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The Effectiveness of Public Health Education via Online Training during Pandemic COVID-19: Evident from Malaysia

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Abstract

Online learning has been used as online training to deliver public health education among the society especially during the pandemic COVID-19; however, its effectiveness has not yet been researched. Hence, this research aimed to determine the effectiveness of public health education via online training; in which, an online training aimed to change participants' learning towards beauty and health care routine among 77 Malaysian societies was organized. Findings indicated a significant difference of learning perception among respondents as measured in pre- and post-evaluation across demographic variables including gender, age, income level and employment status. Hence, public health practitioners should organize online training as an alternative to decrease the cost of public health education but at the same time to increase its effectiveness.

Keywords: Public Health Education, Online Learning, Online Training, Training Effectiveness, Pandemic COVID-19, Human Development, Malaysia

Introduction

A large number of researchers reported that public health's educational program is valuable to society although it could be expensive (Bartlett, 1995; Hahn & Truman, 2015; Shapu et al., 2022). Hence, it is a challenge to decrease the cost of public health's educational program but at the same time to increase its effectiveness (Nutbeam, 2000; Ahmad & Hasan, 2016; Yeager et al., 2022). Fortunately, online learning was used to deliver educational programs with the capability to include a large number of participants without distance's barrier and with minimal cost as compared to face-to-face or classroom learning (Bartlett & Golek, 2004;

Shahrill et al., 2021). Therefore, some public health practitioners have been using online learning as online training (Aryal et al., 2019; Silvaggi et al., 2019; Trifunovic-Koenig et al., 2022).

However, applying online learning as online training is not the same because there are some differences in learning and training programs (Aziz, 2018; Noe, 2019); in which, as compared to training, learning programs are delivered without specific time frame, the scope of learning contents are not specific, and the learning content is not expected to be practiced after learning completion (Noe, 2019; Aziz et al., 2022). Hence, it raises the question whether the public health's educational programs can be effective if delivered via online training. Therefore, the purpose of the current research is to determine the effectiveness of public health's education via online training during the pandemic COVID-19 based on participants' learning perception among Malaysian society.

Literature Review

According to Hadlaczky et al (2014), public health's educational programs effectiveness should be evaluated by measuring the cognitive (knowledge), skill (behaviour) and attitude (affective) acquired by participants. This is also consistent with Kraiger's et al (1993) model of training evaluation; in which, the model explains that training effectiveness can be evaluated by determining the learning performance that can increase participants' knowledge, skills, and affective. Therefore, the perception of public health's educational effectiveness via online training should be measured using the knowledge, skill, and attitude learned during training. Further, several researchers, including Talati et al (2018); Moreno-Rodriguez et al (2021); McKay et al (2022) have evaluated online training effectiveness using scores of learning perception by comparing the pre- and post-evaluation; in which, their findings indicated that online training was effective when there was a significant increase of learning between pre- and post-training evaluation. This is consistent with Kirkpatrick (1996); Kraiger et al (1993) suggestion to evaluate training effectiveness by comparing the pre- and post-training evaluation. These have demonstrated that the public health's online training can be evaluated by comparing participants' learning perception in the pre- and post-training evaluation. Therefore, Hypothesis alternative 1 is constructed as follow

There is a significant difference in learning scores as perceived by participants before and after the completion of public health's online training at 0.05 level of significance.

Furthermore, it is important to confirm that public health's online training can be effective across various demographic variables, including gender, age, family's income level and employment status because previous researchers have inconsistent findings about the effect of these demographic variables on training effectiveness. For example, McKay et al (2022) found that a public health's educational program through online training among the Australian parents that play role as caregiver for adolescent under 25 years old suffering suicidal thoughts was effective across different gender, age, and employment status; Trifunovic-Koenig et al (2022) also found insignificant different among gender, age, and employment status when investigating the effectiveness of online training among health care workers in German.

