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Exploring the impact of a student-centred survival swimming programme for primary school students in Australia: the perceptions of parents, children and teachers

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Abstract

Teaching basic swimming, water safety and rescue skills is recommended by the World Health Organization for all school-aged children. However, there is a lack of evidence on effective pedagogies to develop swimming competency and the success of swimming lessons as a drowning prevention intervention. This study used a self-report questionnaire and practical testing procedures to examine the effectiveness of a 10-week student-centred aquatic programme designed for children aged 10–12 years. The study also determined whether the non-traditional swimming programme was accepted by swim teachers, school teachers and principals, and parents from a range of schools from different geographical regions in Victoria, Australia. A total of 204 students were enrolled in the programme. The pre-programme results indicated a good level of swimming, water

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safety and aquatic knowledge, but low swimming ability. Swimming ability significantly improved from pre-programme to post-programme, with no significant post-programme ability differences between male and female children or for participants from different programmes. Qualitative feedback collected through questionnaires, interviews and/or focus groups from students ($n = 73$) and parents ($n = 69$), school teachers and principals ($n = 14$), swim teachers and swim school managers ($n = 21$) indicated strong support from principals and swim teachers for the student-centred pedagogy, and all stakeholders valued the focus on survival swimming competencies. This research highlights the importance of including stakeholders when designing and implementing aquatics programmes. The study has resulted in a well-founded, effective programme with tailored resources and instructional materials that are available for swim centres and schools that would enable schools globally to adopt and implement this programme.

Keywords
Aquatic education, pedagogy, school swimming, swimming competency, survival swimming, drowning prevention

Introduction

Globally, drowning is a leading cause of injury-related death in children aged 0–14 years and while this burden is greatest in low-income and middle-income countries, where most drownings occur in connection with domestic life, travel, natural disasters and occupational pursuits, drowning remains an issue in high-income countries such as Australia (Australian Water Safety Council, 2016; World Health Organization, 2014). In high-income countries, many drownings occur in relation to intentional immersion and are often associated with recreational activity, while others are the consequence of unintentional immersion (Stallman et al., 2017). There is strong evidence to demonstrate that four-sided pool fencing is effective at reducing child drowning deaths (Thompson and Rivara, 1998). Other strategies specific to children include teaching skills to parents such as cardiopulmonary resuscitation (Marchant et al., 2008), appropriate levels of supervision (Petrass et al., 2011), and child safe play areas (Fragar et al., 2003).

Swimming and water safety lessons have been proposed as a key drowning prevention strategy (Wallis et al., 2015); however, until recently there was limited evidence on their effectiveness as a drowning intervention. If aquatic educational programmes are to provide protective value, a comprehensive survival swimming curriculum should include the 15 physical, cognitive and affective competencies that are supported by research evidence demonstrating that they contribute to an individual's water competence and reduce the risk of drowning (Stallman et al., 2017). Swimming proficiency is recognised as one of the competencies (Stallman et al., 2017; World Health Organization, 2017), which is interwoven with a number of the others, that contribute to water competence. While different schools and/or aquatic organisations adopt various strategies to develop swimming competency through their programmes, albeit with varying levels of success, relatively little is known about specific pedagogical approaches for maximising children's development, success and learning in aquatic contexts.

Over the past two decades, education has moved in a direction that considers student-centred approaches to be most effective (Le Ha, 2014) and within physical education and sport pedagogy, student-centred models and forms of inquiry, critical pedagogies, and peer-assisted learning

approaches have been advocated as effective ways to achieve a broad range of outcomes (O'Sullivan, 2013). Specialist Health and Physical Education (HPE) teachers would acquire this pedagogical knowledge through their four-year physical education teacher education programmes, and would have experience in applying this pedagogy in various contexts, including aquatic education. However, swimming and water safety is recognised as one of the most commonly outsourced activities in primary schools, along with traditional sports, dance and gymnastics (Williams et al., 2011). In Australia, primary schools are known to outsource their aquatic programmes to commercial learn-to-swim teachers, Education Department appointed swim teachers, or teachers from the community (Peden et al., 2009).

The teaching of basic swimming, water safety and rescue skills is recommended by the World Health Organization (2014) for all school-aged children. However, there is limited empirical evidence on: (a) the success of swimming lessons as a drowning prevention intervention (Wallis et al., 2015); and (b) effective pedagogies to develop student swimming competency (Rocha et al., 2018). Furthermore, the provision of swimming and water safety education is an important aspect of the HPE curriculum in Australian primary schools (Australian Curriculum Assessment and Reporting Authority, 2010). Currently in Australia, not all school children have access to in-school swimming and water safety education (Royal Life Saving Society Australia, 2012), despite its mandate within the Australian curriculum. The barriers that inhibit participation are varied and include, among others: a lack of qualified staff; increasing teacher workloads; legal liability concerns; limited access to facilities (especially for those from remote geographical locations); the need to undertake risk assessments; managing varied levels of swimming ability; and cost associated with travel, lessons and pool entry (Peden et al., 2009; Whipp and Taggart, 2003). However, the recommendation by the World Health Organization (2014) for teaching of basic swimming and water safety skills for all school-aged children and the inclusion of swimming and water safety in four focus areas within the HPE component of the Australian Curriculum (Australian Curriculum Assessment and Reporting Authority, 2010) means that strategies are required to assist schools in the provision of swimming and water safety education.

