

## Education

# Undergraduate paramedic students' experience of paramedic tutors teaching public health

Marguerite C Sendall PhD, is Senior Lecturer in Health Promotion and Qualitative Research and the Postgraduate Research Coordinator<sup>1</sup>; Athena Ng MPH, is a Research Assistant<sup>1</sup>; Laura K McCosker BSc, BN, is a Research Assistant<sup>1</sup>

### Affiliations:

<sup>1</sup>School of Public Health and Social Work, Faculty of Health, Queensland University of Technology, Brisbane, Queensland

<https://doi.org/10.33151/ajp.18.765>

## Abstract

### Introduction

Previous studies have shown teaching public health in medical courses improves students' analytical, problem-solving and communication skills. However, little research to date has shown if public health teaching is helpful to paramedic students. The aim of this study was to examine if having paramedic tutors teach public health had a positive effect on students' learning and interest in public health.

### Methods

184 second-year paramedic students at an Australian university completed a printed survey and provided feedback about their learning experience. Students answered multiple choice and open-ended questions about whether their understanding of a public health subject was improved by having a paramedic tutor, and if having different tutors each week affected students' learning.

### Results

Most students reported their understanding of public health improved when the subject was taught by a paramedic tutor and when paramedic scenario examples were included in teaching. Nearly half felt having different tutors each week made learning difficult. The following themes emerged from student narratives: the relevance of public health to their career; an improved understanding of public health; a realisation about the importance of public health; difficulties presented by an inconsistent teaching style; and poor follow-up and conflicting advice.

### Conclusion

Teaching public health from a paramedic perspective enabled students to understand the relevance of paramedic practice and the role paramedics play in the public health system. Having the same paramedic tutor teaching each week helped students understand the relationship between public health and paramedic practice.

### Keywords:

university; undergraduate; curricula; engagement; public health; paramedicine

Corresponding Author: Marguerite Sendall, [m.sendall@qut.edu.au](mailto:m.sendall@qut.edu.au)

## Introduction

Paramedic practice is situated within the broader health environment of health services management, health policy and systems and preventive health and health promotion. Public health issues relevant to paramedics include disaster and emergency, infectious and communicable disease, and non-communicable and chronic disease management. For example, paramedics play an integral frontline role in reducing the spread of infectious diseases in the community by identifying and managing suspected cases. Australia has witnessed an increasing shift towards community-based models of paramedicine that emphasise aspects of public health, such as health promotion and disease. A previous study explored how community paramedics create and maintain professional boundaries and identities to distinguish models of care and community paramedicine. This observational ethnographic case study approach used interviews, focus groups and field observations to collect data. Thematic analysis and boundary theory revealed this community paramedicine model of care followed the mnemonic RESPIGHT: Response to emergencies; Engaging with communities; Situated practice; Primary health care; Integration with health, aged care and social services; Governance and leadership; Higher education; Treatment and transport options. The authors concluded community paramedicine models of care are distinguished from other paramedicine models by community engagement and situated practice and are integrated with health, aged care and social services (1). This shift to community-based models of paramedicine informs pedagogical approaches underpinned by public health and health promotion principles and practice.

Previous pedagogical studies demonstrate public health units can be successfully introduced into medical courses through online learning and practical learning. Using a comparative case approach, a United Kingdom study highlighted how three medical schools used online approaches to increase medical students' engagement with learning public health. The study found most (67–85%) eligible students preferred online materials to live lectures across the medical schools. Students valued the flexibility of e-learning but found online discussions challenging. Despite this, students valued online technologies because it offered opportunities to explore topics in-depth and consolidate learning of key public health concepts (2). Another study used an in-depth 3-year case study approach at a large UK medical school to better understand why health promotion remains deprioritised in the medical curricula. Insights about teacher and learner experience of topics, pedagogies and modalities were gathered through focus groups, reflective learning submissions and evaluation data. The findings revealed challenges about inadequate support for clinical teachers, relevance to strategic learners, experiential clinical learning to support classroom activities and a competing curriculum. Heterogeneous deep learning is more beneficial than standardised surface learning, and assessment modalities impact types of learning (3).

