Revitalizing Basic Life Support Certification: Insights into Blended Learning

Mohd Fazrul Mokhtar[1*], Suraya Abdul-Razak[2]

[1][2]Faculty of Medicine, Universiti Teknologi MARA,
UiTM Sungai Buloh Campus, 47000 Sungai Buloh, Selangor, Malaysia
fazrul2293@uitm.edu.my
[2]Cardiovascular and Lungs Research Institute (CaVaLRI),
Hospital Al-Sultan Abdullah (HASA), Universiti Teknologi MARA, 42300 Puncak Alam, Selangor, Malaysia
suraya617@uitm.edu.my
[*]Corresponding Author

Abstract: The primary objective of the Basic Life Support (BLS) course is to impart high-quality cardiopulmonary resuscitation skills, regardless of participants' background. Traditionally, this course has been a one-day program involving classroom instruction, live demonstrations, and assessments. However, the COVID-19 pandemic exposed limitations in conventional BLS training and certification, prompting the adoption of innovative teaching methods. To address current challenges and ensure timely skill enhancement for healthcare professionals, we introduced a blended learning approach to the BLS course. This paper presents the development process of a hybrid BLS learning management system, encompassing curriculum design, validation, website development, and usability testing. During content validation, 10 experts were involved, and amendments were made based on feedback given which resulted in a final item-content validity index (I-CVI) = 1 for all training videos. In its inaugural year, the hybrid BLS course conducted 28 sessions and successfully trained 493 participants, primarily healthcare professionals. Notably, 92.3% of participants provided a System Usability Scale (SUS) score >68%, indicating a positive user experience. Participants also emphasized the user-friendly interface with easy navigation and content effectiveness. This outcome highlights the practicality of delivering BLS using a blended learning approach, which not only improves course administration but also has the potential of income revenues through professional certification programme.

Keywords: Cardiopulmonary Resuscitation, Curriculum, Learning, Pandemic, Software

1.   Introduction

Basic Life Support (BLS) course aims to educate participants on how to stabilize a person experiencing cardiac arrest or other life-threatening events. The key components of BLS include recognizing cardiac arrest, performing cardiopulmonary resuscitation (CPR), automated external defibrillation (AED), basic airway management and choking relief. The BLS certification has been mandated for all healthcare professionals (HCP) and there has been a growing demand for this certification among individuals who do not have a medical background. Traditionally, the course has been delivered in a face-to-face (f2f) format. BLS courses in Malaysia have continued to rely on traditional methods characterized by classroom teaching and demonstrations, manual assessment method, and administrative system.

In 2020, the COVID-19 pandemic has posed significant obstacles to learning, training, and organizing BLS courses. In addition to concerns over the transmission of infection during f2f training,

HCP who served as the BLS faculty also involved in surge capacity of COVID-19 patients while facing shortage of clinical personnel due to workplace infection spread (Azahedi, 2021). The public BLS courses were also suspended in accordance with the movement control order (Tang, 2022). Nevertheless, the European Resuscitation Council in their educational update during the pandemic has emphasized the importance of maintaining BLS training for HCP including enhancing distance learning, self-directed learning, augmented and virtual learning (Nolan et al., 2020).

As a new teaching hospital, Hospital Al-Sultan Abdullah (HASA), UiTM began its operations in stages in 2020 allowing for adequate preparation of various clinical departments to begin their services. These necessitate standardized and timely training, encompassing the acquisition of knowledge, procedural skills, and relational skills necessary for an effective response to a cardiorespiratory arrest. Despite the obstacles faced during the pandemic, yet the need for regular training sessions, the UiTM BLS team has developed a blended learning concept in BLS course to reduce COVID-19 transmission, and minimize teaching and study leave time, while maintaining efficiency, and improving faculty and learner satisfaction. It consists of online and f2f instructions which both complement one another. The application of multimedia technologies ensures a highly effective, engaging, and motivating classroom instruction that meets the requirements of diverse students (Keengwe et al., 2008). A meta-analysis of 56 studies found that integrated learning for HCP has a consistent positive effect and is more effective or equivalent to traditional instruction for knowledge acquisition (Liu et al., 2016). This paper describes the procedural framework entailed in the development of a hybrid BLS course.

2.   Methods

The hybrid BLS learning management system (LMS) was developed in two phases. Phase 1 was identifying content, constructing the curriculum, and developing the BLS training website. Meanwhile, Phase 2 was training the trainers and evaluating the usability of the hybrid BLS course among the participants. The project began in March 2021 and was completed by December 2022 (see **Fig. 1**).