However, Manoharan et al (2022) found that aged participants had better learning outcomes among adult learners in classroom settings. Additionally, Moreno-Rodriguez et al (2022) found that age could affect online training effectiveness aimed to train undergraduates about

people with disability and their needs for help; in which, the increase in age will increase the level of training effectiveness. Meanwhile, Tran et al (2020) found significant differences among gender and age groups that affect the effectiveness of health information dissemination through online sources in Vietnam. Moreover, Truitt (2011) found that employees' employment status affect classroom training effectiveness among the society in three American states; in which, the parttime and contract employees have less interest in training effectiveness.

In addition, some researchers found that family's income level differences among training participants affect training effectiveness; in which, Wagner et al (2002) found that participants with a very low-income family had more positive effects in a community training named Parents as Teachers Program. However, Tharenou (2001) found that income level among employees will not affect classroom training effectiveness among Australians in the private and public sector. Hence, several demographic variables including age, gender, employment status, and family's income level should be investigated further in online training involving public health among the society. If there is a significant difference among various demographic variables, some consideration should be made to organize the public health's online training. Therefore, alternative Hypothesis 2 is constructed as follow

There is no significant difference of learning perception and behavioural changes among different groups of gender, age, employment status, and family's income level among participants in the public health's online training at 0.05 level of significance.

Methodology

To test research hypotheses and achieve the research objective, an open registration for online training named Beauty and Health Care Webinar (BHCW) organized in December 2020 was taken for a sample. Participants involved in the online training were mandated to answer a set of questionnaires for both before and after the completion of training via Google Form. Participants' learning perceptions were evaluated using surveys to determine the online training effectiveness.

The BHCW online training was organized free of charge and was advertised through Facebook and social media. The online training program was handled by a secretariat consisting of undergraduate students registered for SKPM2093 subject (Training Management and Behaviour Modification) with supervision by lecturer. The BHCW online training was also delivered in Malay language, registered as student's formal activity in The National University of Malaysia (Universiti Kebangsaan Malaysia/UKM) system named i-star with code C-SKPM2093-2020-129, organized in one day, invited related speakers within subject matter expert, and structured with public health's educational objectives. The program was attended by 77 participants from various backgrounds of Malaysian citizens based on voluntary participation.

Three speakers were invited including a Dietitian from the UKM Hospital with specialization in Dietary, a University Lecturer with specialization in Human Development, and a Malaysian social media influencer with a bachelor's degree holder. Although the name of BHCW has two terms including beauty and health; however, the contents to achieve these two terms are the same, such as healthy diet, exercise, and positive thinking. The training content was also checked by an expert in the field of Public Health. Beside general speech by speakers, other activities were also included in the online training; these include open discussion, answering quiz via Kahoot application by rewarding those participants with highest scores achievement,

video sharing for beauty care routine, and providing participants with training content using Google link.

The effectiveness of BHCW online training in achieving its objective was evaluated using participants' learning perception towards beauty and health care routine. The instrument used to evaluate training effectiveness was adapted from General Training Effectiveness Scale (GTES) by Aziz (2015); in which, GTES has sufficient level of content validity and construct validity. To evaluate learning performance, the GTES was adapted into 15 items of questionnaire; in which, item number 1 to 5 represent knowledge acquisition, item number 6 to 10 represent skills acquisition, and item number 11 to 15 represent attitudinal acquisition. The same questionnaire was given to be answered by participants before (pre-training evaluation) and right after the completion (post-training evaluation) of BHCW's online training. This is consistent with Kirkpatrick's (1996) suggestion that a comparison between pre- and post-training score should be used to determine training effectiveness.

The questionnaires were constructed into positive items, using Malay language, and attached as Google forms that can be accessed by participants. Participants also need to determine their own perception as perceived before and after the completion of the online training. Participants need to answer the questionnaire based on 10 continuous scales; in which, scale 1 represents strongly disagreed, and scale 10 represents strongly agreed. An Alpha Cronbach reliability analysis for questionnaire used in this research indicated a good internal consistency for the 77 participants. The Alpha Cronbach value for 15 items measuring learning performance was $\alpha = 0.954$; the questionnaire items can be referred to Table 1.

The research was conducted in accordance with the Declaration of Helsinki. Participants that have agreed to join the online training based on voluntary participation were given a Google form link to give their consent. Next, participants were given a link to participate in the online training. Participants were also given the link to answer questionnaires at the time before training, right after training completion, and one month after training completion. To remain anonymous, participants need to give any email address for their questionnaire; this email address was then used to pair the pre- and post-evaluation answers.

