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# Impact of the learning context on undergraduate healthcare students' evidence-based practice confidence and attitudes

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## Abstract

*Evidence-based practice (EBP) is a complex process of enquiry and reasoning undertaken by practitioners to ensure defensible healthcare decisions are made. This study investigated the impact of different learning contexts on undergraduate healthcare students' EBP confidence and attitudes. Within a broader project, 231 third- and fourth-year students in 20 undergraduate healthcare degrees in one Australian university completed an online survey. Students were asked to indicate: the context(s) in which they could remember learning EBP skills (in a research-focused subject, in a non-research-focused subject, and/or during workplace learning); their frequency of exposure to research articles in different learning contexts in the past year; and their levels of EBP confidence and other attitudinal target variables. There was no association between learning EBP skills in a research subject and any target variable. Learning EBP skills in a non-research (e.g., clinically focused) subject or during workplace learning was associated with higher levels of EBP confidence ( $p < 0.05$ ) and pro-EBP attitudes. In addition, there was a positive relationship between exposure to research articles and EBP confidence, found to be strongest when exposure to the research occurred in the context of practice-based learning ( $\rho = 0.42$ ,  $p < 0.001$ ). The findings show that the curricular context in which EBP skills are taught impacts on students' EBP confidence and attitudes. Teaching EBP skills in research-focused subjects may be necessary, but it is insufficient for maximising confidence and attitudes conducive to EBP. These findings are relevant to curriculum designers and educators seeking to enhance the effectiveness of undergraduate EBP education.*

**Keywords:** Evidence-based practice, undergraduate education, allied health, nursing, social work, curriculum design

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Universities providing undergraduate training for healthcare practitioners invest significantly in delivering curricula intended to teach students how to find, evaluate, and appropriately apply research evidence for professional practice. This is important in degrees preparing students for healthcare professions where there are mandated standards relating to evidence-based practice (EBP). Arguably, efforts to build students' knowledge and skills for EBP are wasted if students do not feel a resultant sense of confidence and commitment to engage in EBP in their professional practice. For the substantial resources invested in training undergraduate students in the skills of EBP, universities should produce EBP-confident graduates.

Various definitions of EBP have been published (e.g., Dawes et al. 2005; Hoffmann, Bennett & Del Mar 2017; Melnyk et al. 2010), but common to most is the notion that EBP is a question-in-context driven, client-centred process in which healthcare practitioners in situations of uncertainty seek out and judiciously incorporate relevant research evidence in their professional decision-making. It involves engaging in professional reasoning that takes into account the best available research evidence, their own and other clinicians' experience-based wisdom, their clients' individual situations and preferences, and the characteristics of the practice context (Hoffmann, Bennett & Del Mar 2017).

Operationally, EBP involves five steps, each of which requires training and practice (Dawes et al. 2005; Hitch & Nicola-Richmond 2017; Hoffmann, Bennett & Del Mar 2017; Khan & Coomarasamy 2006; Malik, McKenna & Griffiths 2017; Melnyk et al. 2010; Villanueva et al. 2001). EBP requires practitioners to: (1) Ask – Recognise situations of uncertainty and translate that uncertainty into answerable questions; (2) Acquire – Find the best research evidence available, if there is any, on those questions; (3) Appraise – Judge that evidence for its applicability to their situation and its validity/trustworthiness; (4) Apply – Act on the evidence if appropriate, following a process of reasoning that incorporates their own and other clinicians' learned wisdoms, client factors, and the practice context; and (5) Assess – Evaluate their reasoning processes and the outcomes of their decisions, to build experience-based evidence for their future practice.

However, significant barriers to implementing EBP have been documented (Curtin & Jaramazovic 2001; Harding et al. 2014; Harvey & Kitson 2015; Verloo, Desmedt & Morin 2017; Zwolsman et al. 2013): a lack of access to, or skills to access, research evidence; perceived inaccessibility in the way research is reported; perceived lack of available research evidence that is relevant and applicable; a lack of confidence to engage in EBP; and a lack of time to engage in EBP. Some of these obstacles are issues for researchers, research funders, publishers, and service managers to address (O'Halloran, Porter & Blackwood 2010; Rousseau & Gunia 2016). However, a range of EBP

obstacles might be overcome by better pre-service healthcare-professional training. Indeed, the perceived lack of time commonly cited as a barrier to EBP may in part be a proxy for barriers related to inadequate training. For example, a lack of skill in identifying types of practice decisions that can be informed by research, a lack of skills to appropriately formulate questions and efficiently search for relevant research, and/or a lack of the skills and confidence required to quickly dismiss irrelevant or poor quality research would make EBP impracticably time consuming in any practice context.

Indeed, many healthcare practitioners report a lack of confidence in their skills to engage in EBP (Curtin & Jaramazovic 2001; Graue et al. 2010; Saunders & Vehviläinen-Julkunen 2016; Zwolsman et al. 2013). Failure to produce EBP-confident graduates is problematic, as integration of research into professional reasoning means opportunities to optimise health outcomes may be missed. EBP is also important for avoiding inefficient, ineffective, and dangerous practices (Dawes et al. 2005; Grimshaw, Eccles & Tetroe 2004). Moreover, funds invested into research go to waste when research is not duly considered in healthcare decision-making. Improved pre-service EBP education might assist in overcoming obstacles linked to poor EBP skills and confidence.

