85
	29. I am sure that I know how Sarah was feeling	2.59	3.35
	30. I feel confident that I could accurately describe how Sarah felt	2.68	3.56
	Subscale 6 mean (SD)	17.91 (5.12)	21.97 (4.04)
CSES mean total score (SD)		94.71 (17.1)	112.79 (18.27)

NOTE: response scale: Rate the extent to which you experienced each of these feelings in response to xx/Sarah's story from 1 (not at all) to 5 (very much).

Scores for the six subscales within the instrument were also examined, as presented in Table 3. All six-factor scores significantly increased from baseline (p=<0.05).

Table 3: Outcomes: Association of pre-test and post-test factor scores†

Subscale factor	Pre-test M (SD)	Post-test M (SD)	z-score	*p*-value	Effect Cohen's *d*	% varia-nce (*r*²)
F1 Empathic concern	19.20 (3.97)	22.12 (4.82)	-3.261	0.001	0.66	9.6
F2 Distress	17.03 (4.72)	21.32 (5.27)	-3.674	<0.001	0.86	15.0
F3 Shared affect	11.26 (3.60)	14.79 (3.36)	-4.441	<0.001	1.01	20.4
F4 Empathic imagination	14.41 (3.13)	16.23 (2.76)	-2.952	0.003	0.62	8.7
F5 Helping motivation	14.88 (2.83)	16.35 (2.95)	-2.496	0.013	0.50	6.0
F6 Cognitive empathy	17.91 (5.12)	21.97 (4.04)	-3.339	0.001	0.88	16.2
† Wilcoxon Signed Ranks Test for related samples. A Cohen's *d* of ≤0. 5 is a medium effect, *d*= ≥0.6 is a significant effect. The squared correlation between standardised groups (r²) gives the percentage of variance (Becker, 2000).						

A significant increase from baseline pre-tests scores was demonstrated for five of the six factors, and all had an effect size of *d*= ≥0.60. The factor F 3 Shared effect (I felt distressed, was affected by emotions, experienced Sarah's feelings) was the most influential, showing an increase of 20.4%. F6 Cognitive empathy (understanding the situation, knowing how Sarah was feeling, reacting) was also significantly increased (by 16.2%). Helping motivation (wanting to help Sarah, thinking about what could be done to help her) displayed the lowest impact with an increase of 6%.

Design thinking innovations

On the final day, each student group presented their proposal to four 'Shark Tank' experts, who used a summative assessment sheet to rank presentations. Proposals were judged on the following criteria: feasibility, desirability, quality of prototype, creativity and communication. All innovations were declared impressive and perceived as appropriate for adoption by the chairperson of the women's refuge. The groups presented varied solutions displaying unique insights gathered throughout the project. Ideas included a camp for teenagers staying at the refuge; an app for women to engage in local community

activities as residents; a florist training program for therapy and financial independence; a community housing project for women post refuge; a childcare program to support mothers; an educational-awareness and empathy-building program for school children on domestic violence; and an app to support young people experiencing family violence.

Student-reported benefits of Design Week

Students provided positive feedback on the quality of the Design Week program (n=39). On average, students rated the likelihood of recommending the program to others as 8.6 /10 points and the helpfulness of having mentors involved as 8.5/10. Students' comments on the main benefit of Design Week (n=39) were evenly divided across three main themes-(i) gaining a good understanding of the design process; (ii) more knowledge and awareness about domestic violence; and (iii) developing empathy.

Table 4: Subjective outcomes-benefits of Design Week for students

	Theme	Student quotation on the main benefit to students
(i)	Understanding the design thinking process	A good understanding of the design process; By the end … I felt I was better at working with a large team and listening to others thoughts and ideas; Collaborating in a team to reach a goal.
(ii)	Learning about domestic violence	Learning about the complexity of domestic violence and how much it affects so many people; Learning about domestic violence and the difficulties of survivors; I thought it was great in terms of learning life skills and getting a better understanding of DV.
(iii)	Empathising with people	Understanding and being able to empathise; Understanding of their struggles (survivors and refuges); Developing empathy and building interpersonal skills

Teachers' feedback about Design Week program quality

Five teachers (three teachers attended the entire week, the school counsellor attended for three days, and one teacher attended for three days) responded to an online evaluation survey and reported positive program ratings. Overall, these included a strong agreement that the boys were engaged in the program and grew in empathy throughout; other comments included:

> … boys have a logical understanding of issues but perhaps lack the empathy for the problems given at such a young age they don't have a lot of life experience. This task helped them to learn about and understand the complexities of Domestic Violence. It also helped them to think about how they can still make real-world change even if they are not directly impacted by particular social issues.

