The “ABC SAVES LIVES”: A Schoolteacher-Led Basic Life Support Program in Navarre, Spain

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Abstract
To implement a teacher-led basic life education program in schools. Design thinking methodology was used to develop a comprehensive program to make teachers competent and confident in the delivery of Basic Life Support (BLS), and then to independently implement teaching programs in their school’s community. Specific teaching material and training manikins were provided by the “ABC Save Lives association.” Training was open to all but focused on physical education teachers at all schools in the region. Between 2011 and 2019, 1,726 teachers from 208 schools [35% preschool-primary, 28% secondary, 28% private schools partly funded by public funds; 9% vocational] participated in the program. Sixty percent (619) were physical education teachers, who trained 59465 students. All schools have progressively been supplied with at least five BLS manikins each. In 2014, the regional government of Navarra approved mandatory BLS education in physical education in primary and secondary schools. With adequate education and proper support, physical education teachers can independently implement a Basic Life Support program in their schools aiming to increase bystander cardio-pulmonary resuscitation competencies. Furthermore, the Basic Life Support education increases students’ confidence of social responsibilities and awareness of cardiac arrest as a public health problem.

Keywords
cardiac arrest, design thinking, basic life support, schools, teacher, physical education

Background
Basic life support (BLS) can save lives in case of a cardiac arrest and education in this life saving skill has been introduced into school curricula with varied success in different countries and regions worldwide (Bohn et al., 2013; Böttiger, 2020; Semeraro et al., 2016, 2018).

Every year about 700,000 people die of out-of-hospital cardiac arrest (OHCA) in Europe and the USA (Böttiger et al., 2020) and between 60% and 80% of these OHCA occur at home (Folke et al., 2010). The neurologically intact survival of this life-threatening event remains poor at around 8%, although resuscitation system-based programmes at the community level have shown improved survival rates of up to 50% (Becker et al., 2014; Gräsner et al., 2021; Semeraro et al., 2021; Wissenberg et al., 2013). The differences in survival rates are due to successful implementation of system-based strategies strengthening the early links of the “Chain of Survival” like early recognition of cardiac arrest and alerting emergency medical services, early cardiopulmonary resuscitation (CPR), early defibrillation, and early access to advanced medical care (Deakin, 2018; Nolan et al., 2006). Early bystander CPR rates are significantly associated with higher survival rates and better neurological outcomes of OHCA victims (Christensen et al., 2019).

BLS school education programs not only increase the proportion of BLS competent citizens over time, but also enhance in schoolchildren self-confidence and empower students to play a vital role as rescuers and ambassadors of CPR in their community (Parnell et al., 2006; Vetter et al., 2016; Wingen et al., 2018). In general, Physical and Sport Education unequivocally impacts and shapes students’ personal and social development (Wallhead & O’sullivan, 2005). Physical education as a practical activity, offers an ideal context for teachers to implement BLS in schools in a cross-curricular...
 approach by involving other teachers to teach children and adolescents how to lead a healthy and physically active lifestyle (Bulger et al., 2001).

Professional career development for teachers is offered by the education department of the Navarra government at five Continuing Professional Development centers, which embedded BLS education in the physical education career program with an obligatory annual training in class. We identified in Navarra 307 schools for students in the age range of 6 to 18 years: 173 were public primary schools (6–12 years) and 53 secondary schools (13–16 or up to 18 years), 48 were private schools receiving public funding under pre-established conditions, 16 Basque ikastolas (teaching provided in Basque language), and 17 vocational training institutes.

**Purpose**

In 2010 pre-hospital emergency health care professionals founded a not-for-profit association “El ABC que Salva Vidas” (“The ABC Saves Lives”) because of witnessing poor bystander CPR and low survival rates when attending OHCA victims. The aim was to strengthen the Chain of Survival with a structured educational BLS program for schools and first responders, and to launch a citizen awareness program on cardiac arrest. The specific objective of the school BLS program was to train physical education teachers as change agents to implement and sustain a BLS program into their school curricula.

