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Effectiveness of A Web-Based Course on Vaccination Competence in Higher Education: The Eduvac Erasmus+ Project

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Abstract

Immunization is a highly cost-effective investment in health, proven to be an effective tool in controlling and eliminating dangerous infectious diseases. Health science students require evidence-based knowledge to tackle challenges in healthcare, particularly in the field of vaccination.

The aim of the current study is to asses students' knowledge on vaccinations and further explore their feedback after attending Educating Vaccination Competence web-based course (EDUVAC web-based course).

Students from five Higher Educational Institutes voluntarily participated in the EDUVAC web-based course. The course provided various study materials, including PowerPoint presentations, videos, quizzes, texts, and references to reputable websites. It also offered small assignments and self-tests for self-evaluation. An online questionnaire was available to students before and after they completed the EDUVAC web-based course.

The mean knowledge score on vaccines increased significantly after the EDUVAC web-based course ($p<0.001$). The majority of the students (95%) felt that the web-based course has benefitted them for their future career and 96.4% would encourage other students to attend the EDUVAC web-based course. Overall, our findings suggest that EDUVAC is a valuable resource for those seeking to enhance their understanding of vaccination.

Keywords: health science students, knowledge, satisfaction, vaccination competence, web-based course

1. Introduction

1.1 Overview

Immunization is a highly cost-effective investment in health and a proven method for controlling and eliminating

dangerous infectious diseases. It's estimated that it prevents nearly 2-3 million deaths every year (WHO, 2020). The competencies required for immunization range from knowledge of the subject to essential immunization practices and contextual issues that are relevant to immunization. (Public Health Agency of Canada, 2015).

Especially during the COVID-19 pandemic the importance of vaccinations has become even more significant (Machado et al., 2022). Vaccine hesitancy has been reported in more than 90% of countries around the world (Lane et al., 2018). In many countries, the adherence to MMR vaccine has been reduced under the 95% threshold set by the WHO, which is essential for herd immunity (The Lancet Child & Adolescent Health, 2019). The anti-vaccination movement may be driven by personal reasons, such as religious or secular views (MacDonald & the SAGE Working Group on Vaccine Hesitancy, 2015). However, decreased immunization poses a threat to the immunity of the population as a whole. Herd immunity is achieved when the majority of individuals are immune to a disease after vaccination. Maintaining herd immunity is vital due to the high contagiousness of many diseases (Bullen et al., 2023). According to a study on COVID-19 vaccination, there is a negative correlation between vaccination hesitancy and individuals without a high school education (Khairat et al., 2022). Literature suggests that healthcare workers' willingness to accept the COVID-19 vaccine is related to their level of education (Fakonti et al., 2022) and knowledge of vaccine safety and confidence (Karlsson et al., 2019).

Health science students are required to gain knowledge based on evidence to meet challenges in healthcare, particularly in the field of vaccination. In order to administer vaccinations safely, it is necessary for students to acquire the required knowledge and skills during their studies. This may require utilizing different types of learning methods in addition to clinical practice (Babenko-Mould et al., 2015). Moreover, students must also develop critical thinking, effective interprofessional communication, and collaborative skills to ensure the delivery of high-quality services to people (Brisolara et al., 2019; Kalaian & Kasim, 2017).

Health care providers have a crucial role to play in the success of immunization strategies by influencing parents and adults in their communities (Kernéis et al., 2014; Tafuri et al., 2014). Those professionals who administer vaccines should be well-informed about the latest scientific information on vaccinations. This will enable them to provide justifications, advice, and explanations on vaccination schedules, safety, and possible side-effects to parents and clients (Expert Panel on effective ways of investing in Health [EXPH], 2018; Nikula et al., 2009). Health care professionals who have knowledge, skills and positive views towards vaccinations can influence positively the groups of their community performing health promotion actions for vaccination (Sakellari, 2019).