To analyse data, SPSS (Statistical Package for Social Sciences) version 26 was used. A paired sample t-test was analysed to test hypothesis 1. Additionally, an independent sample t-test and one-way ANOVA was used to test hypothesis 2. All tests were tested at 0.05 level of significance.

Table 1

Questionnaire items measuring learning perception.

Num.	English Version	Malay Version
1.	I know what beauty and health care routine is.	<i>Saya tahu tentang rutin penjagaan kesihatan dan kecantikan.</i>
2.	I know the technique for beauty and health care routine.	<i>Saya tahu teknik rutin penjagaan kesihatan dan kecantikan.</i>
3.	I know the steps in beauty and health care routine.	<i>Saya tahu langkah-langkah dalam rutin penjagaan kesihatan dan kecantikan.</i>
4.	I am knowledgeable about beauty and health care routine.	<i>Saya arif dalam rutin penjagaan kesihatan dan kecantikan.</i>
5.	I can list down all the important things about beauty and health care routine.	<i>Saya boleh menyenaraikan semua perkara penting tentang rutin penjagaan kesihatan dan kecantikan.</i>
6.	I have skills for beauty and health care routine.	<i>Saya berkemahiran dalam rutin penjagaan kesihatan dan kecantikan.</i>
7.	I have skill to draft beauty and health care routine's schedule.	<i>Saya berkemahiran untuk merangka jadual rutin penjagaan kesihatan dan kecantikan.</i>
8.	I am able to plan beauty and health care strategies.	<i>Saya berupaya merancang strategi penjagaan kesihatan dan kecantikan.</i>
9.	I am able to prepare balanced diet for my own beauty and health care routine.	<i>Saya mampu menyediakan diet seimbang bagi rutin penjagaan kesihatan dan kecantikan diri saya.</i>
10.	I can differentiate the dos and don'ts of beauty and health care routine.	<i>Saya boleh membezakan perkara yang boleh dan tidak boleh dilakukan bagi rutin penjagaan kesihatan dan kecantikan.</i>
11.	I understand how to take care of my own beauty and health.	<i>Saya faham bagaimana untuk menjaga kesihatan dan kecantikan diri.</i>
12.	It is important for me to take care of my own beauty and health.	<i>Penting bagi saya untuk menjaga kesihatan dan kecantikan diri.</i>
13.	I am thinking on how to take care of my own beauty and health better.	<i>Saya memikirkan bagaimana untuk menjaga kesihatan dan kecantikan diri dengan lebih baik.</i>
14.	I realize the negative effect of not taking care of my own beauty and health.	<i>Saya sedar kesan negatif tidak menjaga kesihatan dan kecantikan diri.</i>
15.	I always prioritize beauty and health care for myself.	<i>Saya selalu mengutamakan penjagaan kesihatan dan kecantikan diri sendiri.</i>

Findings and Discussion

A paired sample t-test was done to compare learning performance perceived by participants attending the BHCW online training. Table 2 to 3 present the results of paired sample t-tests for learning perception; findings indicated a significant difference between the mean scores of participants' learning as perceived in pre- and post-evaluation of online training demonstrating a significant increase in learning performance among participants.

Table 2

Paired sample statistics for learning perception as measured in pre- and post-evaluation of BHCW online training.

	Evaluation	Mean	N	Standard Deviation	Standard Deviation Error
Pair 1	Post	9.0918	77	0.82420	0.09393
	Pre	5.1160	77	1.96497	0.22393

Table 3

Paired sample tests for learning perception as measured in pre- and post-evaluation of BHCW online training.