It is well accepted that the development of EBP skills requires training. However, others have shown that it is difficult to teach EBP in a way that assists students to translate EBP knowledge into practice (Kahn & Coomarasamy 2006; Del Mar, Glasziou & Mayer 2004; Thomas, Saroyan & Dauphinee 2011). It remains unclear which specific kinds of learning experience are most effective for enhancing students' EBP competence and confidence (Dizon, Grimmer-Somers & Kumar 2012; Hecht, Buhse & Meyer 2016). Few studies have been conducted in universities with pre-service healthcare practitioners. Among the rare examples are studies by Bennett, Hoffmann and Arkins (2011) and Ruzafa-Martínez and colleagues (2016). These studies evaluated the immediate impact of specific, stand-alone EBP subjects/courses on student knowledge, skills and attitudes, employing a quasi-experimental design.

To date, there is no published research investigating what learning students take from their overall undergraduate training in relation to research evidence and EBP. Taking a realist perspective (Wong et al. 2012), it is reasonable to expect that the entirety of a student's learning experiences throughout their undergraduate training might have a more powerful influence on their EBP confidence and attitudes than any single EBP-focused subject they complete does. The present study investigated associations between the broad curricular contexts in which EBP skills are addressed, as possible influencing variables, and students' EBP confidence and attitudes, as the target variables.

## **METHODS**

### **DESIGN**

This study focused on the relationship between students' past curricular experiences and their current EBP confidence and attitudes, in students undertaking the third or fourth year of their undergraduate training. This study formed part of a broader project in which students in all year levels of Charles Sturt University's (CSU's) undergraduate healthcare degrees were invited to contribute to an anonymous online survey. Prior to data collection, Charles Sturt University Human Research Ethics Committee approved this research (Protocol Number H17113).

### **PARTICIPANTS**

In the broader project, across all year levels, a total of 584 students from 20 health and social care degree courses responded to the survey; however, only students in the third or fourth year of their degree were the focus in the current study. Across all 20 courses, 185 third-year students responded to the survey. Across the eight courses with a duration longer than three years, a total of 46 fourth-year students participated. Therefore, for the purposes of the current study, data from a total of 231 students was analysed. The composition of the sample is shown in Table 1. Most respondents were studying Nursing, Clinical Practice (Paramedic), Social Work, Physiotherapy, and Medical Radiation Science. The response variation across courses generally reflected cohort size variations.

### **DATA COLLECTION PROCEDURE**

The survey was emailed to all CSU's healthcare students at the beginning of Session 2 (midway through the academic year). The students were initially contacted via a generic course-level email. The email included a link to the participant information sheet and survey. The email message conveyed our interest in 'negative, neutral and positive views students have' and encouraged responses from students regardless of whether they knew 'very little or a lot' about research and EBP. Voluntary informed consent was deemed to have occurred if a student chose to proceed. In addition, all academics teaching subjects in the included courses were asked to assist in promoting the survey to their students, by including the link in their subject site announcements and/or verbally encouraging students to complete the survey outside of their class time.

### **SURVEY DESIGN**

The survey was designed to gather anonymous demographic information about each student, their course experience so far, and their confidence and attitudes regarding EBP.

**Table 1. Sample composition and course information**  
(*n* = 231)

Bachelor course	Length of course	Percentage of total sample (%)	Percentage of total sample by year level (%)		Timing of first formal WPL experience <sup>a</sup>
			Year 3 students	Year 4 students	
B Clinical Practice (Paramedic)	3 years	11.8	11.4	N/A	Year 2
B Clinical Science	3 years	0.9	0.9	N/A	No WPL
B Dental Science	5 years	3.1	1.3	1.8	Year 2
B Exercise and Sport Science	3 years	1.3	1.3	N/A	Year 2
B Health and Rehabilitation Science	3 years	1.8	1.8	N/A	Year 1
B Health Science (Complementary Med)	3 years	4.8	4.8	N/A	No WPL
B Health Science (Food and Nutrition)	3 years	3.1	3.1	N/A	No WPL
B Health Science (Mental Health)	3 years	1.8	1.8	N/A	Year 1
B Medical Radiation Science	4 years	7.5	5.7	1.8	Year 1
B Medical Science	3 years	6.1	6.1	N/A	Year 2
B Nursing	3 years	20.2	20.2	N/A	Year 1
B Occupational Therapy	4 years	1.8	0.0	1.8	Year 1
B Pharmacy	4 years	1.3	0.9	0.4	Year 1
B Physiotherapy	4 years	9.7	6.1	3.5	Year 1
B Podiatric Medicine	4 years	0.9	0.0	0.9	Year 1
B Social Science (Psychology)	3 years	0.9	0.9	N/A	No WPL
B Social Work	4 years	10.5	6.1	4.4	Year 3 Session 1
B Social Welfare	3 years	6.6	6.6	N/A	No WPL
B Speech and Language Pathology	4 years	3.5	3.1	0.4	Year 1
B Vet Biology / Vet Science	6 years	2.6	1.3	1.3	Year 1
Total		100.0	80.3	19.7	

<sup>a</sup>WPL = Workplace learning

## DEMOGRAPHIC VARIABLES

In the interests of transparency and replicability, demographic and course-enrolment information was collected for reporting purposes. Demographic information was collected regarding each student's age-group, gender, cultural and ethnic group (using Australian Bureau of Statistics categories, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/1249.0>), and prior qualification level (using the Australian Qualifications Framework levels, <https://www.aqf.edu.au/aqf-levels>).