The primary aim of this study was to evaluate whether participation in a survival swimming programme (SSP) resulted in improved aquatic skills and knowledge among year five and six primary school students. The secondary aim was to explore whether an innovative SSP was perceived as having a positive influence by swim teachers, school teachers and principals, and parents from a range of primary schools from different geographical regions in Victoria, Australia.

Method

Participants

The SSP was implemented as a before school programme for year five and six primary school students (mean age 11 years, standard deviation 0.69) in Victoria, Australia, in one regional area (two schools, $n = 68$ students) and one metropolitan area (one school, $n = 111$ students). As the programme commenced at 8:00 am, buses were provided as part of the programme to transport participants from the school to the aquatic centre, and return the participants to school. For one of the regional programmes, the commute to the aquatic centre was approximately 60 minutes, while the other regional and metropolitan programmes had a much shorter commute, approximately 10–20 minutes. The regional and metropolitan areas were purposively selected based on: (a) a high number of drowning incidents over a 10-year period (2002 to 2012, regional location and 2004 to

2014, metropolitan location); (b) high relative socio-economic disadvantage (Australian Bureau of Statistics, 2013), and consequently these students may not have had access to swimming lessons outside of the school curriculum; and (c) the heterogeneous barriers that regional and metropolitan areas encounter in delivering swimming and water safety education.

Parents with a child involved in the SSP were also recruited for the study. Furthermore, representatives from the three schools (including school principals and leading school teachers, defined as teachers with responsibility for coordinating a large number of staff to achieve improvements in teaching and learning), and the two aquatic centres (including swim school managers and swim teachers involved with the programme) were invited to participate through the completion of questionnaires, and/or involvement with interviews and/or focus groups (as described in the measures section).

Ethical approval for the study was obtained from the University Human Research Ethics Committee and the Department of Education and Early Childhood Development.

Intervention programme

An extensive review and synthesis of the peer-reviewed literature on current health education theories, physical education and sport pedagogy, educational drowning prevention interventions, swimming and water safety instruction, and the epidemiology of child drowning in high-income countries, including Australia, underpinned the development of the SSP. In addition, drowning trends at a local level in Victoria over the previous 10 years were analysed utilising the Life Saving Victoria Drowning Database to further inform the programme content. Finally, the National Swimming and Water Safety Framework was reviewed, as this framework describes the aquatic competencies that the Australian Water Safety Council has proposed as the minimum benchmark level of competence that children should achieve prior to leaving primary school (Australian Water Safety Council, 2016; Royal Life Saving Society Australia, 2010).

The swimming and water safety competencies incorporated into the SSP aligned with the Australian and Victorian Curriculum, Foundation to Level 10, specifically Levels 5 and 6 (most relevant to the student participants) of the HPE Curriculum (Victorian Curriculum and Assessment Authority, 2015). The competencies reflected contemporary aquatic education programmes (Table 1), and the student-centred pedagogical approach facilitated and linked intended learning at conscious and non-conscious levels (Light, 2014). This pedagogical approach is in contrast to many established programmes that utilise a traditional, direct instruction pedagogy and emphasise the development of competitive stroke technique and the capacity to swim specific distances in a closed and stable physical environment. This student-centred approach was selected as it enabled opportunities for students to learn through doing, provided capacity for individual and collective reflection on experiences, and for verbalisation of learning through structured questioning (Light, 2014). As student-centred learning theory and practice are based on the constructivist learning theory, it enabled the theory and practical competencies to be embedded together and developed over the duration of the programme rather than being restricted to a specific lesson.

The SSP was conducted during the school term, with all students attending 10, one-hour practical sessions before school. Students were allocated a practical group based on their self-reported competence, with a maximum of five students in each group. As practical sessions for different aquatic competency levels ran concurrently, there was scope for programme organisers to move students between groups if necessary. The SSP was delivered by 10 qualified AUSTSWIM Teacher of Swimming and Water Safety instructors with extensive experience of teaching

Table 1. The swimming and water safety competencies (theory and practical) introduced in each of the survival swimming programme lessons.

Lesson number	Theory competencies	Practical competencies
1	Introduction to swimming and water safety	Fundamental entries and exits Introduction to the water (submersion and breathing, movement through water)
2	Knowledge about local aquatic environments and associated hazards	Local hazard identification Float and recover to standing and introduction to rotation (front to back to front float) Gliding and propulsion Underwater swimming
3	Water orientation: Why skills are necessary Introduction to survival skills	Floating continued and introduction to survival sculling, sculling for movement and treading water Survival skills (i.e. calling for help)
4 and 5	Personal competence	Survival backstroke Breaststroke Body rotation while swimming
6	Self-preservation and awareness, assessment and avoidance of risk. Casualty recognition and rescue techniques	Advanced entries and exits, including recovery from a fall-in entry Surface dive Rescues – Reach, talk and throw, and being rescued
7	Self-preservation in aquatic emergencies. Knowledge about river and beach environments and associated hazards	Survival skills – Lifejackets, HELP and huddle positions, and safe exits Open water hazards including escape strategies from currents (beach and river)
8	Clothing and impact on swimming competency: What to do if unintentionally enter the water when fully clothed	Survival skills continued –With and without clothing
9 and 10	Rescue competence: Recognition of an aquatic emergency and appropriate steps to safely respond	Emergency response (DRSA –Danger, Response, Send for Help, Airway) Initiative and judgement

Note: Table 1 indicates where the key knowledge and/or skill was introduced; however, these were built upon over subsequent lessons.

swimming and water safety and experience teaching across a range of competencies. To address concerns raised in previous research (Smith, 2015) about the limited capacity of external coaches (including a lack of required teaching skills and techniques, perceived inability to control student behaviour, and limited capacity to know students and how they learn) and to ensure consistency in delivery of the programme and accuracy of student assessment between classes and aquatic centres, all swim teachers completed a four-hour, face-to-face intensive theory-based training workshop.