In 2014, the regional government of Navarra approved mandatory BLS education in physical education in the years 5 and 6 of primary school, and in the years 2 and 4 of secondary schools (Navarra Government, 2014).

This report describes how the program was designed, implemented, and the results obtained.

**Materials and Methods**

In 2011, design-thinking methodology as a theoretical framework was used in two pilot schools to elaborate a comprehensive BLS educational approach for teachers and students within their given school setting. By understanding the needs of the teachers, guiding principles emerged that helped design a program with teachers to support them in their teaching and focusing on the school as a community. This resulted in a three-phase development program, outlined in Figure 1.

Confident and competent first responders: The goal of the first phase was to educate physical education teachers to become competent and confident in BLS.

Volunteer instructors to train these physical education teachers included emergency physicians, nurses, and firemen with experience in attending OHCA and training lay persons. To ensure homogeneity in teaching, the program coordinators (certified Advanced Life Support instructors) provided short training sessions and elaborated teaching guidelines assuring consistency with the content and the approach to teach BLS, and case scenarios for these volunteer instructors. The main reference was the European Resuscitation Council’s guidelines (Greif et al., 2015; Koster et al., 2010; Perkins et al., 2015). The teaching material used by the volunteer instructors was coherent with that used in the second phase and was made available for the physical education teachers. To facilitate intense engagement within the groups the instructor to teacher ratio was 1 to 4-6.

**Teaching formats and delivery:** This phase focused on delivering BLS education to the school community (students, other teachers, school personnel, and parents). Through small group sessions maintaining the same volunteer instructors and teacher groups from the BLS phase 1, the instructors facilitated the discussion of technical and non-technical issues in learning and teaching BLS to schoolchildren. While instructors outlined learning points and BLS skills that children were expected to perform, the schoolteachers provided insights on the delivery process considering the age and maturity of the school children to be taught. Agreement was found that BLS concepts could be introduced gradually over the early school years considering age and maturity, and that periodic deliberate practice would favor long term retention. In addition, they discussed how school boards, other teachers, parents’ associations, and students could be involved to help disseminate BLS training and awareness about cardiac arrest in the school community.

Teachers decided which material best suited them. In these small group sessions, whenever possible an OHCA survivor shared testimony.

Between 2011 and 2013, the program consisted of three hands-on sessions and schoolteachers were provided with an instructional DVD that included a slide presentation on BLS. From 2014 all teaching material was available on the virtual learning Moodle® platform of the education department of Navarra in various formats (Table 1). (Moodle Education Department Navarra, n.d.)

**Implementation and feedback:** The third phase consisted of a 6-to-8-week implementation period in the school community followed by a final session where all the different teachers participating in the BLS educational program provided feedback from their experience.

Teachers were contacted through the 5five Continuing Professional Development centers of the Education department located within the region. These centers published the course on the official course platform and sent a bulletin to teachers at all schools (preschool, primary, secondary, and vocational). This course was offered annually in one or more editions depending on the demand of physical education teachers because BLS education was made mandatory in the school curricula since 2014. However, whenever these courses were not fully booked, teachers from other school subjects showing a special interest in acquiring BLS skills were admitted.
PHASE I: Confident and competent first responders

Access to Online videos 1 week before hands on session
Day 1: 3 hour Hands-on session:
BLS Theory recap 30 min
BLS-AED Practice 120 min
Wrap up and survivors testimony when possible 30 min
Training Groups with Instructor: trainee ratio 1:4-6

PHASE 2: Didactic formats and delivery

Online: Multiple choice test 25 questions (25 min with 2 attempts)
Day 2: 3 hour Hands-on session:
Training in BLS-AED: Practice and evaluation (90 min)
Delivery: Training groups discuss proposals for CPR training in their schools (60 min)
Wrap up conference (30 min):
Instructors summarize small group discussion on CPR delivery for all participants
Visual examples of past teacher-led CPR training and awareness campaigns in schools.
The comprehensive ABC Saves lives program for the community.