## **COURSE VARIABLES**

The survey collected the student's course name, whether or not the course was an integrated honours degree, the student's enrolment mode (full-time or part-time; on campus, online, or blended mode), and their current year level ('What year level do you currently most identify with?' 'What year level are all or most of your current subjects?').

## **CURRICULAR CONTEXT VARIABLES**

### **CONTEXT OF LEARNING EBP SKILLS**

Respondents were asked, 'Ever since you started your course at CSU has your course covered anything about "research"?' This question was asked in relation to four different skill sets: how to do research of my own; how to find research reports; how to read and understand research reports; and how to evaluate or judge the worth of research reports. For each, students could select one or more responses:

- I have no experience of this in my course yet.
- This has been covered in a research methods subject.
- This has been covered in a subject not specifically about research.
- I learned about this while on placement/workplace learning.

### **RECENT RESEARCH EXPOSURE**

Respondents were asked, 'How often have you looked at research in the past year?' Respondents were given the following definition of research: 'A research report/article explains how information was collected and analysed by the researchers to answer their research question(s). Methods are described under a heading such as "Methods" or "Methodology" and results are shown under a heading such as "Results" or "Findings".' The aforementioned question was asked in relation to three different purposes/contexts:

- to complete an assignment;
- to prepare for a test or exam; and
- during practice-based learning (workplace or simulated).

The answer options for respondents were:

- 1.** I have not looked at any research report.
- 2.** I have looked at only one research report.
- 3.** I have looked at two research reports.
- 4.** I have looked at 3 to 5 research reports.
- 5.** I have looked at more than 5 research reports.

This variable was treated as a categorical variable and a scale variable in different analyses.

## TARGET VARIABLES

### EBP CONFIDENCE

Respondents were asked, 'How confident do you feel in each of the following skills?' Each skill (or skill set) could be rated on a five-point scale where 1 meant 'I feel not at all capable' and 5 meant 'I feel very capable'. Feeling 'very capable' was deemed to indicate the highest level of confidence. The skills mirrored the five steps of EBP, with Step 3 being divided into two skills. Thus, six skills were listed:

- recognising the types of question research reports can answer;
- finding research reports relevant to my questions;
- judging the validity of research evidence;
- judging the relevance/usefulness of research evidence;
- applying research evidence to practice; and
- evaluating the impact of applying research evidence.

Overall EBP confidence scores were derived by calculating a mean confidence score for each respondent across all six skills. This variable was treated as a categorical variable and a scale variable.

### EBP PROFESSIONAL IDENTITY

Respondents were asked, 'How much is evidence-based practice part of your professional identity?' Respondents answered on a five-point scale where 1 meant not at all and 5 meant to a very large extent. This variable was treated as a scale variable.

### PERCEIVED PROFESSION IMPACT

Respondents were asked, 'How would you rate the impact of research evidence in the profession you are training to enter?' Respondents selected from five options:

1. I don't know how impactful research evidence is in my profession.
2. Research seems to rarely impact on practice in my profession.
3. Research seems to sometimes impact on practice in my profession.
4. Research seems to often impact on practice in my profession.
5. Research seems to guide almost all practice in my profession.

This variable was treated as a scale variable.

### PERCEIVED PERSONAL IMPACT

Respondents were asked, 'How much has research you have read impacted on you as an emerging health professional?' Respondents selected from five options:

6. I have never read any research report.
7. The research I have read did not affect me at all.
8. The research I have read affected me a little.

9. The research I have read affected me moderately.

10. The research I have read affected me substantially.

This variable was treated as a scale variable.

## DATA ANALYSES

Descriptive statistics were calculated for all key variables. Relationships between categorical variables and continuous, normally distributed dependent variables were tested with the Independent Groups t-test, where two groups were compared. Where the dependent variable was not normally distributed, the Wilcoxon signed-rank test was used. Pearson's  $r$  or Spearman's  $\rho$  (rho) correlations were computed, depending on whether parametric assumptions were met ( $r$ ) or not ( $\rho$ ). Cohen's (1988) guidelines were followed when interpreting the strength of correlation coefficients: small = 0.10, medium = 0.30, large = 0.50. Microsoft Excel and IBM SPSS Statistics 24 software packages were used.