The swim teachers' workshop used a cooperative learning pedagogy, with key components of the programme presented and discussed (Table 2). Pre-prepared detailed lesson plans were

Table 2. Overview of content in the theory-based training workshop for swim teachers.

Programme aspect/item	Overview of key areas addressed
Background to programme	• Overview of swimming competency research and current school-based swimming and water safety programmes in Victoria, Australia • Justification of the need for the survival swimming programme
Local drowning epidemiology	• What do the statistics tell us – Who, where and why are children aged 5–14 years drowning in Victoria, Australia?
Programme overview	• Programme focus: Understanding survival swimming and swimming competency, not just enhancing stroke technique and swimming distance • Programme aim and learning outcomes
Lesson plans	• Structure and format of lessons within programme • Overview of each lesson, with opportunities for questions and discussion • Key points – Terminology, catering for diverse swimming abilities within a lesson, awareness of different learning styles, teaching space and equipment
Teaching pedagogy	• Understanding survival swimming and swimming competency • Direct instruction versus learner-centred pedagogy • Learning requirements for individuals and groups • Instruction of small groups: Techniques, positioning, maximising participation, etc.
Assessment	• Reliability and objectivity in assessment and understanding the assessment checklist • Completion of attendance record • Skill assessment process • Purpose of feedback book and questionnaires

provided to swim teachers at the workshop to ensure consistency of delivery, and more specifically, so that student differentiation and planning of lesson progressions were addressed. In line with the overall programme philosophy, lesson plans were underpinned by a student-centred pedagogy, acknowledging the need for both student-centred and teacher-centred pedagogy to ensure the achievement of learning outcomes. Swim teachers were encouraged to: provide students with the opportunity to learn through exploration; allow time for students to try different techniques and strengthen individual and collective reflection; challenge student thinking through guided discussion; and utilise a holistic approach to achieve the lesson learning intentions. The lesson plans incorporated specific teaching points and progressions for skills, as well as individual and collaborative scenario-based learning activities, and accompanying guided discovery questions that swim teachers could work through to facilitate a positive learning experience and the achievement of programme outcomes.

Measures

Knowledge, perception, and demographics. To measure the impact of the SSP on participant aquatic competencies, during school class time, participating students completed a validated and reliable self-report questionnaire pre-programme and post-programme. To obtain construct and content

validity, 10 drowning prevention experts and practitioners reviewed and provided feedback on the draft of the survey. To determine reliability, a test–retest measurement was conducted. A convenience sample of 40 individuals, aged 10–14 years were conveniently sourced and invited to undertake the survey. In total, 35 participants completed the initial test and these participants were contacted 10 days later and asked to complete the survey again. Thirty participants completed the re-test. To determine reliability, Cohen's Kappa was conducted on categorical data, and linear weighted Kappa for ordinal data. As all reliability scores were at least moderate strength, the survey was deemed reliable.

The questionnaire provided insight into three main areas: perceived swimming competency (for example 'How good are you at swimming compared to others of your age?' 'How long can you stay afloat in deep water in a swimming pool without support?'); level of water safety knowledge (measured through 10 true/false statements, for example: 'A rip is a strong current of water that can carry a person away from the beach and out to sea,' 'Freestyle is the best stroke to do over a long distance if you have to swim with your clothes on') with the overall knowledge score reflecting the number of correct responses (maximum score of 10); and exposure to aquatic environments ('How often do you go to swimming lessons?' 'How often do you swim in a pool, not including swimming lessons?'). Demographic information was also captured. The post-programme student questionnaire also contained open-ended questions to ascertain their opinions about the programme including whether they enjoyed the programme and why, any challenges they experienced, and how they felt the programme could be improved.

Practical aquatic skills. Practical skills tests were conducted by members of the research team pre-programme and post-programme and these replicated items that the participants responded to in the questionnaire. Students performed practical skills individually, and were observed and assessed on the: (a) distance they could swim (using any swimming stroke, no speed requirement) up to a maximum of 300 metres (m) assessed on a six-point scale (see Table 3 for details); (b) swimming efficiency on back and front, up to a maximum of 25 m (including any traditional stroke, or combination of strokes), with both ability on front and back assessed independently on a five-point scale (Table 3); (c) time the child could float and/or tread water and/or scull, unsupported in deep water (at least 1.8 m) up to a maximum of 2 minutes, assessed on a six-point scale (Table 3); (d) dive entry into deep water (at least 1.8 m deep) assessed on a five-point scale (Table 3); and (e) ability to swim though a submerged hoop (40 cm below the surface of the water) without pushing off the wall or using goggles, assessed on a three-point scale (Table 3). For further details relating to how consistency in assessment items was established, see Petrass et al. (2012). To minimise the likelihood of any bias in reporting, participants were not informed of what was included in the practical tests prior to undertaking the testing.