Public health teaching has been shown to improve medical students' planning, analysis, research, problem-solving and interpersonal skills. A previous study assessed undergraduate medical students' viewpoints about various aspects of the MD/MPH dual degree program at Shiraz University of Medical Sciences in Iran. This cross-sectional study used a four-part self-structured questionnaire in Persian: demographic factors; goals, content, skill development, applicability and expectations; self-reported increase of knowledge; and motivations and opinions about the impact of the program on their future career. Data analysis used descriptive statistics. All MD/MPH students (89) participated in this study. Students had a positive view about most aspects of the MD/MPH program, and their enthusiasm may have motivated better learning and success in the program (4). Another study described a self-directed health promotion project-based learning task integrated into the second-year curriculum of a medical degree program at United Arab Emirates University. Students were introduced to public health and health promotion practice, health behaviour change and program design. The study reported students develop a solid background in prevention valued in their training and future careers (5). However, there is little to no research to date to show if these benefits apply to paramedic students specifically. Therefore, it is necessary to investigate if students from other health disciplines, such as paramedic students, value learning about public health and if learning about public health has benefits for paramedic students.

Pedagogical approaches to public health units often include an interdisciplinary approach, with students from various health disciplines learning together within the same class. In another study, the experience of an interprofessional approach using interprofessional education, threshold concepts, virtual learning and narrative pedagogy for pre-registration healthcare students was recreated to address health inequalities (6). Similarly, another study conducted a pilot project that used diabetes as a public health issue to cut across and integrate first year Master of Public Health core curriculum courses. This approach provided early exposure to the interdisciplinary nature of public health. The project was successful and intended to be replicated using a different health issue (7). The Harvard T. H. Chan School of Public Health used five principles to transform their education strategy to create an arc of continuous learning education. The values of peer review and quality assessment were adapted to bridge the research versus education dichotomy and create research-teaching congruence. This approach included T-shaped competencies (breadth across fields, depth in primary fields), flexible and modular design, greater experiential learning, three levels of education (informative, formative and transformative learning) and integrated instructional design (online, in person, and in the field) (8). This approach enables students to be exposed to the perspectives of students from other health disciplines, assisting in the development of analytical and critical-thinking skills.

An interdisciplinary approach can be challenging for some

students because it necessitates their integration into a new learning environment (6). However, critical thinking includes learning how to understand differing views and should be encouraged. It can be difficult for educators to teach basic public health concepts in meaningful ways relevant to a diverse range of students (7). A previous study examined the implementation of a health promotion curriculum within a medical course. The findings demonstrate this approach enables students' choices in researching a topic relevant to their discipline. Additionally, it improved their learning experience and interest in the course content (3). The curriculum (or parts of) needs to be valuable to the student's future career for them to be interested and engaged in learning.

Teaching paramedic students about public health is more complex. Due to the comparatively autonomous and applied nature of the paramedic profession, Australian paramedic students may develop an in-group mentality and be reluctant to participate in interdisciplinary classes (9). However, this disciplinary culture may be reinforced if paramedic students are not exposed to interdisciplinary group work throughout their degree and impact on their ability to function effectively in a multi-disciplinary practice environment. Furthermore, the paramedicine curriculum in most Australian institutions focusses on clinical practice and placement programs, with little emphasis on other areas of health practice (10). Further research into how to effectively engage paramedic students in public health issues is needed. This study examines paramedic students' feedback about their experiences of learning about public health while being taught by a paramedic tutor. In this study, a paramedic tutor is an expert paramedic who practises as a clinician or in a public health environment and has experience in higher education learning and teaching. The primary aim was to examine if having paramedic tutors improved student learning and interest in public health. The second aim was to compare the effect of having a single tutor or different tutors each week on student learning and interest in public health.

## Methods

Contemporary Public Health (PUB251) is an undergraduate unit offered by the school of public health and social work at a large Australian university. It is a core unit for students enrolled in the public health and paramedic science disciplines. Students from other disciplines may enrol in PUB251 as an elective. The unit is an introduction and overview to the nature, scope, philosophy and strategies of public health. Students are introduced to the public health system, public health policy and multidisciplinary nature of public health. The unit provides insight into a wide range of approaches necessary for creating comprehensive public health activities, responding to health needs of communities and improving health outcomes for the broader population.

This enquiry was designed as a learning and teaching quality

assurance activity. The activity was designed to answer the following question: What is the effect of paramedic tutors teaching public health on paramedic students' learning experience and interest in public health? Students were recruited in the final tutorial to ensure the semester's experience was captured. The unit coordinator was aware of the potential power imbalance between tutors and students. To ensure voluntary participation and authentic feedback, the unit coordinator briefed the tutors about standard and precise execution of the procedure. As this was a customised unit evaluation, students were encouraged to provide feedback. Tutors provided an overview of the survey and its purpose before leaving the room. The survey did not collect any identifying information such as student name or student number. Students collected the surveys, put them in an envelope, sealed it and signed across the seal. Tutors returned the sealed envelopes to the unit coordinator.