	Evaluation	Mean	Standard Deviation	Standard Error Mean	95% Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Post Pre	3.97576	1.98420	0.22612	3.52540	4.42612	17.582	76	.000

There was significant improvement in post-evaluation (M = 9.0918, SD = 0.82420) as compared to pre-evaluation of BHCW online training (M = 5.1160, SD = 1.96497) with the change of $t(76) = 17.582, p < 0.000$ (two-way). The increase in mean scores was 3.97576 with 95% confidence interval for the difference between 3.52540 and 4.42612. Cohen (1988, pp. 284–287) and Pallant (2020) have suggested to determine effect size using a given formula; in which, using the formula, the eta-squared statistic showed a large effect size (0.80266). Meanwhile, Figure 1 clearly shows the increase of mean scores for learning perception as evaluated in pre- and post-evaluation. Hence, hypothesis 1 is fully supported. Hence, the BHCW online training was effective to increase participants’ learning performance.

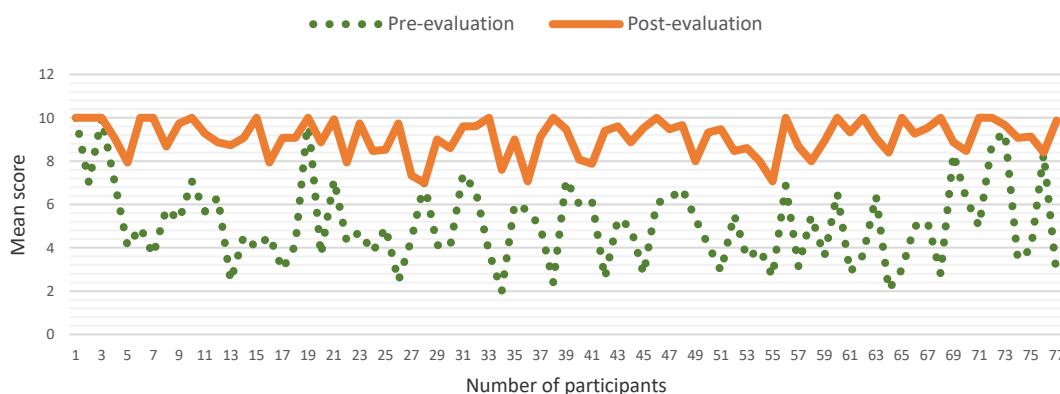


Figure 1. Mean score for learning performance as measured in pre- and post-evaluation of BHCW online training.

Findings are consistent with previous research that found public health’s educational programs to the society were effective to increase learning performance among participants attending classroom training including those by (Campbell et al., 1998; Hadlaczky et al., 2014; Soe et al., 2018). Findings are also consistent with previous research that found public health’s educational programs were effective to increase learning performance among participants attending online training in specific samples including those by (Moreno-Rodriguez et al.,

2021; McKay et al., 2022; Talati et al., 2022). Findings are consistent with Kraiger's et al (1993) model of training evaluation that suggests participants acquire knowledge (cognitive), skill, and attitude (affective) outcomes during training programs because of training effectiveness; in which, it is demonstrated that online training to deliver the public health's educational programs can also provide suitable cognitive, skill, and affective outcomes to the society. However, the difference between current and previous research is that the current research used a sample of online training with participants from the general society that compose of various demographic backgrounds. Hence, the current research findings contribute to the field of Public Health by confirming that online training is effective to increase learning performance among the society with various demographic backgrounds.

On the other hand, Table 4 presents the frequency and percentage of participants' demographic backgrounds including gender, age, family's income level, and employment status with a total 77 participants (100%). Majority participants were female (84.4%) and were born as generation Z (97.4%). Females might be more interested because the objective of BHCW online training was related to beauty and health care routine and more relevant to them. Meanwhile, according to Cilliers (2017); Bhutto et al (2022), generation Z are individuals that were born between 1995 and 2010, and generation Y were born between 1982 and 1994; in which, the generation Z were born and raised during the access of internet and social media. Hence, it can be seen that the majority of generation Z are interested in online training as compared to generation Y because they might be more comfortable with online activities.