Stakeholder feedback. Parent/carers and swim teachers completed validated questionnaires comprising closed-ended questions to report their overall satisfaction with the programme. The parent/carer questionnaire also contained open-ended questions to: provide feedback related to their opinions about the programme including coordination, delivery, and the impact on their child/children; identify any challenges; note suggestions for improvement; and provide any feedback from their child/children. The swim teacher questionnaire contained open-ended questions to provide constructive feedback about the effectiveness of the programme in terms of aims, outcomes, content and delivery.

Table 3. Practical skills and associated scales that were used for assessment.

Practical skill test and scoring	Practical skill test and scoring
Distance child can swim (any stroke) 6 = completes 201–300 m 5 = completes 101–200 m 4 = completes 51–100 m 3 = completes 25–50 m 2 = completes 1–24 m 1 = does not attempt test	*Dive* 5 = completes task easily with excellent form 4 = completes comfortably with good form 3 = completes with satisfactory form 2 = completes dive with poor form 1 = does not attempt test
Swim efficiency (front and back) 5 = completes task easily with excellent form and pace 4 = completes task easily with good form and pace 3 = completes with satisfactory form and pace 2 = completes with poor form and pace 1 = does not attempt test	*Swim through submerged hoop* 3 = completes task demonstrating ability to submerge and propel underwater 2 = unable to fully submerge and propel underwater 1 = does not attempt test
Float, scull or tread water 6 = completes 2 minutes + 5 = completes 2 minutes 4 = completes 1 minute 3 = completes 30 seconds 2 = completes 15 seconds 1 = does not attempt test	

Individual face-to-face semi-structured interviews were conducted with three school principals, three leading school teachers and two swim school managers from the regional and metropolitan aquatic centres to explore the impact of the programme through an ecological lens. An interview guide was implemented during the interviews, and probes were used where required to clarify statements and/or to obtain further information. Pilot interviews lasting approximately 35 minutes were conducted with two female participants to establish validity of the interview guide. This resulted in the rewording of two questions for clarity, but as no other issues were evident the guide was considered appropriate for implementation. Interview questions focused on: how schools and swim school managers perceived the programme (for example, *can you share with me your impressions of the programme, including both strengths and weaknesses?*); the impact of the programme on the school and/or aquatic centre (for example, *did you notice any changes in relation to student learning and behaviour once students returned to school after completing the morning SSP?*); the effect of the programme on their staff (*for example, did you experiences changes in swim staff availability with the scheduling of the SSP in the morning?*); and suggestions for improvement. Each interview lasted approximately 40 minutes.

To provide additional information, six focus groups (that contained three to four participants) were conducted with swim teachers, to further explore their views on the characteristics of the programme, and to seek specific views on the programme purpose and objectives, aims, outcomes, content, and pedagogical approach. Two focus groups that contained year five and six classroom

teachers were conducted to evaluate broader impacts including: student attitudes and motivations upon returning to school; whether the programme met the student and/or teacher needs; and the ease of scaffolding further aquatic learning within the classroom. The focus groups lasted approximately 30 minutes.

Following completion of the final pilot programme, the SSP was distributed via email for critical review by experts from the Victorian Education sector and aquatic industry, for formative and summative evaluation. Experts were asked to provide qualitative feedback on each of the areas above, as well as each of the 10 lessons, including recommended changes for improvement.

Data coding and analysis

Due to the nature of the research, data analysis was ongoing throughout the data collection process. All quantitative data were double entered and cleaned in Microsoft Excel and the cleaned data were transferred to SPSS (version 25) for statistical analysis. Frequencies and percentages were conducted initially to summarise categorical variables, and as the data were categorical and ordinal, non-parametric statistics were conducted. The Wilcoxon matched pairs signed ranks test was conducted to determine significant differences between knowledge and practical swimming ability pre-programme and post-programme. Mann–Whitney U tests were used to establish whether there were significant differences in practical swimming ability, and knowledge pre-programme and post-programme between two groups (i.e. male and female, the regional programmes, regional versus metropolitan programmes) while Kruskal–Wallis H tests were used when there were more than two groups (i.e. comparison of the three metropolitan programmes). The Spearman's rank-order correlation was used to determine whether any relationships existed between the practical skills tested.

Data collected via interviews and focus groups were recorded with audio-recording technology and transcribed verbatim. Qualitative data from questionnaires, interviews and focus groups were subjected to thematic analysis, which is recognised by Roulston (2010) as one of the most commonly used forms of analysis within qualitative research. To ensure that a sound thematic analysis was conducted, the process was guided by the six phases and a 15-point criteria checklist identified by Braun and Clarke (2006). Thematic analysis involved the team of researchers familiarizing themselves with the data, with the lead author generating initial codes, searching for and reviewing themes, and defining and naming themes. The entire dataset was subsequently coded independently by two authors, and these were compared for consistency. Following discussions among the researchers, transcripts, coding, and themes were revisited and amended to strengthen the quality of the findings.