A printed survey was purpose-developed for this quality assurance activity. The purpose of this survey was to gather primary evaluation data to inform this new and innovative model of learning and teaching. The survey was informed by relevant literature, enquiry driven and not piloted. The survey was distributed to all students in the final PUB251 paramedic-only tutorial session in semester two in two consecutive years. Of the 263 paramedic students in PUB251, 141 were enrolled in 2012 and 122 in 2013. The purpose of collating results from 2 years was to demonstrate compelling evidence for this model of learning and teaching for paramedic students. The unit was offered in the same structure and format over these 2 years. All paramedic tutors received tutorial slides and guidelines each week and attended fortnightly meetings with unit coordinator. All paramedic tutors had previous experience in public health and teaching paramedic students. The survey asked students if their understanding of public health was improved by having a paramedic tutor. Students were also asked if having the same tutor or different paramedic tutors each week affected their learning. The survey contained nine questions and took approximately 10 minutes to complete. Students were assured their responses were confidential and anonymous.

## Analysis

Eight out of nine questions were used for analysis. Question 5 was not analysed because tutorial attendance does not directly add to understanding paramedic students' experience of paramedic tutors teaching public health. Questions 1, 3, 6, 8 and 9 were quantitative and analysed using IBM SPSS Statistics Version 25. Descriptive statistics were generated for all quantitative variables. Questions 2, 4, and 7 were qualitative and analysed using thematic analysis to identify primary themes. The students free text narrative data was deeply rich and descriptive justifying deductive and inductive analysis (11). The narrative data was grouped deductively by question. After several readings, open codes were applied to significant statements in context. An iterative process of axial coding was undertaken to

represent original concepts. Grouping and re-grouping of codes ensured internal homogeneity and external heterogeneity of emerging themes. Emergent themes settled to represent the final themes. Inter-judge reliability was conducted to ensure the final themes were authentic and truly represented the students' voice. Quotes are presented to support each of the final themes.

## Ethics

The primary purpose of this investigation was quality assurance and was exempt from human ethics review and approval per the National Statement on Ethical Conduct in Human Research 2007. However, this activity was conducted ethically in accordance with the Ethical Considerations in Quality Assurance and Evaluation Activities (National Health and Medical Research Council, 2014).

Although this customised unit evaluation and quality assurance activity was exempt from formal ethics approval, the unit coordinator sought advice from the ethics office about due process (described above) required to uphold ethical practice. Voluntariness was maintained because students were not required to complete the survey. Anonymity and confidentiality were maintained because students were not required to provide identifying information and the unit coordinator could not identify incomplete surveys. Tutors were informed about the survey, its purpose and the survey questions and distributed the

survey. Tutorials were identified by day and time (eg. Thursday 10–11am) not by tutors' names. Tutors were provided with de-identified and collated findings of the customised unit evaluation and were aware these might form the basis of a publication.

## Results

A total of 184 paramedic students (response rate 70%) completed the survey. There were 64 students who were taught by a single tutor for the whole semester, while 93 students were taught by two tutors and 26 students were taught by three or more tutors.

The results showed most students with one or two tutors either 'agree' or 'strongly agree' their understanding of public health improved when the subject was taught by a paramedic tutor (Table 1). Students with three or more paramedic tutors were less likely to report their understanding of public health improved.

Approximately 84% of students with one or two tutors, and half of students with three or more tutors, felt using paramedic scenario examples in teachings improved their understanding of public health (Table 2).

Among students taught by the same tutor (n=53) throughout the semester, nearly all were satisfied about the tutor's teaching quality. However, among students taught by two or more tutors

Table 1. Number of students who felt their understanding of public health was helped by having a paramedic tutor (by number of tutors who taught the student)

	One tutor (n=64)		Two tutors (n=93)		Three or more tutors (n=26)	
	n	%	n	%	n	%
Strongly Agree	23	35.9%	37	39.8%	2	7.7%
Agree	32	50.0%	30	32.3%	10	38.5%
Neither agree nor disagree	7	10.9%	17	18.3%	7	26.9%
Disagree	2	3.1%	6	6.5%	4	15.4%
Strongly disagree	0	0.0%	3	3.2%	3	11.5%

Table 2. Number of students who felt the inclusion of paramedic scenarios has helped their understanding of public health (by number of tutors who taught the student)