PHASE 3: Implementation and feedback

CPR implementation in schools 6 – 8 weeks.
Final questionnaire on activity in schools
Permanent access to online content for annual training

Figure 1. Outline of current teacher training program.
Table 1. Didactic Resources Available Online for Teachers.

Module I Basic life support-AED
1. Introduction
Learning Journey map and course checklist
Instructions for rental of manikins, AED trainer and mini Anne.
Google based survey on implementation (link)
2. Videos and transcripts (Spanish-Basque)
   a. Videos
      Presentation
      Introduction to Basic Life support (BLS): cardiac arrest
      Chain of Survival
      Recovery position
      Cardiopulmonary resuscitation
      Agonal breathing-gasping
      Pediatric BLS
      Defibrillation
      Management of Foreign Body Airway obstruction (adult child baby)
      Videos and video transcripts available for download.
   b. Regional AED regulations (pdf.)
   c. Online BLS theory exam
      (2 attempts allowed-25 questions. Limit 25 minutes)
Module II Dissemination of CPR
1. Theory
   a. Slide presentations (BLS)—open to modification
      (Available in Spanish, Basque and English)
   b. App for Android tablets (Links to app in Basque and Spanish)
   c. BLS-AED guidelines
   d. Theoretical exam for students
2. Practical
   a. Basic BLS Scenarios
      response but with a health problem
      no response, breathing (airway, breathing, recovery position)
      no response, no breathing (cardiac arrest)
      using an AED (Cardiac arrest and AED)
   b. Case bank (Spanish-Basque)
   c. Checklist for practical evaluation
   d. Guidelines: How to teach CPR in your classroom
   e. Examples of CPR dissemination in schools from teacher experiences
   f. Kids Saves Lives program—WHO statement and video presentation
   g. Real life: Interview with teacher who saved his father’s life.
   h. BLS Posters (Spanish, Basque)
   i. Cartoon templates to color based on BLS and Chain of survival
   j. Assembly and maintenance of manikins (Practiman)
   k. Download “Stayin Alive” mp3
3. Other resources
   a. Other time-dependent emergencies: Myocardial infarction; Stroke; Traffic accidents
   b. Link to Mr. Bean CPR video
Resources at Continuing Professional Development Centres
Free rental: 150 Manikins (Practiman™): numbers may differ depending on breakages.
6 Baby Anne™ Laerdal manikins
6 AED Trainers
210 schools with at least 5 manikins each

Note. Access to material Available free and permanently for teachers on the Moodle Platform of the Education Department, Navarra Government.

Teachers and schools writing directly to the association were referred to the Education department website to register for the course. That way they received standard accreditation from their department.

From 2014 on, teachers received permanent access to online videos and didactic material on the Moodle® platform before the hands-on sessions, and individual schools were equipped progressively with five manikins each. Thus, theory was fundamentally available online through videos (Table 1), while hands-on practice and implementation strategies were discussed during presentational sessions. As a suggestion from teachers, we eliminated the last hands-on session after school implementation. From now on, feedback regarding teacher implementation in schools would be recorded with Google Forms™. This information included number of students trained, classes, materials employed, and problems encountered.

After each course a survey sent by the Navarra education department asked about the teachers’ course satisfaction. Teachers received 12 hour continuing professional development certification from the Navarra education department after complying with course attendance and providing evidence of school implementation of the BLS program.

Teaching Materials for the Schools

To ensure that all schools have 100% access to BLS-manikins, all the five Continuing Professional Development Centres offered 150 BLS-manikins (Practiman Basic CPR manikin™, Vicedo Marti SL, Spain) for free to rent. Since 2014 the “ABC saves lives association” has progressively donated manikins to school with the intention to equip all schools with BLS-manikins by 2021. Besides facilitating implementation, providing schools with their own manikins reduces the burden of maintenance and transport from the centers. The rental offer still co-exists for the demands of manikins of preschools and small primary schools demands for manikins.