Establishing trust between healthcare professionals and their clients is crucial for successful vaccination (Yaqub et al., 2014). According to Nikula et al. (2009), it is crucial to train health science students on vaccination techniques, schedules, possible side effects, and counseling to ensure that they possess the necessary skills. In order to provide effective training to students, a combination of the internet, technology applications, games, audio, video, and teamwork can be utilized while employing various learning theories (Keengwe & Kidd, 2010). Web-based learning provides students with boundless opportunities to learn, express their creativity, and engage with their classmates without any constraints of time or distance (Deejring, 2014). Research has shown that e-learning is highly effective in augmenting students' knowledge and can be employed either independently or in conjunction with traditional teaching approaches to enhance consultation skills (Warnecke & Pearson, 2011).

The “Educating Vaccination Competence” (EDUVAC) program was developed to address the educational requirements of health science students. The program's purpose was to utilize innovative teaching methods to train and enhance students' skills and knowledge in vaccinations. The ultimate objective of the EDUVAC program is to strengthen the positive attitude, knowledge, and skills of future health professionals to improve vaccination coverage across various population groups. To achieve these goals two courses were developed: a Web-based course (3 ECTS) and an Intensive Course (2 ECTS).

The aim and research questions

The aim of the current study is to explore

1. students’ knowledge on vaccinations before and after their participation in the EDUVAC web-based course

2. students’ feedback after attending the EDUVAC web-based course.

2. Method

2.1 Educating Vaccination Web-based Course

The current study was an intervention study implemented as part of the EDUVAC project involving partners from five European higher educational institutes: University of West Attica (Greece, leading University), Metropolia University of Applied Sciences (Finland), Trnava University (Slovakia), University of Vic - Central

University of Catalonia (Spain), and the University of Modena and Reggio Emilia (Italy).

After assessing the educational needs through a thorough review of the literature as well as the national authorities of the participating countries, the project team has arrived at the decision to develop a digital content of six sections/topics for the EDUVAC project that could be used both for the web-based course and the intensive course:1) Vaccination basics, 2) Vaccination procedure, 3) Counselling people, 4) Vaccinating refugees, migrants, and asylum seekers, 5) Vaccinating travellers and people on the move, 6) People who hesitate to take vaccines and anti-vaccination groups.

The web-based course run for three cycles (semesters). Students from five Higher Educational Institutes participated voluntarily in the EDUVAC web-based course hosted by Metropolia University on Moodle platform. The students could study in an asynchronous environment, choosing the time they devote both to studying and to completing the tasks assigned to them. To facilitate the learning process, different types of study material were used (e.g. PowerPoint presentations with or without sound, videos, quizzes) along with supplementary material in text format and references to websites of recognized organizations (WHO, CDC, ECDC) for further study. In order to help students, assimilate the information and new knowledge they acquire, small assignments and tests were available for self-evaluation. To successfully “pass” the course and receive a certificate of attendance (3 ECTS), students must submit their final assignments in their portfolio on Moodle. Teachers from each HEI acted as tutor to guide and support the students. Additionally, an online questionnaire is filled out by students both before and after their participation in the EDUVAC web-based course.

2.2 Data Collection

The data were collected during the autumn 2019 and spring 2020 academic semesters. An online questionnaire was developed to evaluate students' knowledge on vaccination, both before and after their participation in the EDUVAC web-based course. The questionnaire consisted of various categories, including previous knowledge, knowledge after the course, and satisfaction. Dichotomous questions with answers of yes/no and true/false were used to evaluate students' theoretical knowledge. Additionally, students' achievement throughout the course was compared using questions with a rating scale of “fully achieved, largely achieved, not achieved and very limited achieved”. To evaluate students' satisfaction, questions with a rating scale of “Poor, Fair, Good, Very good, Excellent, Don't know” were used.

2.3 Ethical Issues

Informed consent was obtained by all participant students who were informed about the study purpose, voluntariness and anonymity, before filling in the online questionnaire. The approval was obtained in March 2019 by Metropolia UAS because it hosted the EDUVAC web-based course in Moodle, and by other universities if required.