## RESULTS

### DEMOGRAPHIC VARIABLES

The largest group of respondents (41.8%) were aged 21–25 years. Almost a third of respondents (32.7%) were aged 26–35 years. One quarter (25.5%) were aged 36–45 years. Female students comprised 77.8% of the sample. Most (81.3%) of the respondents were non-Indigenous Australian; 4% were Aboriginal or Australian South Sea Islander people. A significant minority (14.5%) started their current degree with no previous qualification, 11.8% with a senior secondary certificate, and 10.5% following a previous bachelor degree. The remaining 63.2% of students had started their degree with a TAFE certificate, diploma or associate degree.

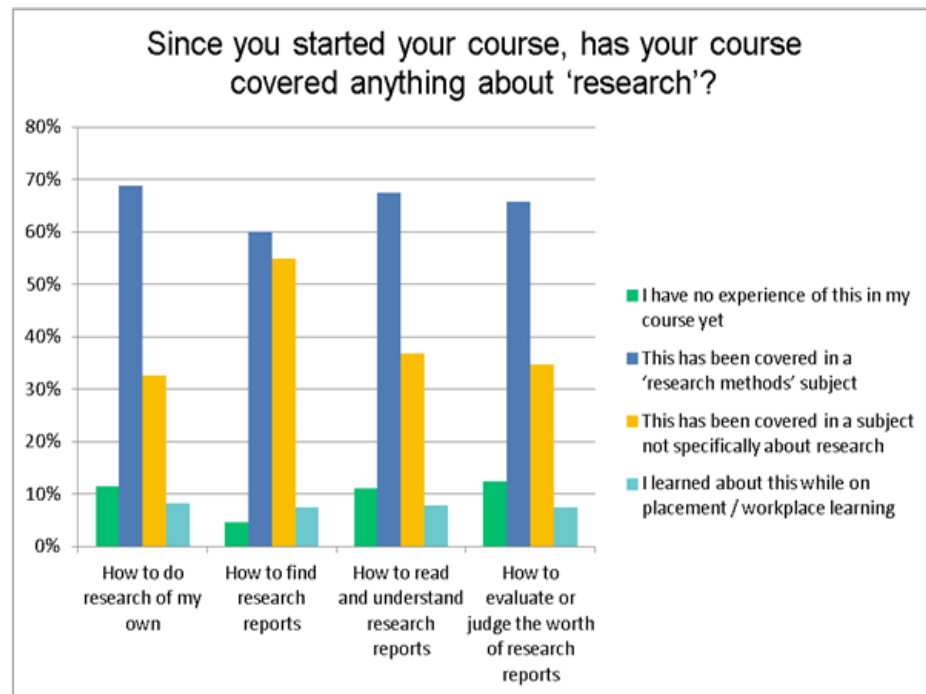
### COURSE VARIABLES

The respondents' bachelor courses are listed in Table 1. Only 2.6% of respondents were enrolled in a bachelor honours stream of their degree. Most (63.5%) of the sample was studying full-time. Similar proportions were studying fully on campus (43%) versus online (46%), and 11% were studying in a blended mode.

### CURRICULAR CONTEXT VARIABLES

Figure 1 shows the contexts in which respondents recalled learning EBP skills in their course so far. Between approximately one-third and 55% of the students recalled learning EBP skills in a non-research focused (e.g., clinically focused) subject. Less than 10% of the students recalled learning these skills during workplace learning (WPL) experiences.





**Figure 1:** The curricular context of exposure to evidence-based practice (EBP) skills in Year 3 and 4 students from 20 CSU healthcare degree courses ( $n = 231$ )

Table 2 shows how often the respondents 'looked at' research in the past 12 months in different learning contexts. Of the contexts in which recent research exposure might have occurred, exposure to research during practice-based learning was less frequent ( $m = 3.61$ ) than exposure to research to complete an assignment ( $m = 4.75$ ), but more frequent compared with to prepare for a test or exam ( $m = 3.16$ ).

### TARGET VARIABLES

Table 3 shows the respondents' EBP confidence levels across the six EBP skills. The overall EBP confidence score was  $m = 3.49$  ( $SD = 0.84$ ). The mean EBP professional identity score was  $m = 4.05$  ( $SD = 0.92$ ). The mean perceived profession impact score was  $m = 4.21$  ( $SD = 0.77$ ). The mean perceived personal impact score was  $m = 3.96$  ( $SD = 0.75$ ).

**Table 2. Self-reported frequency of exposure to research reports of Year 3 and 4 students from 20 CSU healthcare degree courses ( $n = 231$ ) in the 12 months preceding the survey**

Purpose/context	Recent research exposure categories				Average ( $m$ )
	No research report (%)	1 or 2 research reports (%) <sup>a</sup>	3 to 5 research reports (%)	More than 5 reports (%)	
To complete an assignment	1	4.5	12.0	82.5	4.75
To prepare for a test or exam	27.6	29.2	14.1	29.1	3.16
During practice-based learning (workplace or simulated)	16.7	22.9	26.0	34.4	3.61

<sup>a</sup>Two categories are collapsed in this column

**Table 3. Percentages of respondents selecting each confidence level for Evidence-Based Practice (EBP) skills for Year 3 and 4 students from 20 CSU healthcare degree courses ( $n = 231$ )**