Between 2011 and 2019, a total of 1531 manikins were purchased for schools, of which 57% were provided by the “ABC saves lives association,” 36% by the Navarra’s Health department, and the rest by the Education department of Navarra. Since 2017, seven baby CPR manikins (Laerdal Baby Anne™ Laerdal Medical, Norway) and seven AED trainers (CR2 AED Trainer, Stryker, USA and HeartSine Samaritan PAD Trainer, Stryker European Operations Limited; Ireland) were provided for free rental.

Assessment of Student Skill Acquisition

In 2014, we performed a peer assessment to evaluate whether trained teachers are able to identify and correct errors while a 32 student who previously received BLS education in school performed a case based BLS scenario.
Later, CPR skill acquisition and retention was evaluated in 141 secondary school students (17- to 18-year-old), of which 99 (45 girls) had been instructed the year before, and 42 students (19 boys) 2 years before by the same teacher. Multiple choice testing and a practical exam for CPR skills were carried out. Students were not informed of the evaluation performed during a physical education class. The practical exam consisted of a case based cardiac arrest scenario, and a health care instructor and primary researcher used a checklist to evaluate student performance.

Results

Between 2011 and 2019, 1,032 teachers from 208 schools participated in 75 Continuing Professional Development courses. Three-hundred and sixty-one (35%) of the teachers were from preschool and primary schools, 289 (28%) from secondary school, 289 (28%) private schools receiving public funding, and 93 (9%) from vocational training schools. Of these participating schools, 146 (70%) were in large urban centers (>10,000 inhabitants), 35 (17%) smaller cities (3,000 and 10,000 inhabitants), and 27 (13%) in rural villages (<3,000 inhabitants).

Participating teachers came from different areas: physical education 619 (60%), which includes all physical education teachers in Navarre, general and health sciences 134 (13%), language 88 (8.5%); mathematics, religion, and other school subjects including 26 (2.5%) teachers of children with special needs, while 165 (16%) teachers came from vocational schools (electronics, mechanics, art school, hairdressing, etc.).

In 2020, of the 307 schools, 210 (69%) schools were equipped with their own manikins. These included all secondary schools, vocational schools, private schools receiving public funding, and Basque ikastolas. AED trainers were provided for free rental as teachers in secondary schools demanded them.

The education department sent the course survey between 2011- and 2018 to all teachers (n = 854) and got back 454 responses (Table 2).

Didactic Formats and Delivery

Implementation and feedback: All teachers reported having carried out BLS teaching in their school community: teaching students, other teachers, other school personnel, parents, and their own family members. Between 2011 and 2014, 235 participating teachers reported to have taught 59,465 persons (95% students, what are the 5% other members of the school community). From 2014 to 2018, the 797 additional teachers reported to have taught 18,716 persons (94.4% students; 5.6% other members of the school community).

Teachers in preschool and the primary school taught 5 to 8 years old children on the needed actions in an emergency, like assessment of unconsciousness, breathing and abnormal breathing, learning their home address, identify and contact a helping adult and the emergency number simulated calls. Children between 8 and 12 years in primary school gradually learned the entire BLS sequence.

In secondary schools, where CPR education is mandatory (years 2 and 4), the full BLS sequence were carried out. Teachers also reported training colleagues and parents in the full BLS sequence. Schools with own manikins tend to offer at least one theoretical and two annual practice sessions.

Physical education teachers employed different teaching formats individually or in combination: chalk and talk, video instruction, slide presentations, theatrical simulation, posters, and the Android-based downloadable app (ABC saves lives CPR app, Spanish)

A standard school class session usually lasted 50 minutes, and teachers carried out at least two training sessions to cover learning objectives.

Schools reported CPR education activities during health promotion weeks to create awareness on cardiac arrest and to disseminate CPR to peers and families on many occasions with the participation of students themselves. Teachers and students elaborated and displayed graphic and audio-visual material, such as posters, videos, and plays. The inclusion of teachers from different subjects such as biology and health sciences reinforced BLS theory and contributed to stronger engagement of the school community in the program through cross-curricular activity. Teachers started to organize school activities and collaboration with the “ABC saves lives association” on the annual celebration of the World Restart a Heart Day on the 16th of October.