Phase 1: Curriculum development and construction

(i) Identifying the content and designing the hybrid BLS training module

Three emergency physicians participated in the development of the curriculum. A literature review was conducted through search of PubMed/MEDLINE using search terms "basic life support" and several terms for cardiac arrest including "cardiopulmonary resuscitation", "basic airway management" and "drowning". The most recent protocols published by the American Heart Association (Panchal et al., 2020) and the National Committee on Resuscitation Training (Ministry of Health Malaysia, 2017) were used as the foundational concepts, while the learning objectives were design to align with the overall faculty's education mission and matched with Bloom's Taxonomy. Experts identified the specific topics, concepts and skills that will be covered in the curriculum and following thorough deliberations, the content is divided into adult, child, and infant BLS, as well as adult and infant approaches to choking and drowning situations. Each lesson including skills demonstrations are delivered through video produced by the team. The expert panel ensured the uniformity of terms and techniques between international recommendations and local practice. The teaching script was made to be simple for participants to comprehend and to adapt Ausubel's theory of meaningful learning. The entire BLS modules' learning outcomes (LO) were blueprinted against the assessment method and impact factor calculated for examination questions development (Naidoo, 2023).
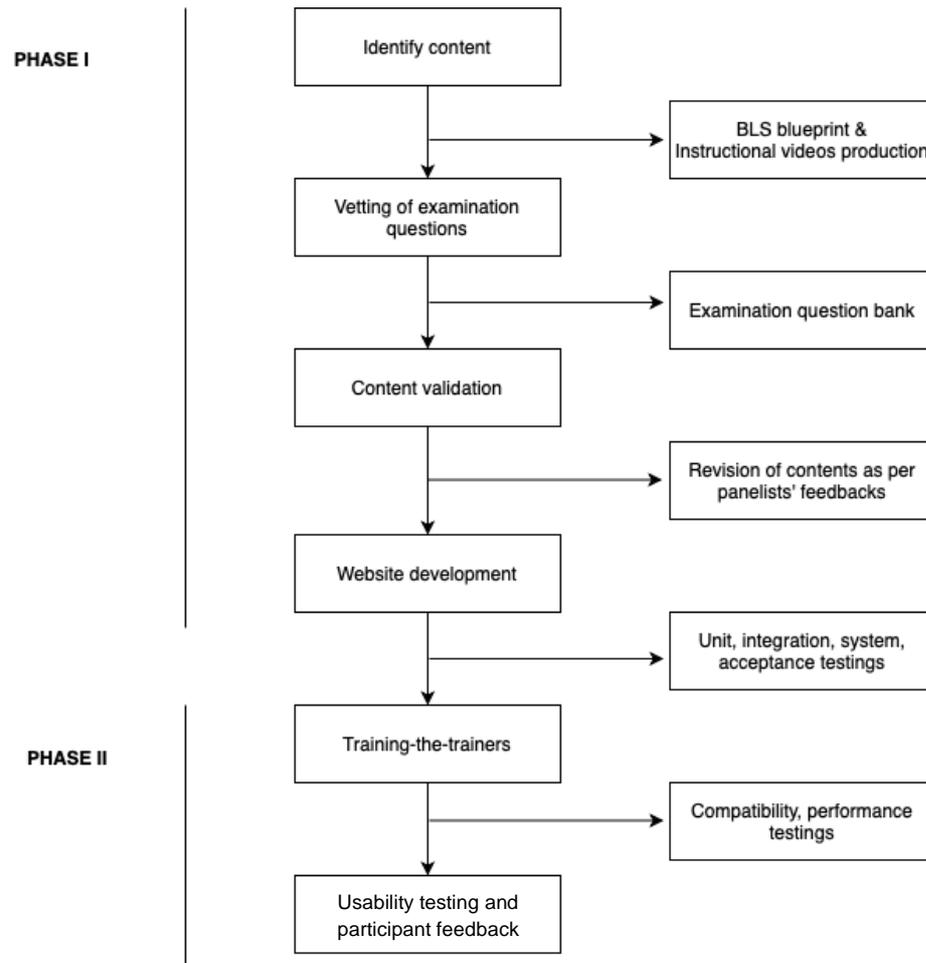
Fig. 1 Flow process of the hybrid BLS learning management system development

(ii) Content for hybrid BLS training module

There are 22 video clips lasting between three and five minutes each, containing explanations and demonstrations of skill techniques. The skill techniques demonstrated in the video lessons are shown as Table 1 below.

Participants need to view the video clips and they are encouraged to practice in the skills lab using a direct-feedback manikin while observing the clips before the actual course. Then, participants need to select a date for the f2f session with an instructor, for skills demonstration and formative assessment. On the day of the course, an instructor demonstrates the skills and rectifies the participants' techniques. In the hybrid BLS, the f2f session is reduced to 3 hours from 7 hours as compared to the conventional BLS course. After the demonstration, participants will sit for practical and theory examinations. The flow chart in **Fig. 2** summarizes the certification process using the hybrid BLS.