Several strategies were used to establish trustworthiness and rigour, including addressing credibility, dependability and confirmability of data (Forero et al., 2018; Lincoln and Guba, 1986). Credibility was obtained through all investigators having prolonged and varied engagement with each aquatic setting, and peer debriefing meetings at different stages throughout the programme delivery. Data credibility was increased with pilot interviews that resulted in refinement of the interview process, including the interview protocol. Dependability was achieved through the development of a rich description of the study protocol with documentation of all changes and revisions, along with the establishment of an audit trail, which included a detailed record of the data collection process and agreement by the research team to all steps in the coding and data analysis. To assess the confirmability of the findings, methodological and investigator triangulation were undertaken. Methodological triangulation was achieved by using the mixed methods

approach with data from interviews and focus groups linked to qualitative data from questionnaires, while investigator triangulation was obtained through consensus decision-making within the research team.

Programme refinement

This paper describes the findings of the SSP as delivered on five occasions – twice in regional settings and three times in a metropolitan setting. In line with best practice strategies in health promotion (Israel et al., 1995), process evaluation was undertaken during each programme, and outcome evaluation at the conclusion of each programme. Where considered appropriate, programme modifications were made to improve delivery and enhance outcomes. Following the completion of these five deliveries, subject experts from the fields of education and aquatics also reviewed programme findings to make recommendations for further improvements.

Results

The iterative process used to implement and assess the effectiveness of the SSP (Figure 1) enhanced validity at each stage. A total of 204 students were enrolled in the SSP; however, removal of missing data (e.g. where the student did not complete pre-testing or was absent at the time of follow-up testing) reduced the sample size to 179. Gender balance was relatively even (48.6% males and 51.4% females).

Practical skills results

Results from the regional programmes (stage 1) demonstrated that participants' overall swimming ability showed statistically significant improvement from pre-programme practical testing to post-programme practical testing ($z = -5.37$, $p < 0.001$, $r = -0.69$). When analysed according to each individual practical skill, statistically significant improvement was observed in four of the six practical skills tested (see Table 4). There were no statistically significant post-programme differences in the level of swimming ability between male and female participants ($U = 443.5$, $z = -0.76$, $p = 0.449$, $r = -0.09$) or for participants from the two different regional schools ($U = 454.5$, $z = -0.59$, $p = 0.552$, $r = -0.07$).

Further analysis using Spearman's correlation coefficient demonstrated that participant baseline practical distance swim was positively correlated with their dive technique ($r_s = 0.54$, $p < 0.001$), float ($r_s = 0.45$, $p < 0.001$), swim technique on back ($r_s = 0.45$, $p < 0.001$), swim technique on front ($r_s = 0.50$, $p < 0.001$), and ability to submerge and propel underwater ($r_s = 0.41$, $p < 0.001$). The equivalent post-programme measures demonstrated similar relationships (dive technique ($r_s = 0.51$, $p < 0.001$), float ($r_s = 0.54$, $p < 0.001$), swim technique on back ($r_s = 0.52$, $p < 0.001$), swim technique on front ($r_s = 0.54$, $p < 0.001$), and ability to submerge and propel underwater ($r_s = 0.45$, $p < 0.001$). Therefore, swimming distance was used as a proxy measure to determine participant improvement in swimming ability within the metropolitan programmes (stage 2).

Consistent with the regional programmes, the participants within the metropolitan programmes showed statistically significant improvement in overall swimming ability from pre-programme to post-programme ($z = -6.35$, $p < 0.001$, $r = -0.62$). There were no statistically significant post-programme differences in the level of swimming ability between male and female participants