Assessment of Skill Acquisition by Students

The results of peer assessment of teachers’ competences are displayed in Table 3. Teachers were able to identify errors and correct them after the scenario. CPR skill retention of previously BLS trained students achieved $8.5 \pm 1.1$ to $8.6 \pm 1.2$ points out of 10 in the multiple-choice test. In contrast, the practical exam resulted in low performance: only 50% of the students check patients’ responses, almost no student called for help, about 60% opened the airway incorrectly, and only 22% called the emergency medical service correctly. On the

| Table 2. Teacher Evaluation of the Training Program (2011–2018). |
|------------------------|----------------------|
| N=454 responses to survey sent to 854 teachers | Score |
| General satisfaction | 9.35 (8.81–10) |
| Objectives and contents | 9.32 (8.88–9.67) |
| Instructors | 9.47 (8.92–9.83) |
| Practical application: | 9.5 (8.5–9.86) |
| Materials: | 9.2 (8.82–10) |
| Organization | 9.2 (8.81–9.71) |

Scale: 0 to 10 (0 = totally unacceptable; 9- strongly acceptable and 10 perfectly acceptable).
other hand, 77% of students checked breathing, 92% performed correct chest compressions, and 88% applied rescue breaths correctly.

### Discussion

When designing the educational strategy for the schools in Navarra, we reviewed experiences from around the world (Bohn et al., 2012; Eisenburger & Safar, 1999; Reder & Quan, 2003). While there are exemplary cases and widespread calls to integrate CPR education in schools, it still seems a demanding task (Lind, 2007; Böttiger et al., 2017; Cerdà Vila & Balanzó-Fernández, 2019; Connolly et al., 2007; Isbye et al., 2007; Miró et al., 2012; Reder & Quan, 2003).

Barriers include lack of resources such as trained instructors, equipment, unawareness of mandatory legislation or the importance of BLS skills, overburdened curricula, legal issues, or lack of institutional or financial support for long-term initiatives (Hart et al., 2013; Hoyme & Atkins, 2017; Mpotos et al., 2013; Salvatierra et al., 2017). By taking up the challenge to overcome these barriers, our goal was to develop a long-term BLS education program in schools led and sustained by physical education teachers.

School children have been taught by health care professionals, first responders, teachers, and medical students (Cuijpers et al., 2016; Jimenez-Fabrega et al., 2009; Plant & Taylor, 2013). Some studies showed that teachers expressed doubt on their competence or willingness to teach BLS unless previously properly educated in BLS, or even when properly trained. Miro et al. reported that teachers still preferred health care professionals for BLS teaching (Miró et al., 2006). However, others have shown that teachers were just as good as health care professionals in teaching CPR (Bohn et al., 2012; Cuijpers et al., 2016; Lafferty et al., 2003).

Like Mpotos et al. (2013) described, we also found initially that teachers were reluctant to teach students CPR, as they did not feel confident to apply a medical subject. However, the option to rely on external health care professionals to provide long-term CPR training in schools changed. Through design thinking methodology, we accessed the potential of physical education teachers as primary change agents of the school curricula (Brown, 2008; Brown & Wyatt, 2010). The results of our program show over the years that properly trained and supported physical education teachers as well as teachers of other subjects can disseminate BLS in their community, and children can become competent first responders and ambassadors of BLS. Similarly, Pichel López et al. (2018) recently confirmed our findings that the ability for teachers to deliver BLS is a prerequisite to teaching BLS to students.

### Advice to Other Initiatives for Long Term Implementation

Some key factors contributed to success in the long term which may be useful to other similar initiatives around the world. Following design thinking principles, we constantly try different approaches and get quick feedback from instructors and teachers that helps us fit the program to their needs and keeps us constantly improving delivery. Over the years, the ABC Saves Lives association maintains regular contact and is always available to support teachers already implementing the program. This helps sustain their motivation to promote awareness of cardiac arrest and BLS in their school communities.