Further, participants' family's income level was categorized into three groups: the B40, M40 and T20. This is in line with categorization made by the Malaysian government as reported by the Department of Statistics (2020); in which, the B40 is referred to those with monthly household income at bottom 40% or in low-income earners category with less than RM4850, the M40 is referred to those with monthly income at medium 40% or in average-income earners category with income between RM4850 and RM10959, and the T20 is referred to those with monthly income at top 20% or in high-income earners category with income more than RM10959 (Department of Statistics Malaysia, 2020). The majority of participants were in the T20 category (49.4%), followed by M40 (27.3%) and B40 (23.4%) revealing that those that come from families with higher income levels were more interested in the BHCW online training. This might be explained by the capability of those with higher income to have appropriate gadgets to be involved in online training (Agarwal et al., 2021; Baticulon et al., 2021). Furthermore, for employment status, most respondents were students (75.3%), followed by entrepreneur (9.1%), teacher (5.2%), clerk (3.9%), promoter (2.6%), dispatch rider (2.6%), and factory operator (1.3%). This might be explained by their flexible time to attend the BHCW online training, in which students and entrepreneurs had more flexible time as compared to other professions with fixed working hours.

Table 4

The frequency and percentage of participants' demographic background

Num.	Demographic	Category	Frequency	Percentage (%)
1.	Gender	Male	12	15.6
		Female	65	84.4
2.	Age	Generation z	75	97.4
		Generation y (Millennials)	2	2.6
3.	Family's Income Level	B40	18	23.4
		M40	21	27.3
		T20	38	49.4
4.	Employment Status	Student	58	75.3
		Entrepreneur	7	9.1
		Clerk	3	3.9
		Promoter	2	2.6
		Teacher	4	5.2
		Dispatch rider	2	2.6
		Factory operator	1	1.3

In addition, Table 5 shows an independent sample t-test to determine the differences in participants' gender and age groups using post-evaluation of learning perception. For gender groups, results indicated insignificant mean differences for females and males with the difference of $t(75) = -0.392$, $p=0.696$ (two-way) for learning perception. Findings are consistent with research by McKay et al (2022) that used samples among the Australian parents, and Trifunovic-Koenig et al (2022) that used samples among the health care workers in Germany in online training. However, findings are not consistent with Tran et al (2020) that found significant differences among gender that affect the effectiveness of health information dissemination through online sources in Vietnam. The inconsistent findings might be explained by the gender's equality in those countries; in which, different genders are treated equally in some countries including Australia, Germany and Malaysia that affected the balance of knowledge acquisition in these countries. Hence, participants have the same ability to learn in online training. However, gender inequality exists in Vietnam either in social status, education, and income level Phan & Coxhead (2013); Nguyen & Simkin (2017); Vo et al (2021); hence, training was more effective among male participants in Vietnam because of unbalanced knowledge acquisition among different genders.

Table 5

Independent Samples t-test for Gender and Age Groups

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	Lower	Upper
Independent Samples t-test Results for Gender Group											
Learning perception	Equal variances assumed	3.724	.057	-.392	75	.696	-.10214	.26041		-.62090	.41663
	Equal variances not assumed				21.053	.615	-.10214	.19999		-.51797	.31370
Independent Samples t-test Results for Age Group											
Learning perception	Equal variances assumed	.099	.754	-.591	75	.556	-.35067	.59306		-1.53210	.83077
	Equal variances not assumed				-.610	1.058	.647	-.35067	.57468		-6.77480

Additionally, for age groups, results also indicated insignificant mean differences for generation Z and generation Y with the difference of $t(75) = -0.591$, $p = 0.556$ (two-way) for learning perception. Findings are significant with some of previous researchers that concluded online training as effective across age groups in providing participants with learned knowledge, skills, and attitude. For example, research by McKay et al (2022) that used sample of parents in online training related to caregiver roles for adolescent with suicidal thoughts, and Trifunovic-Koenig et al (2022) that used sample of young workers in online training related to occupational safety and health. However, findings are not consistent with Manoharan et al (2022) that used sample among the Malaysian undergraduates attended courses related to English language, and Moreno-Rodriguez et al (2021) that used sample among undergraduates attend online training related to the needs of people with disability. The inconsistent findings demonstrated that age would affect training effectiveness when the training context itself is difficult to understand and needs more knowledge and experiences related to the training context (Wickens et al, 2013; Hughes et al., 2013). Perhaps the context of online training in the current research was not difficult for participants' available knowledge and experience to learn; however, the training context in Manoharan's et al (2022) research was difficult to understand among participants with younger age. Meanwhile, for the training context in Moreno-Rodriguez et al (2021) research, participants with younger age need experience to be more empathetic in understanding the training context related to disabled persons.