Table 1. BLS Video Lessons

Video No.	Topic	Video No.	Topic
1.	Introduction	12.	1-hand technique CPR (child)
2.	Chain of Survival	13.	Scene assessment for (infant)
3.	Scene Assessment	14.	Breathing, pulse check (infant)
4.	Checking signs of life	15.	Rescue breathing (infant)
5.	CPR Techniques	16.	Witnessed, unwitnessed cardiac arrest (infant)
6.	Rescue breaths	17.	CPR techniques (infant)
7.	One-rescuer, Two-rescuer (adult)	18.	Two-rescuer (infant)
8.	Automated external defibrillator (AED)	19.	Automated external defibrillator (AED) (child)
9.	Bag valve mask device	20.	Relief of choking (adult and child)
10.	Putting all together (adult)	21.	Relief of choking (infant)
11.	BLS (child and infant)	22.	Drowning

(iii) Evaluation component of hybrid BLS Course

Cognitive and affective domains of participants are evaluated via theory examination, while psychomotor domain is evaluated via practical examination. To pass the hybrid BLS course, participants must pass both the theory and practical components of the examination. This format of summative evaluation is widely utilised internationally. The examination questions were constructed based on the blueprint prepared. There are four sets of theory questions, each consisting of 30 multiple choice questions on topics such as components of chain of survival and components of high-quality CPR. The questions are uploaded on the examination system. To prevent leaks and to ensure no individuals from different sessions receive the same set of questions, the system randomized the questions. A pool of questions or a 'question bank' which have been carefully curated and categorized based on the topics and difficulty levels are regularly made, vetted, and updated by the vetters. In the practical exam, participants must perform each step taught for adult and infant cardiac arrest scenarios. The given scenario has been set to assure standardization. Certification of BLS is granted when participants pass the theory and practical examinations.

(iv) Content validation

The hybrid BLS training module and the video clips were validated using the Delphi method. This method was selected as it is commonly employed by HCP to create guidelines (McMillan et al., 2016). The purpose of this process is to ensure that the script and video clips are easy to understand by the user. 10 expert panelists were given a structured written questionnaire, and f2f communication was used for panel interaction. They were given 90 minutes to familiarize themselves with the hybrid BLS training module. The questionnaire consisted of a series of statements and 22 clips of procedural skills. The content validity of each item was determined using the item-content validity index (I-CVI) and the panelists were expected to rate each item on a 4-point Likert scale ranging from 1 as not relevant to 4 as highly relevant. Each item has its own I-CVI and was calculated based on the number of experts rating the item as 3 (quite relevant) or 4 (highly relevant) and divided by the total number of experts. The acceptable value of the I-CVI for a panel consisting of at least nine experts is 0.78 or higher as an acceptable content validity (Yusoff, 2019). Items that were scored below 0.78 were revised and the second stage of Delphi was performed.
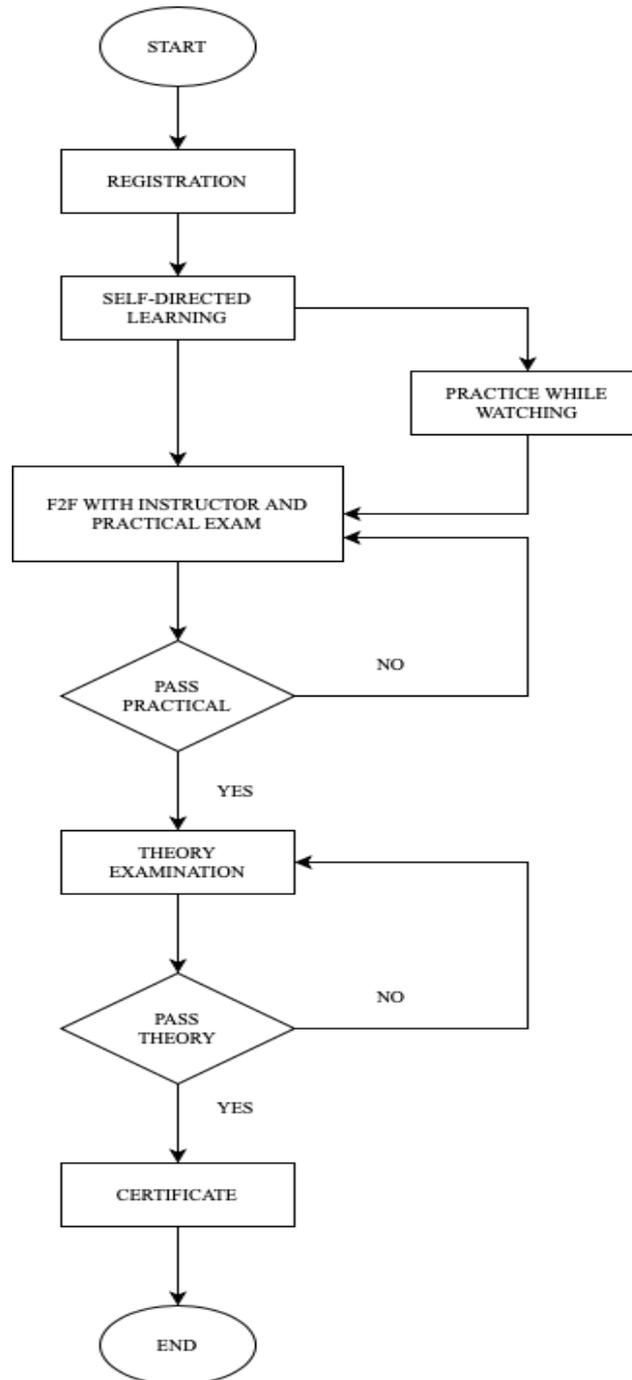
**Fig. 2** Flow process of hybrid BLS certification

(v) Website development

We collaborated with the Department of Infostructure of HASA to develop the hybrid BLS LMS. It was created to simplify the following elements: (i) teaching and learning experience, (ii) examination, (iii) course administration, and (iv) quality assurance. The development started with developers acquiring information from the faculty members about the requirements, technical feasibility, and other risks with regards to the mentioned elements.