	Respondents selecting each level of confidence (%)					Average ( $m$ )
	5 = 'I feel very capable'					
	1	2	3	4	5	
Recognising the types of question research reports can answer	4.8	11.5	39.2	29.7	14.8	3.38
Finding research reports relevant to my questions	2.9	7.2	20.6	41.2	28.2	3.85
Judging the validity of research evidence	5.3	15.8	35.4	31.6	12.0	3.29
Judging the relevance/usefulness of research evidence	2.9	8.1	30.1	39.2	19.6	3.65
Applying research evidence to practice	2.9	12.0	37.5	29.8	17.8	3.48
Evaluating the impact of applying research evidence	6.2	13.4	40.2	28.7	11.5	3.26

For the EBP skills shown in Figure 1, whether or not a student believed the skill had been covered in a 'research methods' subject (measured categorically) had no association with any target variable ( $p > 0.05$ ). However, significant associations with target variables were observed when students' learning within non-research (e.g., clinically) focused subjects was examined. Students who believed that 'how to find research reports' had been covered in a non-research subject felt more strongly that they had been personally impacted by research in their professional development ( $m = 4.07$ ) compared with students who could not recall this being covered in a non-research subject ( $m = 3.83$ ,  $p < 0.05$ ). Students who believed that 'how to read and understand research' had been covered in a non-research subject also endorsed higher levels of perceived personal impact ( $m = 4.14$  versus  $m = 3.86$ ,  $p < 0.01$ ) and had greater overall EBP confidence ( $m = 3.63$  versus  $m = 3.41$ ,  $p < 0.05$ ). Finally, students who believed that 'how to

judge the worth of research' had been covered in a non-research subject endorsed higher levels of EBP confidence ( $m = 3.65$  versus  $m = 3.40$ ,  $p < 0.05$ ).

Significant associations with target variables were also observed when students' learning during workplace learning (WPL) was examined. Students who recalled learning about 'how to read and understand research' during WPL endorsed higher levels of perceived personal impact ( $m = 4.41$  versus  $m = 3.91$ ,  $p < 0.01$ ), perceived profession impact ( $m = 4.59$  versus  $m = 4.18$ ,  $p < 0.05$ ), and EBP confidence ( $m = 3.83$  versus  $m = 3.46$ ,  $p < 0.05$ ). These effects are larger than the corresponding effects of learning 'how to read and understand research' in a non-research subject, displayed above.

Also, exposure to research in the past year was positively associated with EBP confidence, with a moderately strong effect size ( $\rho = 0.43$ ,  $p < 0.001$ ). Exposure to research during practice-based learning had the strongest correlation with EBP confidence ( $\rho = 0.42$ ). The next strongest correlation was found for exposure to research to complete an assignment ( $\rho = 0.37$ ). The weakest correlation was found for exposure to research to prepare for a test or exam ( $\rho = 0.27$ ).

Finally, EBP confidence was positively correlated with perceived personal impact of research ( $r = 0.36$ ,  $p < 0.001$ ) and EBP professional identity ( $r = 0.25$ ,  $p < 0.001$ ). Stronger EBP professional identity was also associated with greater perceived profession impact ( $r = 0.38$ ,  $p < 0.001$ ). All other associations between the curricular context variables and target variables were either not statistically significant ( $p > 0.05$ ) or weak ( $\rho$  or  $r < 0.2$ ).

## DISCUSSION

This study explored relationships between the context in which undergraduate healthcare students have read research articles and learnt about EBP, on the one hand, and their EBP confidence and attitudes, on the other. Third- and fourth-year students in 20 CSU healthcare degree courses contributed to this study via an online survey midway through the academic year. Overall, the respondents expressed positive attitudes regarding the role of research in their own professional development and the role of research in the profession they were training to enter. They also tended to feel that EBP was an important part of their professional identity. Confidence in the various EBP skills varied between skills and between students but, overall, EBP confidence levels were moderate.

Our study found that teaching EBP skills in non-research focused (e.g., clinically focused) subjects and during workplace learning (WPL) contributed to students' EBP confidence and positive attitudes, beyond any contribution made by research-focused subjects. Students who learnt EBP skills outside of a research-methods subject tended to feel more confident about their EBP skills. These same students, compared with students who had only learnt EBP skills in a research-focused subject, also tended to feel more strongly that research evidence impacted on the profession they were training to enter and that research evidence impacted on their own professional

development. It was concerning, therefore, that only one-third to one half of the third- and fourth-year students surveyed in this study reported learning EBP skills in any subject other than a research-focused subject. Few students recalled learning EBP skills during a WPL experience, even though students in most courses had experienced at least one formal WPL placement prior to completing the survey. Another key finding was that students' exposure to research articles was significantly correlated with EBP confidence. Research exposure during practice-based learning (workplace or simulated) was more strongly linked to their EBP confidence compared with exposure to research for the purpose of completing tests or assignments.