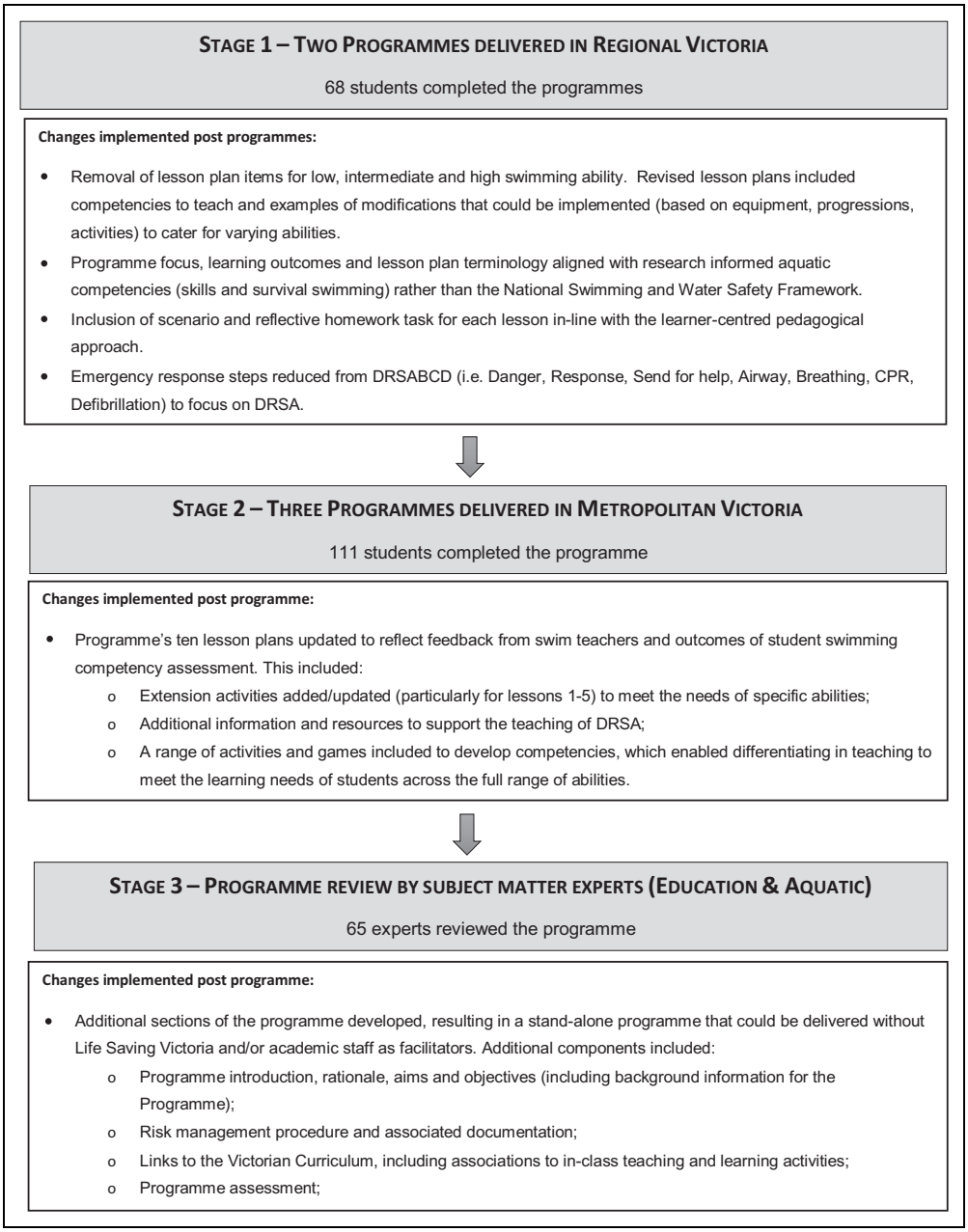

Figure 1. Implementation and adaptation/modification of the survival swimming programme.

Table 4. Median scores and interquartile range (IQR) for the six practical test items pre-programme and post-programme (stage 1, regional programmes).

Practical Skill tested	Median pre-progamme (IQR)	Median post-programme (IQR)	z value	p value
Dive technique	2 (1)	3 (1)	-3.18	0.001*
Distance swim	4 (3)	5 (2)	-4.96	<0.001*
Float	6 (2)	6 (0)	-3.21	0.001*
Swim technique on back	3 (2)	3 (1)	-0.93	0.354
Swim technique on front	3 (1)	3 (2)	-2.58	0.010*
Ability to submerge and propel underwater	3 (0)	3 (0)	-1.86	0.063

Note: * denotes significant improvement from pre-programme to post-programme.

($U = 1423.5, z = -0.20, p = 0.843, r = -0.01$) or for participants from the two regional programmes or three metropolitan programmes ($X^2(2) = 3.875, p = 0.144$).

At baseline, participants of the regional (stage 1) and metropolitan (stage 2) programmes demonstrated a good level of swimming, water safety and aquatic knowledge (median (Mdn) = 75%). There were no significant differences in the level of knowledge between male and female participants from the regional ($U = 477.0, z = -1.00, p = 0.315, r = -0.12$) and metropolitan cohorts ($U = 1577, z = -0.596, p = 0.551, r = -0.05$) or for participants from the two regional schools ($U = 483.5, z = -0.98, p = 0.326, r = -0.12$) or three metropolitan schools ($X^2(2) = 1.114, p = 0.573$). For the regional programmes, there was no significant change in knowledge post-intervention ($Mdn = 81\%$) ($z = -1.35, p = 0.176, r = -0.17$): 15 participants obtained a lower knowledge score post-programme; 23 participants obtained the same score; and 24 participants obtained a higher knowledge score post-programme. However, males were significantly more likely to obtain a higher knowledge score than females ($Mdn = 87\%$ versus 75%, respectively) on the post intervention survey ($U = 458.5, z = -0.73, p = 0.463, r = -0.26$). In contrast, results from the metropolitan programmes (stage 2) demonstrated that participants' knowledge improved significantly from pre-programme ($Mdn = 75\%$) to post-programme ($Mdn = 87\%$), ($z = -5.62, p < 0.001, r = -0.58$). There were no significant differences in post-knowledge scores between males and females ($U = 1101, z = -0.87, p = 0.382, r = -0.08$) or between the three programmes ($X^2(2) = 0.761, p = 0.683$).

Stakeholder feedback

The qualitative results provided rich understanding of the SSP from the perspectives of students ($n = 73$) and parents ($n = 69$), school teachers and principals ($n = 14$), swim teachers and swim school managers ($n = 21$). Themes from the qualitative data included: programme enjoyment; programme continuation; programme endorsement; programme impact; administrative considerations; pedagogical approach; and water safety and survival swimming content.