For the first element, all digital content is accessible via a website hosted on the university server. It is designed to be viewed on a variety of devices, such as desktop computers, laptops, tablets, and mobile phones. The responsive design ensures a consistent and user-friendly experience across multiple

platforms, and user interaction with the website occurs via clicks, scrolls, and keyboard input. The website is accessible through common web browsers such as Safari, Google Chrome, Mozilla Firefox, and Microsoft Edge, and neither app stores nor installation are required. The second element of the system is an online examination system that enables efficient exam analysis. In the third element, the LMS interface was made intuitive for both administrators and participants. Administrators can administer all aspects of an online course, including user accounts, content creation, course scheduling, payment gateway, reporting, and analytics, through a centralized administration dashboard. In the meantime, the LMS provides participants with an intuitive enrollment process, integrates communication tools such as email notifications and helpdesk, and ensures compliance with data protection regulations. The final element is quality assurance. To ensure that the LMS is a reliable and effective platform for online education, the LMS is designed to be user-centric, undergoes comprehensive testing at various stages of development including unit testing, integration testing, system testing and acceptance testing before it undergoes tests for functionality, compatibility, performance, and usability. Reading material with more detailed explanation is also made available on the website.
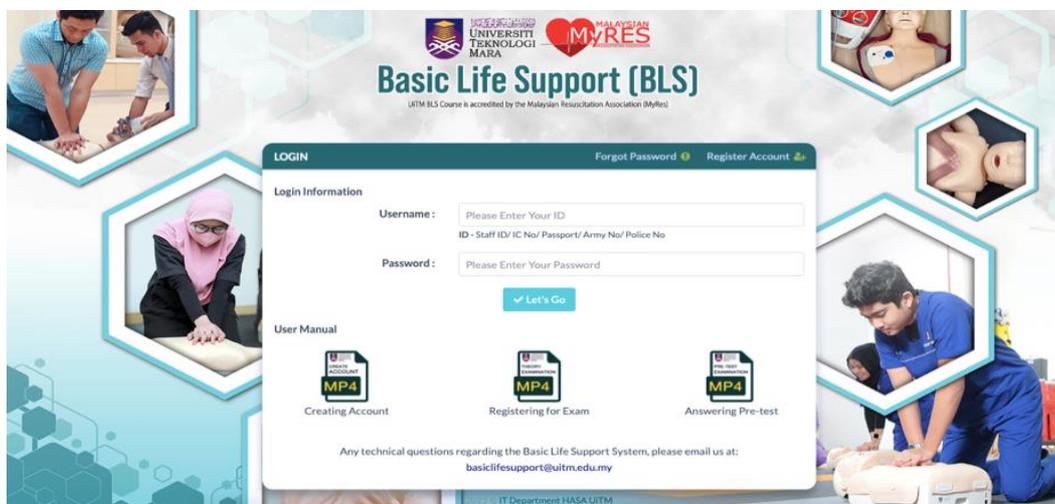
Fig. 3 The front page of the website features a login section, along with videos demonstrating the process of registration and use of the service.
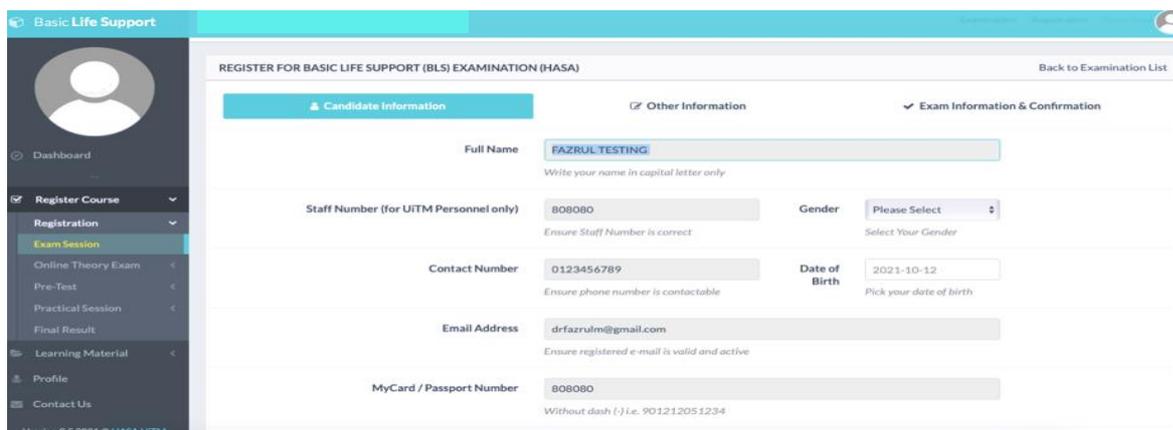
Fig. 4 The registration page to register for the course and the menu on the sidebar to navigate various features on the website.
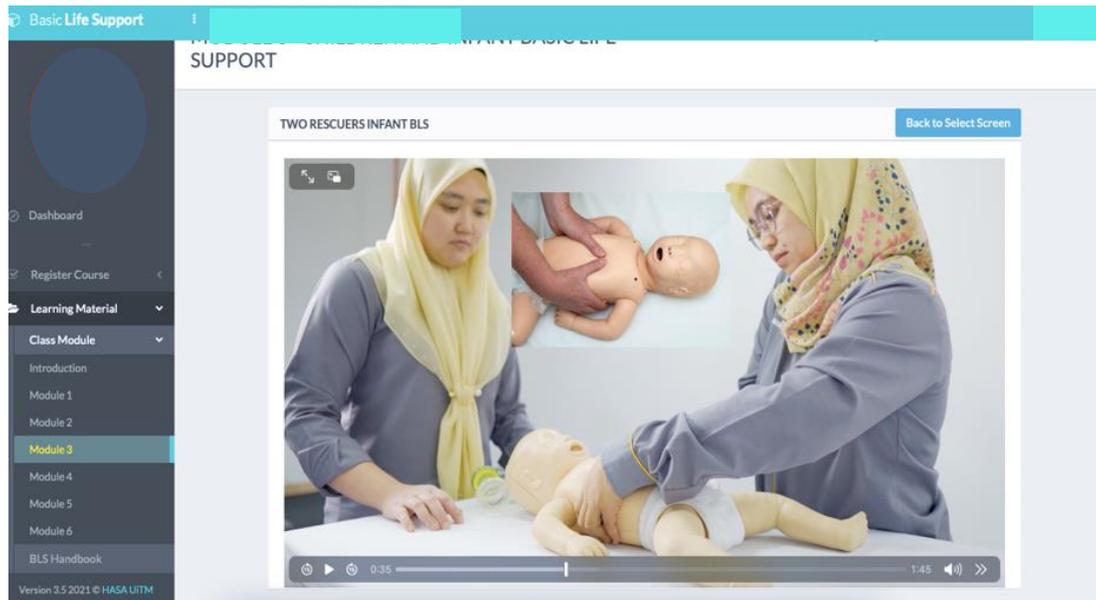
Fig. 5 The webpage that comprises instructional videos.