Together, these findings are important for the design of students' EBP learning experiences. It makes sense that looking at research with a real EBP purpose – driven by questions concerning clients in real-world contexts – would have a larger positive impact on EBP confidence than looking at research for an assignment. University assignments often require students to access and appraise research (Malik, McKenna & Griffiths 2017), giving students practice at Steps 2 and 3 of EBP but not necessarily Steps 1, 4 or 5. To become fully EBP-proficient, students need practice at 'joining up' the steps of EBP in a client-centred contextualised way, starting with Step 1. Real or simulated practice settings provide an ideal context in which to facilitate such practice. However, 17% of the respondents in this study reported that they had not looked at any research for practice-based learning purposes in the past year, and a further 23% of the respondents reported looking at only one or two research reports in a practice-based context.

Given that incomplete and over-simplistic notions of EBP are in circulation that limit the potential of EBP to enhance healthcare (Patterson-Silver Wolf, Dulmis & Maguin 2012; Swinkels et al. 2002), it is important to teach future graduates that EBP is different from simply adopting empirically supported treatments. A university task that requires a student to first read some research, and then propose how that research should impact on practice, runs the risk that students learn what we propose should be termed 'research-reactive practice', rather than EBP. EBP, in contrast, starts with a situation of uncertainty about how to best assess, diagnose, treat, advise or care for clients in a particular practice context (Hoffmann, Bennett & Del Mar 2017). Some research deserves attention in the absence of recognised uncertainty and warrants widespread changes in practice. However, simply adopting new practices in response to research is not EBP, and research findings should never dominate over client preferences or judicious practitioner reasoning.

To counteract naive notions that students might otherwise develop when studying research articles in the absence of authentic practice contexts, practice-based learning provides opportunities to teach EBP as a process of client-centred and contextualised professional inquiry and reasoning.

The relationship observed in this study between research exposure and EBP confidence is probably causal, but not necessarily directly or uni-directionally causal. For example, it is possible that exposure to research articles during practice-based learning may lead to increased EBP confidence. However, it is equally feasible that higher levels of EBP confidence may lead a student to seek out research more often in their practice-based learning. In other words, there may be a positive feedback loop in operation; a bi-directional causal relationship between EBP confidence and research exposure. Regardless of the nature of the relationship, the fact that research exposure and EBP confidence are positively linked suggests that educational designers, academics and clinical educators should work to maximise students' confidence in the skills of EBP and their authentically purposeful exposure to research. At least one of these variables is likely to impact on the other; probably both.

The findings of this study prompt questions about the worth of delivering EBP skills training in research-focused subjects at all. However, they do not suggest that research-focused subjects have no role to play in preparing students for EBP. The knowledge and skills learnt in research-focused subjects can provide important foundations on which students' practice-focused subjects can build. We suggest that research-focused subjects are best viewed as 'necessary but insufficient' for preparing students for EBP. Teaching students how to understand and evaluate research articles in both research and non-research focused subjects appears necessary to maximise students' preparedness for EBP careers.

Attention has previously been drawn to the importance of WPL experiences in students' development of EBP skills and confidence (Towns & Ashby 2014; Hitch & Nicola-Richmond 2017; Westwater-Wood, Hendrick & Diver 2014; Zhang et al. 2012). Practitioners require a number of attributes to be effective WPL educators, including: being a competent practitioner and capable teacher (Higgs & Mcallister 2007); being able to balance client and student needs and priorities (Rodger et al. 2011); and being able to clearly articulate to students the reasoning and decision-making processes involved in the therapy process (Ajjawi & Higgs 2008). However, research shows that not all experienced practitioners engage in EBP (Harding et al. 2014; Jette et al. 2003; Thomas & Law 2013; Verloo, Desmedt & Morin 2017), and it is possible that WPL supervisors may not be an exception. WPL supervisors may not necessarily have the capacity to confidently model, facilitate and assess students' EBP, potentially impacting on students' EBP learning (Brooke, Hvalič-Touzery & Skela-Savič 2015; Fiset, Graham & Davies 2017; Zhang et al. 2012). Further research in this area is important to understand how best to support WPL supervisors to facilitate and assess their students' EBP skills.

When healthcare degrees claim to prepare graduates for EBP, it is important that university assessments, including WPL supervisor reports, include an explicit focus on the attributes and skills required for EBP, beginning with a spirit of enquiry; that is, responding questioningly in situations of professional uncertainty (Melnyk et al. 2010).

The apparent lack of focus on EBP skills in practice-focused learning contexts uncovered in this study may or may not be redressed by the end of students' courses. Further investigation is warranted on this question.

## LIMITATIONS

It is important to note that the respondents in this study were only halfway through their third or fourth year of study. Some students may have been yet to undertake practice-based learning experiences, during which they might look at research and practice the skills involved in EBP. Only 43 fourth-year students responded to the survey. Without surveying a large proportion of students at the end of their degree, it is not possible to determine the full extent to which they focus on EBP skills before they graduate. Nonetheless, the correlations between variables observed in this study were moderate-to-strong and statistically significant, indicating the importance of students learning EBP skills in practice-based learning contexts. We found that such learning, when it did happen, was significantly positively correlated with students' EBP confidence and attitudes. While it is probably helpful for undergraduate students to begin to learn EBP skills in their research-focused subjects, these skills should be contextualised and consolidated in their other subjects, especially in practice-based learning contexts.