2.4 Data Analysis

Quantitative variables were expressed as mean (Standard Deviation) or as median (interquantile range). Qualitative variables were expressed as absolute and relative frequencies. Wilcoxon and McNemar tests were used for time comparisons. All reported p values are two-tailed. Statistical significance was set at $p<0.05$ and analyses were conducted using SPSS statistical software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp).

3. Results

3.1 Participants’ Characteristics

In table 1 the characteristics of the participants are presented. A total of 223 health sciences students took part in the study, out of which 91.9% were females. The majority of students (83%) were 18 to 25 years old and were pursuing degrees in Community Health (42%), Public Health (38%), Public Health Nursing (35%), and Nursing (105%). (Table 1).

Table 1. Sample characteristics

	N (%)
Gender	
Females	205 (91.9)
Males	16 (7.2)
Prefer not to say	2 (0.9)
Age	
18-25 years old	185 (83.0)
26-30 years old	19 (8.5)
31-40 years old	12 (5.4)
>40 years old	7 (3.1)
University	
Metropolia University of Applied Sciences	40 (17.9)
University of Modena and Reggio Emilia	61 (27.4)
University of Trnava	32 (14.3)
University of Vic	42 (18.8)
University of West Attica	48 (21.5)
Subject of studies	
Community Health	42 (18.8)
Midwifery	2 (0.9)
Nursing	105 (47.1)
Other	1 (0.4)
Public Health	38 (17.0)
Public Health Nursing	35 (15.7)

3.2 Participants' Knowledge

Table 2 presents the results that analyzed participants' knowledge about vaccines before and after taking the EDUVAC web-based course. The study found that after the course, participants significantly agreed more with the statement that "Vaccinating is an important health promotion method" and that "My vaccination knowledge is up-to-date". Moreover, the percentage of participants who answered the following questions correctly increased significantly: "Tetanus is spread from person to person", "Yellow fever vaccination is mandatory for travelers traveling to India", "Good vaccination counseling should include criticism", "Three doses of DTaP-IPV-Hib should be administered to immigrants $\geqslant$ 2 months, in the absence of documented evidence of prior vaccination", and "Vaccines contain toxic substances such as aluminum and mercury".

Table 2. Participants' knowledge before and after the course

		Pre	Post	
		N (%)	N (%)	P
Vaccinating is an important health promotion method, mean (SD)		9.6 (0.9)	9.8 (0.9)	0.001+
Median (IQR)		10 (10 - 10)	10 (10 - 10)	
My vaccination knowledge is up-to-date, mean (SD)		6.2 (1.9)	8.5 (1.3)	<0.001+
Median (IQR)		6 (5 - 7)	8 (8 - 10)	
Tetanus is spread from person to person	*False*	*191 (85.7)*	*203 (92.7)*	0.007++
	True	32 (14.3)	16 (7.3)	
Two doses of MMR vaccine are needed for proper protection of MMR diseases	False	46 (20.6)	29 (13.2)	0.055++
	True	*177 (79.4)*	*190 (86.8)*	
Previous life-threatening or serious reaction after same vaccine is contraindication to vaccine	False	58 (26.0)	50 (22.8)	0.366++
	True	*165 (74.0)*	*169 (77.2)*	
A vaccinated person should be monitored at least for 15 minutes after the vaccination	False	61 (27.4)	51 (23.3)	0.243++
	True	*162 (72.6)*	*168 (76.7)*	
Yellow fever vaccination is mandatory for travellers travelling to India	*False*	*65 (29.1)*	*86 (39.3)*	0.009++
	True	158 (70.9)	133 (60.7)	
Good vaccination counseling should include criticism	*False*	*77 (34.7)*	*105 (47.9)*	0.001++
	True	145 (65.3)	114 (52.1)	
Three doses of DTaP-IPV-Hib should be administered to immigrants >=2 months. in the absence of documented evidence of prior vaccination	False	63 (28.4)	44 (20.1)	0.018++
	True	*159 (71.6)*	*175 (79.9)*	
Vaccines contain toxic substances such as aluminum and mercury	False	151 (68.0)	112 (51.1)	<0.001++
	True	*71 (32.0)*	*107 (48.9)*	
Knowledge score %, mean (SD)		59.9 (17.1)	68.7 (16.3)	<0.001+
Median (IQR)		62.5 (50 - 75)	75 (62.5 - 75)	