> It was inspiring… to see how engaged the boys were and how seriously and respectfully they undertook this task. I think this will have a lifelong impact on them.

Parents commented on the workshop via email

> We were enthralled by the debrief each day… our son spoke with such passion and enthusiasm about the project.

> It was a remarkable opportunity for these young men ... [My son] was full of news and seemed extremely stimulated ... He said he loved being in a group of boys with strong opinions and enjoyed debating and working out what they were going to do. I could tell that he revelled in the activity, which, as a parent, was incredibly exciting to see.

'Why' and 'how' the Design Week approach worked

Teachers outlined the main strengths of the program, including the group work experience opportunities. Boys enjoyed working in groups, and defined roles were important for them to share the workload. Ownership and creativity of working on different project ideas was an important aspect. The real-world nature of the problem and connection to a local charity gave the project authenticity. Students created a realistic timeline for their projects, making the task seem more real and a key reason they found it valuable.

Second, the opportunity for the project to become a reality was a key driver of success. Early in the project, it was announced that the 'Impact 100' charity was involved and that projects were eligible to present at the Impact 100 competitive event (at a later date) and possibly receive $100, 000 to bring the project to life.

Third, experts' presentations and various experiences presented throughout the week provided multiple perspectives and made the project feel professional and not 'schoolteacher' driven. Presenting to the 'Shark Tank' panel provided focus and was a critical buy-in for students. It was a positive end to the week and helped maintain momentum mid-week to present for Friday. Having an audience of important 'Sharks' to showcase their projects also created a sense of importance and real-world legitimacy.

Students gained understanding through experiential learning, confirming effective learning and teaching strategy by linking the program to a real-world challenge and supporting innovation development with professional experts and mentors.

According to the program teachers, there were barriers to program delivery, including the substantial time required for planning and preparation, coordinating multiple personnel, and implementing the financial cost. As this program was effectively the first trial, the timing would be significantly reduced by repeating the project (or similar project). Aligning the schedule with staff, counsellors, and external personnel, including presenters and mentors, required persistence. The School Foundation offset financial costs for the conference venue and an extra fee charged to students.

Discussion

Results showed the Design Week program using a design thinking approach was successfully raised adolescent students' empathic state. An increase in total scale mean scores from 63% to 75% in the Comprehensive State Empathy Scale was a significant effect size change ($d = 1.06$). It is recognised that repeated surveys may elicit higher ratings from participants due to the Hawthorne effect, for example, when rating one's behaviour or being directly observed (McCambridge, Witton & Elbourne, 2014). However, the substantial improvement in the current study is worthy of note. Additionally, students' socio-emotional ratings in each of the six component subscales (empathic concern; distress; helping motivation; shared effect; empathic imagination and cognitive empathy) were also significantly improved ($p < 0.05$).

Empathy has been found a necessary construct for adolescents to develop social competence and is used to measure prosocial response in the classroom (Marshall et al, 2019; Lockwood, 2016). Several studies confirm educational interventions in school can improve empathy in young people (Malti et al., 2016). These authors reviewed studies that included randomised controlled trials, with nine of nineteen studies targeting early adolescents while others studied younger children. The changes in socio-emotional indices in all 19 studies were mostly minor effects, as seen in a meta-analysis. Of interest, the findings also had an association with academic functioning (higher scores, better results). Although the studies employed various measures, including empathy, there were no studies that applied the CSES.