Furthermore, Table 6 shows one-way ANOVA to determine the differences in participant's family's income level and employment status using post-evaluation of learning perception. For the family's income level, results indicated an insignificant mean difference in learning perception for three categories including those from B40, M40 and T20 with the difference of $F(76) = 0.453$, $p = 0.638$ (two-way). Findings are consistent with some research findings, such as by Tharenou (2001) that used samples among Australian employees in classroom training; however, findings are not consistent with Wagner et al (2002) that used samples among

American parents in classroom training. Perhaps the inconsistent findings might be explained by the value of the training to participants; in which, participants that perceived the training as valuable because of the training price will appreciate the training and learn more from the training (Suzuki et al., 2014). In Wagner's et al (2002) research, participants attended the training as compulsory with certain fees; however, those with low-income level value the training more because they were helped in paying part of the fees. However, in the current research, as well as in Tharenou's (2001) research, participants were aware that they attended the training without paying any fees; hence, there was no significant difference in the family's income level. Interestingly, some researchers, such as Dhawan (2014) found that not only training price can make participants appreciate the training, but interesting training characteristics will also affect participants' appreciation to learn and improve training effectiveness; this is supported by Mohtar and Yunus (2022) as well as Basar et al. (2021) that highlighted the importance of training characteristics to support online learning effectiveness.

Table 6

One-way ANOVA Results for Differences in Family's Income Level and Employment Status

		Sum Squares	of df	Mean Square	F	Sig.
One-way ANOVA Results for Family's Income Level						
Learning perception	Between Groups	.624	2	.312	.453	.638
	Within Groups	51.003	74	.689		
	Total	51.627	76			
One-way ANOVA Results for Differences in Employment Status						
Learning perception	Between Groups	2.732	6	.455	.652	.688
	Within Groups	48.895	70	.698		
	Total	51.627	76			

Additionally, for employment status, results also indicated insignificant mean difference for six different professions including students, entrepreneur, teacher, clerk, promoter, dispatch rider, and factory operator with the difference of $F(76) = 0.453$, $p=0.638$ (two-way) for learning perception, and $F(76) = 1.265$, $p=0.285$ (two-way) for behavioral changes. Findings are consistent with research findings by McKay et al (2022); Trifunovic-Koenig et al (2022) that used sample of online training, but not consistent with research findings by Truitt (2011) that found the part-time and contract employees have less interest in classroom training effectiveness in three American states. The inconsistent findings might be explained by the training relevancy; in which, the relevance of training context among participants will affect training effectiveness (Aziz et al., 2021; Mohamad et al., 2020). In Truitt's (2011) research the part-time and contract employees were not interested in learning the training because their professions were only part-time and contract; in which, they were already determined to find another permanent job profession. However, in the current research, as well in research by McKay et al (2022); Trifunovic-Koenig et al (2022), the training objective and content were

relevant to participants regardless their job profession; hence, there was no significant differences of employment status in training effectiveness among participants.

Therefore, it can be concluded that there were no significant differences of demographic variables including age, gender, employment status, and family's income among participants who attended online training related to the public health's educational program. Hence, hypothesis Ha2 was fully supported.

Conclusion

The aim of this research was to determine the effectiveness of public health's education via online training during the pandemic COVID-19 using among Malaysian society. Following Kraiger's et al (1993) model of training evaluation, an open registration for online training named Beauty and Health Care Webinar (BHCW) was organized in December 2020; in which, 77 Malaysian societies that attended the online training were taken as sample. Participants' learning perception was measured in pre- and post-evaluation to evaluate learning performance using instruments adapted from GTES by (Aziz, 2015). Findings indicated that the public health online training was effective to increase learning performance across various demographic variables including age, gender, employment status, and family's income. These have demonstrated the effectiveness of online training as a powerful tool to deliver the public health's educational programs. Therefore, online training is recommended to be prioritized among public health practitioners including the government, policy makers and public health specialists as an ultimate medium to deliver the public health's educational programs to the society because it can save cost, is more convenient, timeless, flexible, and can include a large number of participants without distance' barrier.

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