**Instructor – teacher engagement.** To make teachers effective first responders and BLS-trainers in the first part of the course, the health care instructors should be aware of the goal of such a program: high quality bystander BLS as fast as possible for all OHCA victims. During hands on practice, teachers were evaluated for BLS skills and instruction.

Carefully planned phases, small group sessions and intense interaction between the volunteer health care

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### Table 3. Interobserver Concordance Between Teachers and Instructors Evaluating Students for BLS Skills.

| Item                           | Passed by instructor | Passed by teacher | Agreement |
|--------------------------------|----------------------|-------------------|-----------|
| Ensure safety                 | 17/26 (65.38%)       | 23/26 (88.46%)    | 20/26 (86.95%) |
| Check response                | 32/32 (100%)         | 30/32 (93.75%)    | 30/32 (93.75%) |
| Shout for help                | 21/29 (72.41%)       | 20/29 (86.96%)    | 24/29 (82.75%) |
| Open airway                   | 29/32 (90.62%)       | 26/32 (81.25%)    | 29/32 (90.62%) |
| Assess breathing              | 30/31 (96.77%)       | 27/31 (87.09%)    | 28/31 (90.32%) |
| Call for help                 | 28/31 (90.32%)       | 29/31 (93.54%)    | 30/31 (96.77%) |
| Chests compressions           | 30/32 (93.75%)       | 31/32 (96.87%)    | 29/32 (90.62%) |
| Hands in the center of the chest | 26/29 (89.65%)     | 27/29 (93.10%)    | 28/29 (96.55%) |
| Straight arms                 | 27/27 (100%)         | 25/27 (92.59%)    | 25/27 (92.59%) |
| Adequate compression rhythm   | 20/30 (66.66%)       | 24/30 (80.00%)    | 22/30 (73.33%) |
| Rescue breaths                | 32/32 (100%)         | 31/32 (96.87%)    | 31/32 (96.87%) |
| Correct breathing technique   | 30/32 (93.75%)       | 29/32 (90.62%)    | 29/32 (90.62%) |
| Sequence                      | 32/32 (100%)         | 31/32 (96.87%)    | 31/32 (96.87%) |
instructors and teachers themselves, along with skill assessment determine how well the latter will teach their students. The high degree of interobserver concordance between teachers and BLS instructors when employing the assessment template showed that teachers were able to identify and correct errors after the scenario. A template is also useful to help teachers identify frequent errors and train accordingly.

Once trained, frequent deliberate practice at regular intervals (Greif et al., 2015, 2021) could start with a practical assessment to help students and teachers first identify individuals and areas for improvement and adjust training accordingly. Whereas correct skill application rather than bystander BLS knowledge is more relevant to the OHCA victim, the latter can help reinforce retention and motivate students.

**Involving the school as a community not just the classroom.** Targeting all physical education teachers in Navarra led to a rapid extension of BLS education throughout the region’s schools. Teaching other school subject teachers from a single school fosters cross-curricular activity, strengthening the BLS program in that community. School boards were likely to approve annual Cardiac Arrest awareness campaigns, promote education for all personnel and purchase AEDs for their community. Some schools encouraged students to take a BLS teaching kit, containing a DVD, a poster, and a manikin, home to teach their families. Since 2015, the “ABC that save lives association” has promoted the Kids Saves Lives program initiated by the European Resuscitation Council (Böttiger et al., 2017).

**Legislation.** The legal mandate to include mandatory BLS education in primary and secondary school in 2014 was a milestone for the BLS school children educational program initiated by the “ABC Save Lives association” (Navarra Government, 2014).

This achievement was a result of a successful implementation of the teacher-led BLS educational program as well as the influence of key decision-makers in the education and health departments. Teachers recognized BLS as an important lifesaving skill, and their willingness to teach children increased.