Another limitation is that it is possible that students who feel positively about research and/or EBP may be over-represented among the respondents in this study. The views and confidence levels felt by the respondents are not necessarily representative of all healthcare students at this university or elsewhere. However, we encouraged 'positive, negative and neutral' views when inviting students to participate in this study, which we hoped would minimise sampling bias. Regardless, any lack of representativeness of the recruited students does not detract from the significant associations between variables observed in this study.

Finally, it is important to note that only students' perceptions were collected. A student's memory of having learned something was treated as a proxy for their actual learning. Moreover, students' actual EBP skills were not assessed. It is wrong to assume that confidence is equivalent to competence (Barnsley et al. 2004) or that attitudes always predict behaviour (Glasman & Albarracín 2006). Nonetheless, achieving high levels of EBP confidence and attitudinal commitment to EBP in healthcare graduates are important educational goals. If a student's EBP confidence is low, it is likely that their skills to engage in EBP are limited.

However, even if a student's EBP skills are strong when they graduate, without confidence and positive attitudes in relation to EBP, they are unlikely to take an EBP approach in their practice.

## CONCLUSIONS

This study found that third- and fourth-year students who recalled being taught EBP skills in non-research focused (e.g., clinically focused) subjects, compared with students who could not, felt that the research they had been exposed to had more substantially impacted their development as a healthcare professional, and they felt higher levels of EBP confidence. In addition, students who recalled learning EBP skills during WPL had higher EBP confidence, and felt that research evidence had a greater impact on their professional development and on their profession *per se*, compared with students who did not recall such learning during WPL. Recalling learning EBP skills in a research-focused subject did not differentiate students on any target variable. This study also found that students who reported being more frequently exposed to research reports, especially in practice-based learning contexts, tended to have greater confidence in their EBP skills.

In sum, we found that learning experiences interact with their curricular contexts in the development of students' EBP confidence and attitudes. Based on our findings, we recommend that universities facilitate student exposure to research articles for a range of purposes, including in practice-based learning contexts; not just for the purpose of appraising research in research-focused subjects.

These findings raise important questions for future research: What do non-research subject teachers and WPL supervisors understand to be their role in developing students' EBP skills and attitudes? How capable and supported do they feel to facilitate the development of future evidence-based practitioners? How is EBP currently being taught and assessed, particularly in practice-based learning contexts? Further research on these questions will be important in identifying strategies to better facilitate the development and assessment of students' EBP skills and to strengthen students' confidence and attitudinal commitment to EBP as a way of practicing. Further research in this area is important given that universities are increasingly required to provide evidence to government and professional bodies regarding claims made about their students' learning outcomes.

## Conflict of interest

The author declares no potential conflicts of interest with respect to the research, authorship and/or publication of this article

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## References

Ajjawi R & Higgs J (2008) Learning to reason: A journey of professional socialisation. *Advances in Health Sciences Education: Theory and Practice* 13: 133–150. doi: 10.1007/s10459-006-9032-4

- Barnsley L, Lyon PM, Ralston SJ, Hibbert EJ, Cunningham I, Gordon FC & Field MJ (2004) Clinical skills in junior medical officers: A comparison of self-reported confidence and observed competence. *Medical Education* 38: 358–67. doi: 10.1046/j.1365-2923.2004.01773.x
- Bennett S, Hoffmann T & Arkins M (2011) A multi-professional evidence-based practice course improved allied health students' confidence and knowledge. *Journal of Evaluation in Clinical Practice* 17: 635–9. doi: 10.1111/j.1365-2753.2010.01602.x
- Brooke J, Hvalič-Touzery S & Skela-Savič B (2015) Student nurse perceptions on evidence-based practice and research: An exploratory research study involving students from the University of Greenwich, England and the Faculty of Health Care Jesenice, Slovenia. *Nurse Education Today* 35: 6–11.
- Cohen J (1988) *Statistical Power Analysis for the Behavioral Sciences*. 2nd Edition. Hillsdale, NJ, USA: Lawrence Erlbaum Associates.
- Curtin M, & Jaramazovic E (2001) Occupational therapists' views and perceptions of evidence-based practice. *British Journal of Occupational Therapy* 64: 214–22. doi.org/10.1177/030802260106400502
- Dawes M, Summerskill W, Glasziou P, Cartabellotta A, Martin J, Hopayian K, Porzsolt F, Burls A & Osborne J (2005) Sicily statement on evidence-based practice. *BMC Medical Education* 5: 1. doi: 10.1186/1472-6920-5-1
- Del Mar C, Glasziou P & Mayer D (2004) Teaching evidence based medicine. *British Medical Journal* 329: 989. doi: 10.1136/bmj.329.7473.989
- Dizon JMR, Grimmer-Somers KA & Kumar S (2012) Current evidence on evidence-based practice training in allied health: A systematic review of the literature. *International Journal of Evidence-Based Healthcare* 10: 347–60. doi: 10.1111/j.1744-1609.2012.00295.x
- Fiset V, Graham I & Davies B (2017) Evidence-Based Practice in clinical nursing education: A scoping review. *Journal of Nursing Education* 56: 534–541.
- Glasman LR & Albarracín D (2006) Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation. *Psychological Bulletin* 132: 778–822. doi: 10.1037/0033-2909.132.5.778
- Graue M, Bjarkøy R, Iversen MM, Haugstvedt A & Harris J (2010) Integrating evidence-based practice into the diabetes nurse curriculum in Bergen. *European Diabetes Nursing* 7: 10–5. doi: 10.1002/edn.148
- Grimshaw J, Eccles M & Tetroe J (2004) Implementing clinical guidelines: Current evidence and future implications. *Journal of Continuing Education in the Health Professions* 24: S31–S7. doi: 10.1002/chp.1340240506
- Harding EK, Porter FJ, Horne-Thompson FA, Donley FE & Taylor FN (2014) Not enough time or a low priority? Barriers to Evidence-Based Practice for allied health clinicians. *Journal of Continuing Education in the Health Professions* 34: 224–31.