The only known study utilising the CSES instrument was conducted with undergraduate nursing students in Australia (Levett-Jones et al., 2017). Empathy is considered a necessary competency in nursing and a basic component of therapeutic relationships; thus, empathic communication studies are often reported (Levett-Jones, Cant & Lapkin, 2019). Second-year nursing students who participated in a simulation role play of a person with a physical disability said empathy outcome scores for the nurse role as mean 77%, increasing 9%. One reason for the higher empathy of nursing students than secondary students (77% versus 73%) may be a gender difference as adolescent girls have reported higher empathy than boys (Trentini et al., 2021; Van der Graff et al., 2018). In the CSES study, most nurse participants were female (Levett-Jones et al., 2017). Furthermore, nursing students are a highly selected group based on their career intention to help/assist people. In the study mentioned above, nurses had a helping motivation mean final score of 90% compared with boys' mean helping motivation of 82% (M= 16.35/20).

One factor contributing to the success of this program was the program's active, experiential learning design with built-in interactivity between students and the range of peer and expert mentors who guided each student group. At one level, these individuals were able to inform students and exemplify challenges from real-life experiences. The mentors/peers maintained a continuous feedback loop for each student group on the students' interim solutions. In the 'DEFINE' stage, students synthesised information and defined objectives based on feedback from mentors through working in small groups to

define challenges. In the IDEATE stage, they shared and evaluated ideas among themselves and prioritised ideas based on feedback from mentors based on their practical experience. Feedback is a powerful tool in developing learning outcomes (Watling & Ginsberg, 2019), and information provided in feedback is essential in guiding learning (Tricomi & DePasque, 2016). Hence continuous-loop feedback in this study on many levels would help develop solutions to team challenges, facilitating student groups to progress ideas.

School teachers made recommendations for improvement of the program based on experience. The concept of empathy should be clearly defined by discussing what empathy is or is not, at the beginning of the program. Interactive learning could be enhanced by incorporating roleplaying empathy activities to aid understanding of empathy.

An additional observation was that empathy was not dependent on academic success. For students who often did not engage with traditional curriculum material, this workshop provided a democratic opportunity to engage in group work on diverse and engaging tasks.

Study limitations included a case-study approach for students to learn about empathy remotely but with no opportunity to learn how to express empathy. Interactive learning could be enhanced by incorporating classroom-based roleplaying of empathy activities to aid expressions of empathy, by utilising some of the openly available teaching resources used in the education of nursing students (for example, *Virtual Empathy Museum*, https://theempathyinitiative.org/virtual-empathy-museum).

The following comment from a student sums up the beneficial effects that this kind of learning experience can make possible:

> The development of our skills and experiences has been amazing. The process of the week has been extremely enjoyable, moving through the phases, and today's moment of presentation and final pitch was an incredibly proud one. The guest speakers, schedules, design assistance and guidance, have all been exceptional. I think everyone can look back on the week with great pride and the knowledge that we have made even a little difference to this major issue of domestic violence in our nation.

The small and select student sample of Year 10 boys in an all-boys private school suggests that the program model needs further testing in a larger sample, with co-educational and comprehensive schools, to demonstrate program applicability and impact in broader student samples.

In summary, the design thinking experience demonstrates that design-thinking learning activities focused on real-life social issues can positively impact empathy levels in adolescents. Through interactions with people with lived experience, experts and mentors, and aligned with highly structured and interactive activities, this experience provided clear insight into the development of empathetic skills at a secondary school level, with potential for ongoing benefits outside the classroom.

References

Allemand, M., Steiger, A. E. & Fend, H. A. (2015). Empathy development in adolescence predicts social competencies in adulthood. *Journal of Personality,* 83(2), 229-241. https://doi.org/10.1111/jopy.12098

Australian Institute of Health and Welfare (2017). *Specialist homelessness services annual report 2016-2017.* https://www.aihw.gov.au/reports/homelessness-services/specialist-homelessness-services-2016-17/contents/

Batson, C. D. & Ahmed, N. Y. (2009). Using empathy to improve intergroup attitudes and relations. *Social Issues and Policy Review,* 3(1), 141-177. https://doi.org/10.1111/j.1751-2409.2009.01013.x

Becker, L. A. (2000). *Effect size calculator.* University of Colorado, USA. https://lbecker.uccs.edu/effect-size