	One tutor (n=64)		Two tutors (n=93)		Three or more tutors (n=26)	
	n	%	n	%	n	%
Has helped	53	84.1%	74	84.1%	13	56.5%
Has not helped	10	15.9%	14	15.9%	10	43.5%

Table 3. Among students who were taught by two or more tutors, the number of students who felt their understanding of public health was hindered by having a different paramedic tutor each week (by the number of a different paramedic tutor each week)

	Two tutors (n=93)		Three or more tutors (n=26)	
	n	%	n	%
Was hindered	37	40.7%	19	73.1%
Was not hindered	50	54.9%	7	26.9%
N/A	4	4.4%	0	0.0%

(n=117), nearly half felt having different tutors teaching each week made their learning difficult (Table 3). Among students taught by three or more tutors (n=26), almost three-quarters felt having different tutors teaching each week adversely affected their learning.

Themes about the effect paramedic tutors have on students understanding of public health.

Five themes emerged from analysis of students' narratives. Three of these themes arose from students' feedback about the effect of paramedic tutors on their understanding of public health. These themes include: the relevance of public health to their career; an improved understanding of public health; and a realisation about the importance of public health. The other two themes emerged from the students' feedback about the effect on their learning of having the same tutor or having different tutors each week. These themes include: an inconsistent teaching style; and poor follow-up and conflicting advice.

Theme 1. The relevance of public health to students' careers: 'The subject was relevant to me'

From the free text narrative data, most students reported having a paramedic tutor to teach them about public health made the subject more relevant and relatable to their future career. Some students were unsure how paramedic practice was related to public health when they first enrolled in PUB251. Because of this lack of knowledge about the relationship between these two disciplines, some students enrolled in the subject with little interest in learning about public health. However, they became interested when they realised the teachings were relatable to their discipline. One student responded:

"I felt paramedics did not have much of a part in public health prevention at the start of this unit. However, the tutors provided great explanations and examples of how paramedics are vital in preventive health care" (2013-2-34).

Theme 2. An improved understanding of public health: 'I can understand the subject better'

Having a paramedic tutor teaching public health improved paramedic students' understanding of the public health system. When students had difficulty understanding a topic, paramedic tutors could provide examples from their career experience to describe how paramedic practice is related to public health. One student responded:

"Having a paramedic tutor means that if I am unable to understand specific content, she was able to provide a contextual example of its relation to real world practice" (2013-1-6).

Paramedic tutors could share insight about public health issues

focussed from a paramedic perspective, rather than a public health outlook. Students reported the tutors made the subject more relevant to their future career and inspired them to be more interested and engaged in the subject. One student responded:

"I feel my understanding of public health was significantly helped by having a paramedic tutor as they were easier to relate with – sharing insight and stories relative to paramedics. I think this in turn has increased my participation in the class" (2013-1-31).

Theme 3. A realisation about the importance of public health: 'I can see why it is important'

When paramedic tutors discussed public health using real-life scenario examples of paramedic practice in their tutorials, most students reported greater insight about how paramedic practice contributed to the public health system. One student responded:

"I thought it was helpful as it meant we had somebody who could help us see how to get where we want to be. She helped me see how public health is important to working as a paramedic" (2013-1-27).

Paramedic tutors gave students a real-life perspective about how the decisions and actions of paramedics can impact the public health system. One student responded:

"The scenarios gave me a wider understanding of public health issues and how they can be addressed as well as how frameworks can be applied. The paramedical context was highly relevant" (2013-2-43).

These three themes can be considered a chronological timeline of the students learning experience in PUB251. Initially, students were unsure about the nexus between public health and paramedic practice. Paramedic tutors improved students' understanding of public health concepts, as well as being able draw from their career experience to demonstrate the relationship between public health and paramedic practice. The tutors' experiences and perspectives as a working paramedic provided insight about the students' future careers and how they would contribute to the public health system as paramedics.

Theme 4. An inconsistent teaching style: 'It was difficult to follow and absorb information'

From the free text narrative data, students taught by two or more tutors frequently reported the inconsistencies of teaching styles and differing opinions between tutors had made it difficult for them to understand and follow the subject content. One student responded:

"It was confusing as content was repeated or information was communicated differently each week due to a difference in opinion between tutors. I just think it would

have been more thorough and consistent hearing it from the same person" (2013-2-33).