Phase 2. Training-the-Trainer and Usability Testing

Phase 2 of this project involved training the trainers and usability testing among the participants. Usability testing was conducted when the hybrid BLS courses were implemented at HASA. Usability checks the extent to which a product can be used by a specific user for a specific goal in a specific context or environment, and provides an effective, efficient, and satisfying experience (Bevan, 2001). It was conducted between January 2022 and December 2022.

(vi) Training-the-Trainer

To ensure comprehensive understanding and proficiency in the new BLS delivery format, two Training-the-Trainer sessions were conducted. These sessions were designed to equip BLS trainers with the requisite knowledge and skills for effective course delivery. BLS instructors were invited to participate, during which they were furnished with detailed insights into the course's framework and guidance on navigating the online platform. Additionally, they were provided with a comprehensive manual guidebook to serve as a reference tool including teaching script to ensure standardization of information. The second session encompassed a practical simulation exercise, wherein all trainers assumed the roles of participants. This exercise encompassed the entire process, commencing from website registration, progressing through the examination, and culminating in the receipt of certificates. Open channels for clarification and inquiries were actively encouraged, fostering an environment where trainers felt comfortable posing questions and voicing any concerns regarding the novel BLS format.

(vii) Usability Testing and Participant Feedback

Participants were required to provide feedback using the System Usability Questionnaire (SUS). The SUS was self-administered by participants. SUS is a widely used and standardized questionnaire for assessing the perceived usability of a system. It consists of 10 statements that users were asked to respond based on their experience. The score was calculated using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The sum of the points for the positively phrased statements i.e. odd-numbered questions are subtracted by 5 (X= Total odd – 5), and the sum of the points for the negatively phrased statements i.e. even-numbered questions was deducted from 25 (Y= 25 – total even). The SUS score was calculated by multiplying the sum of X and Y by 2.5 [SUS = (X+Y x 2.5)]. The scores obtained were assessed based on a predefined threshold of 68. A score above 68 indicates a

performance level considered as average, whereas a score below 68 is deemed subpar (Brooke, J.,1996, 2013).