Boele, S., Van der Graaff, J., de Wied, M., Van der Valk, I. E., Crocetti, E. & Branje, S. (2019). Linking parent-child and peer relationship quality to empathy in adolescence: A multilevel meta-analysis. *Journal of Youth and Adolescence,* 48, 1033-1055. https://doi.org/10.1007/s10964-019-00993-5

Clark, M. A., Robertson, M. M. & Young, S. (2018). "I feel your pain": A critical review of organizational research on empathy. *Journal of Organizational Behavior,* 40(2), 166-192. https://doi.org/10.1002/job.2348

Conklin, H. G. (2018). Caring and critical thinking in the teaching of young adolescents. *Theory Into Practice,* 57(4), 289-297. https://doi.org/10.1080/00405841.2018.1518643

Ciarrochi, J., Parker, P. D., Sahdra, B. K., Kashdan, T. B., Kiuru, N. & Conigrave, J. (2017). When empathy matters: The role of sex and empathy in close friendships. *Journal of Personality,* 85(4), 494-504. https://doi.org/10.1111/jopy.12255

Dow-Edwards, D., MacMaster, F. P., Peterson, B. S., Niesink, R., Andersen, S. & Braams, B. R. (2019). Experience during adolescence shapes brain development: From synapses and networks to normal and pathological behavior. *Neurotoxicology and Teratology,* 76, article 106834. https://doi.org/10.1016/j.ntt.2019.106834

Heyes, C. (2018). Empathy is not in our genes. *Neuroscience & Biobehavioral Reviews,* 95, 499-507. https://doi.org/10.1016/j.neubiorev.2018.11.001

Kokkinos, C. M. & Kipritsi, E. (2018). Bullying, moral disengagement and empathy: Exploring the links among early adolescents. *Educational Psychology,* 38(4), 535-552. https://doi.org/10.1080/01443410.2017.1363376

Labouvie-Vief, G. (2015) *Integrating emotions and cognition throughout the lifespan.* Springer.

Levett-Jones, T. & Cant, R. (2019). The empathy continuum: An evidenced-based teaching model derived from an integrative review of contemporary nursing literature. *Journal of Clinical Nursing,* 29(7-8), 1026-1040. https://doi.org/10.1111/jocn.15137

Levett-Jones, T., Cant, R. & Lapkin, S. (2019). A systematic review of the effectiveness of empathy education for undergraduate nursing students. *Nurse Education Today,* 75, 80-94. https://doi.org/10.1016/j.nedt.2019.01.006

Levett-Jones, T., Lapkin, S., Govind, N., Pich, J., Hoffman, K., Jeong, S. Y.-S., Norton, C. A., Noble, D., Maclellan, L., Robinson-Reilly, M. & Everson, N. (2017). Measuring the impact of a 'point of view' disability simulation on nursing students' empathy using the Comprehensive State Empathy Scale. *Nurse Education Today,* 59, 75-81. https://doi.org/10.1016/j.nedt.2017.09.007

Liedtka, J. (2018). Why design thinking works. *Harvard Business Review*, September-October 2018. https://hbr.org/2018/09/why-design-thinking-works

Lockwood, P. L. (2016). The anatomy of empathy: Vicarious experience and disorders of social cognition. *Behavioural Brain Research*, 311, 255-266. https://doi.org/10.1016/j.bbr.2016.05.048

Lockwood, P. L., Seara-Cardoso, A. & Viding, E. (2014). Emotion regulation moderates the association between empathy and prosocial behavior. *PloS One,* 9(5), e96555. https://doi.org/10.1371/journal.pone.0096555

Malti, T., Chaparro, M. P., Zuffianò, A. & Colasante, T. (2016). School-based interventions to promote empathy-related responding in children and adolescents: A developmental analysis. *Journal of Clinical Child & Adolescent Psychology,* 45(6), 718-731. https://doi.org/10.1080/15374416.2015.1121822

Marshall, S. L., Ciarrochi, J., Parker, P. D. & Sahdra, B. K. (2020). Is self-compassion selfish? The development of self compassion, empathy, and prosocial behaviour in adolescence. *Journal of Research on Adolescence*, 30(s2), 472-484. https://doi.org/10.1111/jora.12492