Students reported the teaching styles and opinions between tutors were often contradictory. When students were provided with conflicting ideas, they felt confused and it made it difficult for them to learn about the topic. One student responded:

"It was useful having the information come from a paramedic who knew the context it would be in for us, but nothing was consistent. Having different tutors every week meant everything we were told was conflicting" (2012-2-150).

Theme 5. Poor follow-up and conflicting advice: 'I didn't know who to ask or whose advice to follow'

Some students reported having different tutors teaching each week made it difficult for them to know who to contact and follow-up for questions. One student responded:

"Because there was no continuous learning, each week the tutor only knew the content regarding that week. So, it was harder to ask them questions regarding previous week's information" (2012-3-100).

When tutors answered students' questions, students reported they were often provided with advice that varied greatly between tutors. Sometimes conflicting answers made it difficult for students to complete assessment tasks and study for examinations as they could not determine the best advice to follow. Having paramedic tutors was beneficial in helping students understand public health, but not when there were different tutors teaching each week. Two students responded:

"Very inconsistent learning style. They were never sure about questions asked and often we had very varying answers. Made exam study and assignment writing very difficult" (2012-2-169).

"Having the paramedic tutors helped us understand relevant course material. However, it made it very difficult in some aspects because messages were mixed along the way. More often than not, we would be told one thing about our assessment by one person and a completely different thing from another. Perhaps this was due to a lack of clarification about assessment details provided to students or a miscommunication between course coordinator and tutor" (2012-3-107).

These two themes showed different tutors teaching each week resulted in exposure to different teaching styles, opinions and advice. These differences were sometimes contradictory and made it difficult for students to learn about the topic and decide whose advice to follow for assessment tasks. Having different tutors also made it difficult for students to follow-up with

questions about the topics during each given week.

## Discussion

Public health education has shown to help medical and nursing students improve their researching, writing and project management skills (12-14). Previous studies have shown medical students' interest in public health is positively associated with how relevant they perceive public health to their discipline (15). Therefore, this study examined whether similar outcomes could be reproduced with paramedic students if an undergraduate public health unit was taught by a paramedic tutor. The authors also investigated if having the same tutor or different tutors each week had an effect on student learning.

This study showed paramedic tutors teaching public health helped students understand the role of paramedics in public health. Paramedic tutors used their career experience to explain public health concepts from a paramedic perspective and demonstrated how students will contribute to the public health system when they become paramedics. In other words, paramedic tutors helped to make public health topics more applicable to the paramedic discipline and more interesting to paramedic students. These findings indicate paramedic students – like medical students – were more engaged and interested in public health if they perceived it to be relevant to their career (15).

Researchers from Romania examined personality traits of effective teachers. Teachers who were good at empathising, building rapport with students and being adaptive were the most effective teachers (16). Furthermore, researchers from the United States examined the qualifications and experience of health education teachers on teaching quality and found teachers who held health education certification were better at teaching health education than teachers without certification (17). The findings of the present study showed paramedic tutors possessed similar positive traits when they taught public health to paramedic students. In summary, paramedic tutors were effective at teaching public health to paramedic students because their qualifications and expertise facilitated communicating the relevance of paramedics in public health than non-paramedic tutors. Additionally, paramedic tutors were better placed to answer questions and promote discussion about the role of paramedics in public health.

However, having different tutors teaching each week during the semester counteracted the benefits of having paramedic tutors. Tutors' teaching styles and opinions were often contradictory, making it difficult for students to learn and complete assessment tasks. The intention of having different tutors teaching each week was to expose students to different perspectives, opinions and ideas but findings indicate this confused the students and hindered learning. On the other hand, students with a single tutor reported little to no negative outcomes on their learning experience. These findings suggest paramedic students should

be taught by the same paramedic tutor throughout the semester to achieve positive learning outcomes.

## Strengths and limitations

This study has two significant strengths. First, the findings provide evidence paramedic students appreciate and value public health education in their curriculum if they perceive career relevance. This study is among the first to examine whether the tutor's disciplinary background has an effect on students' learning experience, whereas previous research focussed on the quality of the public health unit and case study projects (12,13,15,18). Second, this study had a high response rate. This study has three limitations. First, there is potential recall bias because students provided feedback about their learning experience of the whole semester at one time-point. Students are unlikely to recall their experiences of all lectures and tutorials. A time-series survey may provide a picture of changes in students learning experiences. Second, there is a risk of central tendency because students sat in groups during the tutorial session. This environment allows students to consult with each other while responding to the survey questions. Online surveys may reduce central tendency and improve anonymity. Third, the qualitative responses provided in the free text narrative data may have been compromised by preceding survey questions, group and cultural norms and feedback expectations. Semi-structured interviews may provide insight into a more holistic experience and eliminate peer influence.