Participants also wrote their feedback, which were analysed using thematic analysis framework, involving familiarity of the data, generating initial codes, and categorizing data into themes (Stemler, 2021), hence providing a comprehensive understanding of the participants' perspectives. NVivo12 (QSR Ltd) was utilised to assist with data management.

3.   Ethical consideration

The study did not require an ethical approval from the institutional research ethical committee as it involved analysis of secondary data from the BLS LMS registry.

4.   Results

Phase 1. Content Validity

There were 10 experts involved in the content validity and all were from critical care working areas. They have vast experience in BLS training ranging between five and 15 years for which halved were nurses while the others were doctors (see Table 1)

Table 1. Characteristics of content experts

No.	Highest academic qualification	No. of years working	No. of years involve in training BLS
1.	Masters in Science (Critical Care Nursing)	16	10
2.	Masters in Science (Critical Care Nursing)	18	12
3.	Post Basic Coronary Care Nursing	14	10
4.	Adv. Dip. Cardiovascular Nursing	14	10
5.	Adv. Dip. Cardiovascular Nursing	13	8
6.	Doctorate	14	5
7.	Doctorate	14	7
8	Doctorate	13	8
9.	Degree	10	5
10	Doctorate	22	15

Experts found that the videos produced were mostly adequate and relevant to the teaching of BLS except for video pairs no. (13, 14), (17, 18), and (20, 21) in which the I-CVI score was 0.4, 0.7 and 0.7 respectively. Videos 13 and 14 were on early steps for cardiac arrest in infants, videos 17 and 18 were on CPR techniques in infant and 2-rescuer infant BLS, while videos 20 and 21 were on about choking. Other comments received were: "*the flow is not like AHA recommendation,*"; "*need to act again to show the difference between "witnessed" vs "unwitnessed",*"; "*add a title to the scene to increase understanding,*"; and "*to provide an image of the Heimlich maneuver because the video lacked adequate zoom,*". Following the feedback provided by the expert panel, the instructional videos underwent revisions and subsequent assessment by the same panelists unanimously concluded that the information provided were sufficient with I-CVI was 1 for all video lessons.

Phase 2: Usability testing and participant feedback

Following a series of training sessions and enhancements, the hybrid BLS learning managent system became operational for BLS participants in January 2022. This milestone marked the initiation of the first BLS course that utilised the system. In the inaugural year, a cohort of 493 participants

engaged in the course, which encompassed a series of 28 sessions held over 10 months in the year 2022. The frequency of these f2f sessions normally ranged from 2 to 3 times each month, with adjustments made to accommodate fasting and festive months during which no sessions were scheduled. The maximum number of participants allowed in each session is restricted to 20 individuals, because of the limitations in the computer lab to conduct the theory exam. Additionally, the ratio of instructors to participants is maintained at one instructor to four participants.

After the completion of both practical and theory examinations during each session, participants were required to provide feedback on the course, which includes the SUS questionnaire. Table 3 shows the characteristics of the participants in 2022. Out of 493 respondents, the majority (92.3%, n=455), gave a good usability score of >68, with a mean score of 84.9 ± 16.5.

Table 3. Characteristics of hybrid BLS Course participants from January 2022 until December 2022

Characteristics	n=493
Age (years) (mean, ±SD)	29.2 ±6.3
Gender (n,%)	
Male	85 (17.2)
Female	408 (82.8)
Ethnicity (n,%)	
Malay / Bumiputra	493 (100.0)
Non-Malay / Non-bumiputra	0
Occupation (n,%)	
Doctor/Dentist	47 (9.5)
Assistant Medical Officer/Nurse	280 (56.8)
Allied Health Personnel	64 (13.0)
Student	64 (13.0)
Public	38 (7.7)
Prior experience with first aid training (n,%)	
Yes	266 (54.0)
No	227 (46.0)
Prior experience with BLS (n,%)	
Yes	214 (43.4)
No	279 (56.6)
Overall results for BLS (n,%)	
Pass	336 (68.2)
Fail	157 (31.8)

As for the thematic analysis, participants consistently highlighted the user-friendly interface, emphasizing the ease of navigation and accessibility of learning materials, content effectiveness and satisfaction with the clarity of information. The hybrid style was helpful because it allowed learners to set their own pace for learning and the f2f sessions were useful for clearing up any confusion. A subset of participants also reported encountering technical issues such as video buffering and login difficulties, which impacted the overall learning experience.

5. Discussions

The advent of the COVID-19 pandemic has steered a transformative epoch in the progression of e-learning platforms, necessitating a comprehensive expansion of Basic Life Support (BLS)

education through this medium to effectively address challenges that were prevalent in the pre-pandemic era (Gong et al., 2021; Naylor & Torres, 2021). Since the adoption of this novel methodology, UiTM has demonstrated a substantial increase in participation, with a noteworthy rise from 493 in 2022 to 802 in the year 2023. This compelling shift in the educational paradigm underscores the efficacy and adaptability of the hybrid BLS course, thus presenting a significant contribution to the evolution of medical education. The conventional approach, which involves longer hours of instructor-led sessions, was associated with significant costs and resource requirements. A cost analysis performed in Spain demonstrated savings up to €9000 after the BLS hybrid course was held in the second year (Castillo et al., 2019).