In the past, a legal barrier prevented teachers from training secondary school students in AED, because teaching of an AED required health care instructors. However, recently introduced regulations on the use of AEDs and its training in Navarra mandates certification and biannual recertification of first responders (lifeguards, police), while citizens can be trained in AED use without official certification (Navarra, 2019).

This allows teachers to train their students in the use of an AED. The “ABC that save lives association” has designed an affordable AED-trainer to facilitate widespread training. (The AED Training Box)

**Inform and involve key players and decision makers.** Partnerships with the main stakeholders is crucial to sustaining such a program. The education department of Navarra provides institutional access to all teachers through the Continuing Professional Development program. The heads of Continuing Professional Development centres coordinate the courses, update the teaching materials on the Moodle platform, and manage the rental of manikins. As schools progressively receive their own manikins, the rental scheme will play a less important role.

The health department of Navarra has provided support on material, funds for manikins, and played an active role in the discussions for the decisions with the education department to make BLS mandatory.

The program would be unsustainable without health care professionals and firefighters who volunteer to teach the teachers and participate in awareness campaigns. These volunteers receive a symbolic stipend for courses and receive results from teacher evaluations and the progress of the teacher education in the school community. While the school program comes at no cost to the teachers, financial income is necessary to sustain the program, mainly to purchase and maintain manikins and other teaching materials. Most comes from the “ABC Saves Lives association’s” parallel community educational programs: first responder (police) BLS teaching, citizen BLS teaching in Navarra’s towns and villages, and the community awareness campaigns. The Navarra Parliament approved two amendments to the regions budget to support the school program.

**Challenges.** Despite the mandatory curricular BLS education in schools, such a program requires further institutional support and refresher courses for teachers. Follow-up of teachers” and students' performance and continuous training in schools’ fights against curricula overload and changing priorities in education policies despite an open-door approach of all stakeholders. Besides including BLS in the curriculum for students, BLS education and didactics during teacher training at university level would consolidate school programs (Abelairas-Gómez et al., 2020, 2021; Böttiger, 2020).

**Limitations.** A key limitation to our study is a lack of continuous monitoring for quality of the acquisition of CPR skills by students taught by teachers and no results about the CPR skill retention over time. This project describes the implementation and improvement of the quality of our course. In addition, no evaluation was made about the effect of different ratios of instructor to teacher in the course (1:4-6) and teacher to student in schools (1:15-30). Small groups are easier to teach, evaluate and foster greater participation than larger ones (Nabecker et al., 2021). We cannot provide data on bystander CPR rates and survival after cardiac arrest as that was not part of our project.
Conclusion

In conclusion, we described a program led by physical education teachers to instruct students on BLS education in schools. The program maintains and ensures that children acquire and retain high quality CPR skills through continuous work-in-progress involving all health professionals as well as students, and teachers. This was achievable with teacher education to become competent and confident BLS providers. The characteristics of physical education facilitate the implementation of a BLS program in the school curricula and the community. The close contact to the students compared to other professionals such as health care workers, the direct access to generations of children and peers over a professional lifetime, the availability of gym space in schools, and the great flexibility to schedule deliberate practice sessions facilitate physical education teachers BLS teaching abilities. Focusing on the school as a community and including teachers from other subjects consolidates yearly BLS educational events and awareness of the possibility to save lives after cardiac arrest.

Authors’ Note

The ABC Saves Lives association is a not-for-profit organization in Navarra, Spain with the objective of improving survival rates of Out of Hospital Cardiac Arrests and bystander basic life support in the community. www.elabcquesalvavidas.org.

Previous Presentations

With regard to Table 2 the results on the survey of teacher courses were presented by the principal authors as a Poster Communication at the European Resuscitation Congress in Bologna, Italy in September 2018.

Teacher evaluation of a training courses in basic life support—The ABC that saves lives program. Resuscitation, Volume 130, Supplement 1, September 2018, Page e73.

The authors consider the reproduction of these results relevant to this original paper. This paper has not been published, nor is it under consideration elsewhere.

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Declaration of Conflicting Interests

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Ethics Statement

No human or animal experimental studies was involved and no approval was required after consultation.

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