Students and parents. When discussing the programme, a theme identified by all parents, including those whose children were hesitant to engage in the programme was child enjoyment:

'He loved the different activities and was thrilled with his improvement in the tests from the start to the end of the programme.' (Parent 26)

'Every day she would tell us about what she did and she was very excited about it. This was a fantastic result as she did not want to attend and we had to convince her to go.' (Parent 35)

'We enjoyed the programme and the goals associated with it. Helping children understand and enhance their swimming abilities is an important life skill. Thank you for taking the trouble to organise this.' (Parent 60)

This theme and sentiments were echoed by the students who talked about their gratification and fulfilment associated with learning new skills that could be applied in real-life. Students commented:

'I enjoyed doing rescues and lifejacket activities the most because they were fun and put us in a situation that could happen in real life.' (Student 52)

'. . . we have learnt valuable swimming and lifesaving skills that can be applied in channels, dams, rivers and the ocean.' (Student 1)

'I love how everyone tries to do something that they haven't tried before.' (Student 83)

Parents/carers also valued the inclusion of personal survival skills developed through the programme and a key theme was programme continuation: 'as a qualified swim instructor with over 20 years' experience this is by far the best programme I have seen' (Parent 15). One parent commented that, 'the programme should be available in all schools/swimming clubs. Aside from swimming, [it] exposes the children to other safety aspects that are not taught in swimming lessons' (Parent 67). Other Parents/carers echoed these opinions, for example, 'these lessons should be provided to all primary aged students for free. [They] will save lives and make children aware of water safety' (Parent 61), 'I really think this programme is beneficial and I would do it all again for all three of my children' (Parent 2) and 'I would encourage everyone to participate in this programme as my son has benefited by learning life skills' (Parent 14).

Administrative considerations, including the early start time of the SSP was a further theme identified by Parents/carers (practical sessions started at 8:00 am) that were involved with the programme, although this did not appear to be a negative consideration. For example:

'. . . the time of lessons did mean very early mornings but we managed ok with this.' (Parent 18)

'It was a change in my routine – needed to get up 30 minutes earlier, but that being said I haven't had the usual arguments of getting kids out of bed earlier.' (Parent 3)

'. . . the early mornings are a bit harder but worth it as they are learning great safety skills as well as swimming.' (Parent 4)

School teachers and principals. School principals articulated their endorsement of the programme and identified that it differed from established programmes that emphasise competitive stroke technique, with one principal reporting, 'the content was good, particularly the focus on rescue and lifesaving skills rather than the usual focus on stroke technique, and the students had fun while they learned' (Principal 1). This theme (programme endorsement) was echoed by one of the leading school teachers (Leading teacher 1) who stated that they: "... liked the focus on rescue and

lifesaving skills rather than the usual focus on technique' and felt that 'there was good integration of the learning outcomes . . . . and it was a great concept of learning though fun'. This same teacher noted that the swim teachers associated with this programme appeared to be very involved and motivated and contrasted this with what they have generally observed: 'in the typical programme the instructors seem to be going through the motions, maybe due to the repetitive nature of the programmes."

Programme impacts (at the student level) was a theme identified for school teachers, including the substantial improvement in students' confidence in the water and the positive impacts of this on their lives:

> 'Some of the improvement was phenomenal . . . a couple of kids improved out of sight as far as being able to save their lives in the water.' (School teacher 1)
>
> 'Hugely positive impact on non-swimmers, immense progress in just two weeks.' (School teacher 1)
>
> 'I think [the students'] confidence built enormously from day one to day ten.' (School teacher 3)
>
> 'It was an amazing programme and the results speak for themselves.' (School teacher 2).

Despite the benefits of the SSP, administrative considerations was a theme identified by both leading teachers and classroom school teachers. There were some reservations expressed which predominantly revolved around class disruption and tired students, as well as challenges associated with supervision. For example, the programme was 'disruptive to normal school curriculum as children don't arrive at the school until 9.30 am. However, this is no more disruptive than [the] typical programme attended' (Leading teacher 1) and 'ideally you would want children back to school by 9.15 am to reduce the impact on the class/curriculum' (School teacher 2). In a similar vein, it was noted that 'if the whole class participated this would be much easier but the interruption was no more than the usual programme as far as children coming through class part way' (School teacher 4). In contrast, teachers from one school reported 'no issues, and no negative impact' (School teacher 7) and felt that it would also be possible to conduct the programme 'during the school day, as part of sport rotation' (School teacher 7).

According to Leading teacher 1, there were some concerns relating to supervision, although this sentiment was not mentioned by other leading teachers and/or school teachers:

> 'Challenge for school as need two teachers to attend every day of the programme and the school cannot spare these teachers . . . need a male and female teacher to assist with the change rooms . . . . Smaller schools may particularly struggle with these issues.'

Swim teachers and swim centre managers. The swim teachers spoke highly of the learner-centred pedagogical approach that underpinned the SSP. Within this theme, teachers emphasised that they felt the lesson plans and activities were different and fun, rather than prescriptive and focusing on technique:

> 'It was a great opportunity to reflect on the way I taught water safety.' (Swim teacher 6)
>
> 'The lessons for each day were well thought out in view of water safety and knowledge of survival strokes.' (Swim teacher 10)

'The lesson plan was excellent as it was straight forward and basic to understand so the kids wouldn't get too overloaded.' (Swim teacher 9)

'The programme was educational and fun for the students. Not like regular [swimming] lessons.' (Swim teacher 6)

This pedagogical approach, while different to a traditional direct instruction pedagogy, did not prevent swim teachers from achieving learning outcomes, with all in agreement that students enjoyed the programme and learnt a lot. 'I enjoyed the programme and got a lot of satisfaction from seeing the students improve with all their skills from the beginning to the end' (Swim teacher 10). Further, one teacher noted it 'helps educate kids on aquatic safety which they may not have been exposed to without this programme' (Swim teacher 7).