Note. Answers in italics indicate the correct answer

+Wilcoxon singed test; ++McNemar test

Table 3. Participants' achievements through the course

	Not achieved	Very limited achieved	Largely achieved	Fully achieved
	N (%)	N (%)	N (%)	N (%)
I have now a better knowledge and understanding about vaccinations	1 (0.5)	9 (4.1)	162 (73.3)	49 (22.2)
I have knowledge on vaccines and immunization in regards to immune system. development of and the way the vaccines work. vaccine preventable diseases and population health	1 (0.5)	17 (7.7)	153 (69.2)	50 (22.6)
I have knowledge and I am able to identify and manage adverse effects	0 (0)	34 (15.4)	152 (68.8)	35 (15.8)
I have knowledge on ethical and cultural issues about vaccinations	2 (0.9)	38 (17.2)	131 (59.3)	50 (22.6)
I have knowledge on evidence-based practice on vaccination	0 (0)	33 (14.9)	134 (60.6)	54 (24.4)
I am aware of different vaccination schedules and be able to find the different schedules targeting different populations groups	0 (0)	27 (12.2)	133 (60.2)	61 (27.6)
I am able to communicate and provide consultation to different populations by applying all the theoretical background knowledge obtained	1 (0.5)	40 (18.1)	135 (61.1)	45 (20.4)
I am able to administer vaccinations to different populations	9 (4.1)	43 (19.5)	126 (57)	43 (19.5)
I feel I have now vaccination competence	5 (2.3)	42 (19)	125 (56.6)	49 (22.2)
I feel more confident now in the use of the English language in a professional context of vaccination	4 (1.8)	47 (21.3)	117 (52.9)	53 (24)

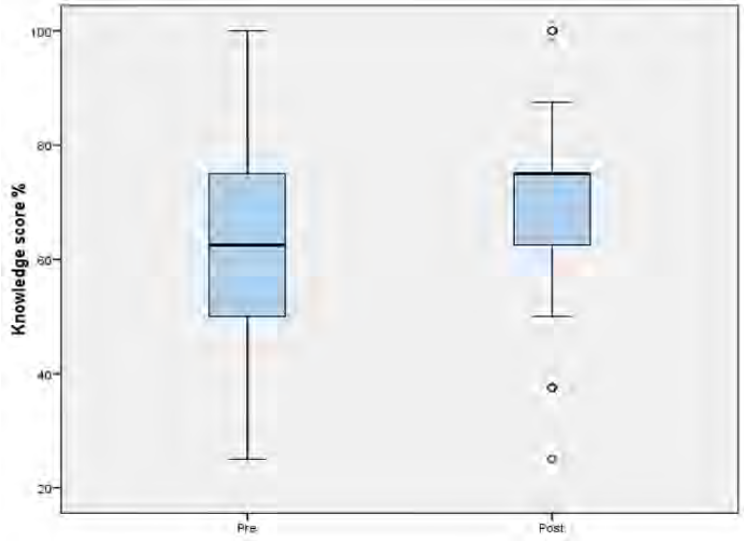

Figure 1. Knowledge score before and after the course

The study also found that the mean knowledge score on vaccines before the EDUVAC web-based course was 59.9% (SD=17.1%) and after the course, it increased significantly to 68.7% (SD=16.3%) (Figure 1). A majority of the participants (89.3%) read all the compulsory material of the EDUVAC web-based course. However, for those who did not read all the material, the sections that were skipped the most were "Counseling people" (15%), "People who hesitate to take vaccines and anti-vaccination groups" (11.8%), and "Vaccination procedure" (11.4%).