The implementation of a hybrid BLS learning management system also represents a pivotal contribution to the Quintuple Helix model, fostering collaboration among government, industry, academia, civil society, and individuals. By offering a dynamic platform for BLS education, the university plays a key role in knowledge transfer to the broader regional knowledge ecosystem. This not only enhances regional innovation and commercialization opportunities but also aligns with the academic institution's commitment to societal impact. The online platform does not only empower individuals with essential skills but also contributes to public health literacy. Furthermore, the adoption of this innovative approach positions the university as a hub for cutting-edge educational technology, promoting academic innovation in the digital era. Meanwhile, from an economic standpoint, the university benefits by expanding its professional certification courses, generating potential revenue streams.

"Knowledge and skill retention" in life support courses has been a longstanding concern, and it is crucial to address this issue effectively to ensure that individuals can confidently and competently perform life-saving interventions in critical situations. Research has shown that the skills acquired during life support training have a relatively short half-life (Connolly et al., 2007; Plotnikoff & Moore, 1989). Without regular practice and reinforcement, individuals may quickly forget how to perform CPR, use an AED, or respond to choking incidents. The current recommendation of two-yearly recertification programs for BLS only ensures that individuals receive updated training, but it does not guarantee that they will retain the skills until the next renewal. Hybrid BLS approach offers a potential solution to this problem (Jang et al., 2021; Saidu et al., 2023). Participants can consistently access learning materials via online platforms and engage in skill practice from the comfort of their homes. With the positive SUS score from over 90% of our platform users, it turns out that our platform can be used as a suitable medium for this purpose. Moreover, our skills lab provides hands-on training with manikins, offering direct feedback and enabling participants to practice independently without the need for formal BLS course enrollment. This approach opens the possibility of exploring a continuous CPR learning certification program, potentially eliminating the need for BLS recertification every two years, leading to long-term cost savings.

As we strive to embrace innovative educational technologies, it is essential to recognize the influence of individual learning preferences, cultural backgrounds, and potentially even generational learning tendencies on our ability to achieve desired learning outcomes. Most participants in our hybrid BLS fall within the 'young' age category, which enhances the method's effectiveness, as they tend to smoothly navigate the web application. However, f2f sessions with an instructor remain essential to the course's success. While certain aspects of resuscitation training, such as the acquisition of factual knowledge, were effectively delivered through didactic teaching videos, 'higher-level' skills and decision-making proficiency were best enhanced through in-person instruction featuring live demonstrations. These sessions provide an invaluable opportunity for instructors to clarify any misconceptions related to the BLS concept. It is noteworthy that, despite a substantial proportion of our participants being HCP with previous BLS training, the theory examination failure rate remains moderate. However, the absence of failures in the practical assessment indicates their ability to perform the steps correctly. This challenge may be partially attributed to the fact that the medium of instruction and examination questions were in English, whereas nearly 100% of our participants are Malay speakers with Malay as their mother tongue. Language can indeed present a considerable barrier to the effective teaching and learning process, especially when there is a disparity between the language of instruction and the learners' native language or proficiency (Jónsdóttir et al., 2023; Sawir, 2005).

Expanding and sustaining this hybrid BLS learning management system is a commendable endeavor. To ensure its growth and long-term success, market analysis needs to be conducted to identify

demand for the hybrid BLS program in different regions or sectors, including considering expanding the platform's reach by translating content into different languages. The business model needs to be given attention by considering different revenue streams such as licensing, institutional partnerships, course fees, and subscription-based models. Quality assurance mechanisms must be continued to ensure accuracy and effectiveness of the training materials including receiving accreditation from governing bodies such as the Malaysian Resuscitation Association.

6. Conclusion

Educational institutions are increasingly adopting distance learning because of the rapid progress in web-based technologies. The use of hybrid learning methods in the BLS curriculum greatly increases the overall learning experience for students. This not only results in long-term cost reductions but also enhances course administration and material delivery to achieve more efficiency. Additional research is warranted to investigate the usefulness and effectiveness of hybrid BLS in a broader population, including non-healthcare professionals or students.

7. Co-author contribution

The authors have declared no conflict of interest related to this article. M.F. Mokhtar conducted the fieldwork, developed the research methodology, and oversaw the writing of the entire manuscript. S Abdul-Razak assisted in the research conceptualization, performed the statistical analysis and enhanced the article's write up. Both authors collaborated on the interpretation of the results.