Discussion

Australia has a long history in the provision of teaching children basic swimming and water safety skills, predominantly through school for primary school children, and/or private swim school programmes (Australian Water Safety Council, 2016). However, concerns remain about the percentage of children that leave primary school in Australia without the skills and knowledge considered necessary to be safe when they are in, on or around the water (Royal Life Saving Society Australia, 2012). This may be a result of swim programmes: (a) utilising a direct instruction pedagogical approach; (b) having a focus on stroke development at the expense of broader water safety and survival skills (Royal Life Saving Society Australia, 2012); or (c) other known barriers impacting on the provision of quality swimming and water safety education (Peden et al., 2009; Whipp and Taggart, 2003).

The SSP presented in this study was developed with these barriers in mind and the iterative process for implementation enabled validation, refinement, and evaluation at each stage. Furthermore, the findings from this study highlight several key lessons that can be considered and applied (if relevant) in the design of future aquatic programmes. For example, the inclusion of perspectives from all stakeholders (students, Parents/carers/carers, school teachers and principals, and swim school managers and swim teachers) is critical, and this study acknowledged that each have a role to play in the development of a purposeful, engaging and effective student-centred SSP. The professional development undertaken with swim centres ensured that managers and swim teachers had a clear understanding of the SSP philosophy, aims and objectives, their individual role within the programme, the teaching pedagogy, and teaching and learning activities that would support the achievement of the programme outcomes. While this training was time-consuming, our field notes and swim centre manager and swim teacher feedback uniformly confirm that this was a valuable investment. If specialist physical education teachers are not delivering school aquatics programmes, upskilling of staff with swim teacher training only needs to be considered. This is particularly important as research has demonstrated that specialised coaches have a lack of curriculum knowledge, including assessment and reporting, along with limited knowledge about relevant pedagogical approaches that enable the inclusion of differentiated strategies to meet specific learning needs of students (Griggs, 2010; Smith, 2015).

Results from this study are in line with the small amount of research that is available on knowledge acquisition related to these types of programmes (Blitvich, 2014; Ramos et al., 2018). Significant changes in knowledge between pre-programme and post-assessment scores have been reported from programmes (even with short duration interventions) focused on positive water

safety behaviour. However, the direct measurement of practical swimming skills pre-programme and post-programme within this study is significant, as there is a dearth of work that directly measures swimming competency through the assessment of multiple skills. Hence Ramos et al. (2018) identified that swimming behaviour is a phenomenon that needed to be addressed with more scientific rigour.

Overall, the findings from the practical evaluation demonstrated that participation in a 10 lesson SSP led to significant improvement in swimming and water safety skills. Although student swimming and water safety knowledge increased over the course of all programmes, there was no statistically significant improvement in knowledge between pre-programme and post-programme for the regional programmes. A possible reason for this is that several students obtained perfect scores (scored at ceiling) on the knowledge questions at pre-programme, and therefore the overall ceiling effect on these questions might have prevented the finding of a significant difference, as these students could only stay at the same level or decrease post-programme. In contrast, the students within the metropolitan programmes, while having the same median knowledge score pre-programme, demonstrated significant improvement in knowledge post-programme. The fact that students demonstrated a high level of water safety knowledge, but poor swimming and water safety skills pre-programme, highlights the need for schools to offer quality swimming and water safety education programmes to develop competencies in swimming and survival skills.

The results of this study indicated strong support from principals and swim teachers for the student-centred pedagogy. This finding is critical, as student-centred approaches have been considered pedagogically superior to the surface delivery commonly associated with a teacher-centred approach, and positioned as a recipe for development and productive learning (Le Ha, 2014). Furthermore, all stakeholders valued the focus on survival swimming competencies. The recognition of the importance and enjoyment associated with the development of survival swimming skills through the active learning strategies implemented in this programme is significant, especially as many established swimming programmes emphasise the development of competitive swimming strokes and the capacity to swim specific distances. It is also likely that Parents/carers have previously undervalued survival swimming competencies, with many swim schools reporting that children are most likely to miss water safety week (defined as a session once per school term to cover all the water safety content) in swimming programmes (Royal Life Saving and Austswim Ltd, 2010). Important here is the connection, communication, and transparency with all stakeholders regarding the programme aims and outcomes which may not always be established and/or clearly communicated with Parents/carers in traditional swimming and water safety lessons. It is evident from this study that these types of interactions, combined with a student-centred pedagogy can help create climates that support child and parent engagement and retention in swimming and water safety education.

Although the present study provides insight into the development, implementation and evaluation of an SSP that is underpinned by a contemporary pedagogical approach, further research is required. First, within the rollout of programmes in this study, there were a number of children who either did not attend, or attended few lessons. Developing an understanding of why these children are not participating, their skill level, and how best to engage them would enable us to better reach potentially high-risk individuals and groups. Second, investigations are necessary to increase our understanding of the best delivery mode (i.e. block versus distributed practice) to maximise development of survival swimming competencies, and longitudinal studies are necessary to determine whether swimming competency developed during a single programme is retained over time. Further research opportunities also exist to explore how best to enhance specialist swim

teachers' capacity and confidence to deliver aquatic programmes using diverse pedagogical approaches.

Conclusion

Overall, the evidence-based iterative approach to this project has resulted in a well-founded, effective programme with tailored resources and instructional materials that are available for both swim centres and school teachers. These materials and resources would enable primary schools globally to adopt and implement this innovative programme which provides a balance of swimming and water safety skills, rescue skills and knowledge, and instruction in basic DRSA (Danger, Response, Send for Help, Airway) skills and knowledge.

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