3.3 Participants' Feedback after Completing the EDUVAC Web-based Course

The evaluation of the course by the students is provided in Tables 3 and 4. Almost one out of four participants stated that after the course had fully achieved to be aware of different vaccination schedules and be able to find the different schedules targeting different populations groups (27.6%), gained knowledge on evidence-based practice on vaccination (24.4%), and felt more confident in using the English language, in a professional context of vaccination (24%). Additionally, 95% of the sample (n=210) felt that the EDUVAC web-based course has benefitted them for their future career and 96.4% (n=213) would encourage other students to attend the EDUVAC web-based course. Most of the students (73.4%) evaluated as "excellent or above average" the information available in advance from teachers and more than half (57.2%) described the organization of the EDUVAC web-based course as "excellent". (Table 4).

Table 4. Participant's evaluation of the program

	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
	Poor	*Below average*	*Average*	*Above Average*	*Excellent*	*Don't know*
Information available in advance from teachers (e-mails. information sessions in classroom)	1 (0.5)	7 (3.2)	46 (20.7)	52 (23.4)	111 (50)	5 (2.3)
The students' Manuals/Guides	2 (0.9)	5 (2.3)	52 (23.4)	58 (26.1)	96 (43.2)	9 (4.1)
The organisation of the Web-based course in general	0 (0)	2 (0.9)	36 (16.2)	52 (23.4)	127 (57.2)	5 (2.3)
	No	*Yes*				
Do you think/feel the Web-based course has benefitted you for your future career?	11 (5.0)	210 (95.0)				
Would you encourage other students to attend this Web-based course?	8 (3.6)	213 (96.4)				
	Totally disagree	*Disagree*	*Agree*	*Totally agree*	*Do not know*	
The duration of the Web-based course was appropriate	6 (2.7)	13 (5.9)	126 (56.8)	75 (33.8)	2 (0.9)	
Workload of the Web-based course (studying & preparing assignment) was appropriate	6 (2.7)	10 (4.5)	134 (60.4)	69 (31.1)	3 (1.4)	
The content of the Web-based course was interesting	3 (1.4)	2 (0.9)	106 (47.7)	109 (49.1)	2 (0.9)	
The instructions of the assignments were clear	5 (2.3)	22 (9.9)	120 (54.1)	74 (33.3)	1 (0.5)	
The assignments helped me to learn	7 (3.2)	5 (2.3)	114 (51.4)	93 (41.9)	3 (1.4)	
The teachers responded sufficiently to my questions	3 (1.4)	6 (2.7)	85 (38.3)	87 (39.2)	41 (18.5)	
Considering the language (English). I did not experience difficulties in understanding the content of the Web-based course	8 (3.6)	41 (18.5)	112 (50.5)	59 (26.6)	2 (0.9)	
Please give us your feedback regarding the relevance of the web-based content.	*Poor*	*Fair*	*Good*	*Very good*	*Excellent*	*Do not know*
Vaccination basics	0 (0)	6 (2.7)	34 (15.2)	76 (34.1)	106 (47.5)	1 (0.4)
Vaccinating procedure	0 (0)	6 (2.7)	35 (15.7)	82 (36.8)	99 (44.4)	1 (0.4)
Counseling people	1 (0.4)	10 (4.5)	36 (16.1)	87 (39)	86 (38.6)	3 (1.3)
Vaccinating refugees, migrants and asylum seekers	1 (0.4)	8 (3.6)	51 (22.9)	84 (37.7)	77 (34.5)	2 (0.9)
Vaccinating travellers and people on the move	0 (0)	7 (3.1)	52 (23.3)	81 (36.3)	82 (36.8)	1 (0.4)
People who hesitate to take vaccines and anti-vaccination groups	2 (0.9)	16 (7.2)	44 (19.7)	74 (33.2)	86 (38.6)	1 (0.4)
Please give us your feedback regarding the quality of the web-based content[1]						
Vaccination basics	1 (0.8)	1 (0.8)	22 (17.5)	42 (33.3)	58 (46)	2 (1.6)
Vaccinating procedure	0 (0)	2 (1.6)	22 (17.5)	43 (34.1)	56 (44.4)	3 (2.4)
Counseling people	0 (0)	1 (0.8)	21 (16.7)	46 (36.5)	54 (42.9)	4 (3.2)
Vaccinating refugees, migrants and asylum seekers	0 (0)	4 (3.2)	24 (19)	43 (34.1)	54 (42.9)	1 (0.8)
Vaccinating travellers and people on the move	1 (0.8)	4 (3.2)	21 (16.7)	47 (37.3)	52 (41.3)	1 (0.8)
People who hesitate to take vaccines and anti-vaccination groups	1 (0.8)	1 (0.8)	21 (16.7)	45 (35.7)	56 (44.4)	2 (1.6)
Please give us your feedback regarding the quality of the learning activities used throughout the web-based course	Poor	Below Average	Average	Above Average	Excellent	Do not know
Self tests	2 (0.9)	12 (5.4)	0 (0)	95 (42.6)	97 (43.5)	17 (7.6)
Power Point Presentations	0 (0)	18 (8.1)	0 (0)	95 (42.6)	106 (47.5)	4 (1.8)
Videos	9 (4)	37 (16.6)	0 (0)	94 (42.2)	77 (34.5)	6 (2.7)
Links to other sources	1 (0.4)	15 (6.7)	0 (0)	81 (36.3)	120 (53.8)	6 (2.7)
Reading material (pdf. text)	1 (0.4)	12 (5.4)	0 (0)	75 (33.6)	131 (58.7)	4 (1.8)
Assignments	2 (0.9)	12 (5.4)	0 (0)	102 (45.7)	99 (44.4)	8 (3.6)
Portfolio assignments	3 (1.3)	8 (3.6)	0 (0)	97 (43.5)	113 (50.7)	2 (0.9)
How would you rate your overall experience in the web-based course?	0 (0)	5 (2.2)	36 (16.1)	73 (32.7)	108 (48.4)	1 (0.4)