8. Acknowledgement

9. References

Azahedi, S. (2021, Juli 22). *The magnitude of Covid-19 is staggering...* NST Online. https://www.nst.com.my/news/nation/2021/07/710512/magnitude-covid-19-staggering

Bevan, N. (2001). International standards for HCI and usability. *International Journal of Human-Computer Studies*, *55*(4), 533–552. https://doi.org/10.1006/ijhc.2001.0483

Castillo, J., Gomar, C., Rodriguez, E., Trapero, M., & Gallart, A. (2019). Cost minimization analysis for basic life support. *Resuscitation*, *134*, 127–132. https://doi.org/10.1016/j.resuscitation.2018.11.008

Connolly, M., Toner, P., Connolly, D., & McCluskey, D. R. (2007). The «ABC for life» programme—Teaching basic life support in schools. *Resuscitation*, *72*(2), 270–279. https://doi.org/10.1016/j.resuscitation.2006.06.031

Gong, J., Ruan, M., Yang, W., Peng, M., Wang, Z., Ouyang, L., & Yang, G. (2021). Application of blended learning approach in clinical skills to stimulate active learning attitudes and improve clinical practice among medical students. *PeerJ*, *9*, e11690. https://doi.org/10.7717/peerj.11690

Jang, K., Kim, S. H., Oh, J. Y., & Mun, J. Y. (2021). Effectiveness of self-re-learning using video recordings of advanced life support on nursing students' knowledge, self-efficacy, and skills performance. *BMC Nursing*, *20*(1), 52. https://doi.org/10.1186/s12912-021-00573-8

Jónsdóttir, A. A., Kang, Z., Sun, T., Mandal, S., & Kim, J.-E. (2023). The Effects of Language Barriers and Time Constraints on Online Learning Performance: An Eye-Tracking Study. *Human Factors*, *65*(5), 779–791. https://doi.org/10.1177/00187208211010949

Keengwe, J., Onchwari, G., & Wachira, P. (2008). The Use of Computer Tools to Support Meaningful Learning. *AACE Review (Formerly AACE Journal)*, *16*(1), 77–92. https://www.learntechlib.org/primary/p/23647/

Liu, Q., Peng, W., Zhang, F., Hu, R., Li, Y., & Yan, W. (2016). The Effectiveness of Blended Learning in Health Professions: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research*, *18*(1), e4807. https://doi.org/10.2196/jmir.4807

Lynn, M. R. (1986). Determination and Quantification Of Content Validity: *Nursing Research*, *35*(6), 382–386. https://doi.org/10.1097/00006199-198611000-00017

McMillan, S. S., King, M., & Tully, M. P. (2016). How to use the nominal group and Delphi techniques. *International Journal of Clinical Pharmacy*, *38*, 655–662. https://doi.org/10.1007/s11096-016-0257-x

Ministry of Health Malaysia. (2017). Basic Life Support Training Manual 1st Edition.

Naidoo, M. (2023). The pearls and pitfalls of setting high-quality multiple choice questions for clinical medicine. *South African Family Practice*, *65*(1), 5726. https://doi.org/10.4102/safp.v65i1.5726

Naylor, K., & Torres, K. (2021). Transitioning to Web-Based Learning in Basic Life Support Training During the COVID-19 Pandemic to Battle the Fear of Out-of-Hospital Cardiac Arrest: Presentation of Novel Methods. *Journal of Medical Internet Research*, *23*(5), e27108. https://doi.org/10.2196/27108

Nolan, J. P., Monsieurs, K. G., Bossaert, L., Böttiger, B. W., Greif, R., Lott, C., Madar, J., Olasveengen, T. M., Roehr, C. C., Semeraro, F., Soar, J., Van de Voorde, P., Zideman, D. A., & Perkins, G. D. (2020). European Resuscitation Council COVID-19 guidelines executive summary. *Resuscitation*, *153*, 45–55. https://doi.org/10.1016/j.resuscitation.2020.06.001

Plotnikoff, R., & Moore, P. J. (1989). Retention of cardiopulmonary resuscitation knowledge and skills by 11- and 12-year-old children. *The Medical Journal of Australia*, *150*(6), 296, 298–299, 302. https://doi.org/10.5694/j.1326-5377.1989.tb136488.x

Saidu, A., Lee, K., Ismail, I., Arulogun, O., & Lim, P. Y. (2023). Effectiveness of video self-instruction training on cardiopulmonary resuscitation retention of knowledge and skills among nurses in north-western Nigeria. *Frontiers in Public Health*, *11*. https://www.frontiersin.org/articles/10.3389/fpubh.2023.1124270

Sawir, E. (2005). Language Difficulties of International Students in Australia: The Effects of Prior Learning Experience. *International Education Journal*, *6*(5), 567–580. https://eric.ed.gov/?id=EJ855010

Stemler, S. (2021). *An overview of content analysis, Practical Assessment, Research, and Evaluation*. *7*(17). https://doi.org/10.7275/Z6FM-2E34

Tang, K. H. D. (2022). Movement control as an effective measure against Covid-19 spread in Malaysia: An overview. *Zeitschrift Fur Gesundheitswissenschaften*, *30*(3), 583–586. https://doi.org/10.1007/s10389-020-01316-w

Yusoff, M. S. B. (2019). ABC of Content Validation and Content Validity Index Calculation. *Education in Medicine Journal*, *11*, 49–54. https://doi.org/10.21315/eimj2019.11.2.6