McCambridge, J., Witton, J. & Elbourne, D. R. (2014). Systematic review of the Hawthorne effect: New concepts are needed to study research participation effects. *Journal of Clinical Epidemiology,* 67(3), 267-277. https://doi.org/10.1016/j.jclinepi.2013.08.015

Meeus, W. (2016). Adolescent psychosocial development: A review of longitudinal models and research. *Developmental Psychology,* 52(12), 1969-1993. https://doi.org/10.1037/dev0000243 [correction in https://doi.apa.org/doi/10.1037/dev0000313]

Miles, R. (2015). Complexity, representation and practice: Case study as method and methodology. *Issues in Educational Research*, 25(3), 309-318. http://www.iier.org.au/iier25/miles.pdf

Nickerson, A. B., Mele, D. & Princiotta, D. (2008). Attachment and empathy as predictors of roles as defenders or outsiders in bullying interactions. *Journal of School Psychology,* 46(6), 687-703. https://doi.org/10.1016/j.jsp.2008.06.002

Nippold, M. A., LaFavre, S. & Shinham, K. (2020) How adolescents interpret the moral messages of fables: Examining the development of critical thinking. *Journal of Speech, Language, and Hearning Research*, 63(4), 1212-1226. https://doi.org/10.1044/2019_JSLHR-19-00168

Oermann, M. H. & Gaberson, K. B. (2016). *Evaluation and testing in nursing education.* Springer. [6th ed.] https://www.springerpub.com/evaluation-and-testing-in-nursing-education-9780826135742.html

Plomp, T. (2013). Educational design research: An introduction. In T. Plomp & N. Nieveen (Eds.), *Educational Design Research.* p10-51. Netherlands Institute for Curriculum Development. https://slo.nl/publish/pages/2904/educational-design-research-part-a.pdf

Seeberger, A., Lonn, A., Hult, H., Weurlander, M., Wernerson, A. (2020). Can empathy be preserved in medical education? *International Journal of Medical Education.* 11, 83-89. https://doi.org/10.5116/ijme.5e83.31cf

Silke, C., Brady, B., Boylan, C. & Dolan, P. (2018) Factors influencing the development of empathy and pro-social behaviour among adolescents: A systematic review. *Children and Youth Services Review.* 94, 421-436. https://doi.org/10.1016/j.childyouth.2018.07.027

Simon, H. (1969). *The sciences of the artificial.* Cambridge, MA: MIT Press.
https://mitpress.mit.edu/books/sciences-artificial
Trentini, C., Tambelli, R., Maiorani, S. & Lauriola, M. (2021). Gender differences in empathy during adolescence: Does emotional self-awareness matter? *Psychological Reports,* online first. https://doi.org/10.1177/0033294120976631
Tricomi, E. & DePasque, S. (2016). The role of feedback in learning and motivation. *Recent Developments in Neuroscience Research on Human Motivation* (Advances in Motivation and Achievement, Vol. 19), Emerald Group Publishing Limited, Bingley, pp. 175-202. https://doi.org/10.1108/S0749-742320160000019015
Van der Graaff, J., Carlo, G., Crocetti, E., Koot, H. M. & Branje, S. (2018). Prosocial behavior in adolescence: Gender differences in development and links with empathy. *Journal of Youth and Adolescence*, 47(5), 1086-1099. https://doi.org/10.1007/s10964-017-0786-1
Van Lissa, C. J., Hawk, S. T., Meeus, W. H. J. (2017). The effects of affective and cognitive empathy on adolescents' behavior and outcomes in conflicts with mothers. *Journal of Experimental Child Psychology,* 158, 32-45. https://doi.org/10.1016/j.jecp.2017.01.002
Virtual Empathy Museum (n.d.). The Empathy Initiative. https://theempathyinitiative.org/virtual-empathy-museum
Watling, C. J. & Ginsburg, S. (2019). Assessment, feedback and the alchemy of learning. *Medical Education*, 53(1), 76-85. https://doi.org/10.1111/medu.13645
Yazan, B. (2015). Three approaches to case study methods in education: Yin, Merriam, and Stake. *The Qualitative Report,* 20(2), 134-152. https://doi.org/10.46743/2160-3715/2015.2102

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