[1]only for 3rd wave participants

Furthermore, a large percentage of students “agreed or “totally agreed” that the content of the web-based course was interesting (96.8%), the instructions of the assignments were clear (87.4%) and the assignments helped them to learn (93.3%). The majority of the students evaluated the relevance of the EDUVAC web-based course content as “very good and excellent” in all sections. The quality of the learning activities used throughout the EDUVAC web-based course, including PowerPoint presentations, links to other sources, reading material, and portfolio assignments, were mostly evaluated as “excellent or above average”, with percentages of 90.1%, 90.1%, 92.3%, and 94.2%, respectively. Finally, more than 80% of the participants rated as “excellent or above average” their overall experience in the web-based course.

4. Discussion

The EDUVAC project has developed a web-based course to address the need for vaccination competence among future health science students in primary healthcare settings. The objective of the present study was to evaluate the knowledge gained and feedback/satisfaction of students who participated in the EDUVAC web-based course. The study results demonstrated a statistically significant improvement in the mean knowledge score on vaccination among the students who underwent the EDUVAC web-based course. Specifically, after completing the course, the students gained a clear understanding of how tetanus spreads, which countries require the yellow fever vaccine, and the number of doses of Diphtheria, Tetanus and Pertussis vaccine that immigrant babies over two months old need. According to a study by Deloian et al. (2015), the use of the web-based education program "Breastfeeding Basics" resulted in improved knowledge across all areas for both nurses and nursing students. In our study, students reported that the EDUVAC web-based course helped them keep their knowledge of vaccinations up-to-date and recognize the importance of vaccinations in promoting health. Other studies investigated the vaccination competence of public health nurse students (Nikula et al., 2011) by knowledge tests showing that there is a need of constant education not only through the basic education but also after they graduate and work in health care settings (Nikula et al., 2012; Abdulla et al., 2020). Additionally, Collins et al. (2022) supported that medical students who participated in a hybrid program, which involved both online and in-person components, felt more confident in their ability to vaccinate the public. Similarly, other studies have demonstrated that online learning enhanced in depth the knowledge and skills of the students during COVID 19 pandemic (Coman et al., 2020; Abdull Mutalib et al., 2022).