## Conclusion

The findings of this study indicated paramedic students entered PUB251 with uncertainty about the relevance of paramedic practice to public health. By drawing from their career experience and explaining public health concepts through a paramedic perspective, paramedic tutors improved and facilitated the student learning experience. Teaching public health from a paramedic perspective enabled students to understand the relevance of paramedic practice and the role paramedics play in the public health system. However, these benefits are mitigated if the student is taught by different tutors each week. Different tutors often hold views that conflict with each other, which confused students and made learning difficult. This is because first year students have not developed advanced critical thinking and reasoning skills. Therefore, these findings suggest the optimal condition to engage paramedic students in learning about and becoming interested in public health is through a single paramedic tutor teaching the class throughout the semester.

## Acknowledgement

The authors would like to thank the paramedic students of PUB251 for offering their time and providing feedback about their learning experiences in PUB251.

## Competing interests

The authors declare no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

## Funding

This research was not funded.

## References

1. O'Meara P, Stirling C, Ruest M, Martin A. Community paramedicine model of care: an observational, ethnographic case study. *BMC Health Serv Res* 2016;16:39.
2. Sheringham J, Lyon A, Jones A, Strobl J, Barratt H. Increasing medical students' engagement in public health: case studies illustrating the potential role of online learning. *J Public Health* 2015;38:e316-24.
3. Wylie A, Leedham-Green K. Health promotion in medical education: lessons from major undergraduate curriculum implementation. *Educ Prim Care* 2017;28:325-33.
4. Farhangiz S, Salehi A, Rezaee R, Imanieh MH. Assessment of students' perspective about master of public health program in medical school of Shiraz University. *J Adv Med Educ Prof* 2016;4:39-43.
5. Kershaw G, Grivna M, Elbarazi I, et al. Integrating public health and health promotion practice in the medical curriculum: a self-directed team-based project approach. *Front Public Health* 2017;5:193.
6. Senior E, Telford M. Using an integrated teaching and learning approach to deliver inter-professional practice in public health. *Nurse Educ Today* 2015;35:1013-5.
7. Dewar DM, Bloom MS, Choi H, Gensburg L, Hosler A. The integrated first year experience in the master of public health program. *Am J Public Health* 2015;105:S97-8.
8. Frenk J, Hunter DJ, Lapp I. A renewed vision for higher education in public health. *ibid.* 2015;105:S109-13.
9. Williams B, Boyle M, Brightwell R, et al. A cross-sectional study of paramedics' readiness for interprofessional learning and cooperation: results from five universities. *Nurse Educ Today* 2013;33:1396-75.
10. Hou X, Rego J, Service M. Paramedic education opportunities and challenges in Australia. *Emerg Med Australas* 2013;25:114-9.
11. Liamputtong P. *Qualitative research methods* (5th edn). Australia: Oxford University Press, 2019.
12. Farhangiz S, Salehi A, Rezaee R, Imanieh MH. Assessment of students' perspectives about master of public health in medical school of Shiraz University. *J Adv Med Educ Prof* 2016;4:39-43.
13. Kershaw G, Grivna M, Elbarazi I, et al. Integrating public health and health promotion practice in the medical curriculum: a self-directed team-based project approach. *Front Public Health* 2017;5:1-9. doi:10.3389/fpubh.2017.00193

14. Duffy SA, McCullagh M, Lee C. Future of advanced practice public health nursing education. *J Nurs Educ* 2015;54:102-5.
15. Wylie A, Leedham-Green K. Health promotion in medical education: lessons from a major undergraduate curriculum implementation. *Educ Prim Care* 2017;28:325-33. doi:10.1080/14739879.2017.1311776
16. Duta N, Tomoaica E, Panisoara G. Desirable characteristics defining to describe an effective teacher. *Procedia Soc Behav Sci* 2015;197:1223-9. doi:10.1016/j.sbspro.2015.07.383
17. Murray CC, Sheremenko G, Rose ID, et al. The influence of health education teacher characteristics on students' health-related knowledge gains. *J School Health* 2019;89:560-8. doi:10.1111/josh.12780
18. Kolchraiber F, De Oliveira Freitas M, De Santana C, et al. Pedagogical strategy for teaching and learning epidemiology in nursing undergraduate school. *Rev Bras Enferm* 2019;72:414-9. doi:10.1590/0034-7167-2018-0077