Literature supports that online learning provides the flexibility of time and place, interaction, and individualization of students’ learning needs (Sinclair et al., 2016) while offering the ability to supply receptive and efficient process of skills expertise in higher education (Bloomfield & Jones, 2013). Recent research has highlighted the potential benefits of online learning to the academic community for effective and satisfactory learning, particularly in the context of the pandemic. (Perifanou et al., 2020).

After completing the EDUVAC web-based course, students gave their feedback. They stated that the course reinforced their attitudes and self-efficacy regarding vaccinations. They felt more confident in their understanding of vaccinations, ability to manage adverse effects after vaccination, awareness of different vaccination schedules, and ability to communicate and provide consultation to different population groups. Moreover, most of the students found “excellent or above average” the role and availability of the teachers who responded through emails, the students’ Manuals/guides and the organization of the web-based course in general. Stone & Zheng (2014) concluded that students’ satisfaction is increasing when learning content is managed and learning activities are well organized. Other studies claim that the effectiveness of a web-based course consists of elements such as use of technology to bring appropriate course materials and evaluation in order to reinforce students' skills of communication and learning (Tam et al., 2018). Therefore, EDUVAC web-based course consisted of different learning activities (pdf, text, links to other sources and portfolio assignments) which students characterized as “excellent or above average”.

As it is documented by Sinclair et al. (2016) that asynchronous e-learning is a more student-centered approach and can be an alternative to traditional education affecting positively students’ accomplishment in education (Lahti et al., 2014). These results support the findings of the current study that nearly all students felt that EDUVAC web-based course has benefited their future carrier and they would encourage other students to involve with the EDUVAC Web-based course. Additionally, students in the current study stated as “excellent or above average” their overall experience of the EDUVAC web-based course since they had the opportunity to be a part of a European Erasmus + project, to study in English language and comment on the educational material in order to improve it for the final open access version.

4.1 Limitations

A potential limitation of this study may be the utilization of self-reported questionnaire to collect data on

students' knowledge and satisfaction with the EDUVAC web-based course. However, the questionnaire was developed by a multidisciplinary research team with questions that were based on the literature review. Additionally, the questionnaire was anonymous, allowing participants to freely express their opinions.

5. Conclusion

In the last decade, there has been a significant increase in online education in Higher Educational Institutions, especially during the COVID-19 pandemic. This has facilitated the continuation of education in all educational settings.

The EDUVAC web-based course provides a wide range of study materials such as PowerPoint presentations, videos, quizzes, and further reading material (text, pdf). Additionally, it offers small assignments and self-tests for self-evaluation. This makes it an ideal resource for healthcare professionals who wish to stay up-to-date and competent in the field of vaccination.

The course is designed to help students strengthen their knowledge, skills, and attitudes. It provides them with the necessary tools to become successful healthcare professionals.

EDUVAC is a valuable resource that can be integrated into the curricula of Higher Educational Institutions to provide comprehensive training on vaccination competence. The final content and learning material of the EDUVAC project is available for open access internationally and can be found at the webpage of the project (http://www.eduvac.eu/)

In conclusion, the EDUVAC program represents a significant step forward in addressing the educational requirements of health science students. Its innovative approach to teaching vaccinations is intended to strengthen the positive attitude, knowledge, and skills of future health professionals to improve vaccination coverage.

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Authors contributions

Conceptualization and design: all authors, data acquisition: all authors, analysis and data interpretation: all authors, writing - original draft preparation: DP, EK, AN, KG, review and editing: all authors, funding acquisition: ES, AN, KG, PGE, CG, supervision: ES. All authors have read and agreed to the published version of the manuscript. Authors were involved in preparation this article. Final proofreading was made by the first author.

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No additional data are available.

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