- Harvey G & Kitson A (2015) Translating evidence into healthcare policy and practice: Single versus multi-faceted implementation strategies – is there a simple answer to a complex question?(Editorial) *International Journal of Health Policy and Management* 4: 123. doi: 10.15171/ijhpm.2015.54
- Hecht L, Buhse S & Meyer G (2016) Effectiveness of training in evidence-based medicine skills for healthcare professionals: A systematic review. *BMC Medical Education* 16: 103–119. doi: 10.1186/s12909-016-0616-2
- Higgs J & Mcallister L (2007) Being a clinical educator. *Advances in Health Sciences Education* 12: 187–200. doi: 10.1007/s10459-005-5491-2
- Hitch D & Nicola-Richmond K (2017) Instructional practices for evidence-based practice with pre-registration allied health students: A review of recent research and developments. *Advances in Health Sciences Education* 22: 1031–45. doi: 10.1007/s10459-016-9702-9
- Hoffmann T, Bennett S & Del Mar C (2017) *Evidence-Based Practice Across the Health Professions*. 3rd Edition. Adelaide, Australia: Elsevier.
- Jette DU, Bacon K, Batty C, Carlson M, Ferland A, Hemingway RD, Hill JC, Ogilvie L & Volk D (2003) Evidence-based practice: beliefs, attitudes, knowledge, and behavior of physical therapists. *Physical Therapy* 83: 786–805.
- Khan KS & Coomarasamy A (2006) A hierarchy of effective teaching and learning to acquire competence in evidenced-based medicine. *BMC Medical Education* 6: 59 –68. doi: 10.1186/1472-6920-6-59
- Malik G, McKenna L & Griffiths D (2017) Using pedagogical approaches to influence evidence-based practice integration – processes and recommendations: Findings from a grounded theory study. *Journal of Advanced Nursing* 73: 883–93. doi: 10.1111/jan.13175
- Melnyk BM, Fineout-Overholt E, Stillwell S & Williamson K (2010) Evidence-Based Practice: Step by Step: The Seven Steps of Evidence-Based Practice. *American Journal of Nursing* 110: 51 –53. doi: 10.1097/01.NAJ.0000366056.06605.d2
- O'Halloran P, Porter SAM & Blackwood B (2010) Evidence based practice and its critics: What is a nurse manager to do? *Journal of Nursing Management* 18: 90–5. doi: 10.1111/j.1365-2834.2009.01068.x
- Patterson-Silver Wolf DA, Dulmis CN & Maguin E (2012) Empirically Supported Treatment's impact on organizational culture and climate. *Research on Social Work Practice* 22: 665–71. doi: 10.1177/1049731512448934
- Rodger S, Fitzgerald C, Davila W, Millar F & Allison H (2011) What makes a quality occupational therapy practice placement? Students' and practice educators' perspectives. *Australian Occupational Therapy Journal* 58: 195. doi: 10.1111/j.1440-1630.2010.00903.x
- Rousseau DM & Gunia BC (2016) Evidence-Based Practice: The Psychology of EBP Implementation. *Annual Review of Psychology* 67: 667–92. doi: 10.1146/annurev-psych-122414-033336

- Ruzafa-Martínez M, López-Iborra L, Barranco DA & Ramos-Morcillo AJ (2016) Effectiveness of an evidence-based practice (EBP) course on the EBP competence of undergraduate nursing students: A quasi-experimental study. *Nurse Education Today* 38: 82–7. doi: 10.1016/j.nedt.2015.12.012
- Saunders H & Vehviläinen-Julkunen K (2016) The state of readiness for evidence-based practice among nurses: An integrative review. *International Journal of Nursing Studies* 56: 128–40. doi: 10.1016/j.ijnurstu.2015.10.018
- Swinkels A, Albarran JW, Means RI, Mitchell T & Stewart MC (2002) Evidence-based practice in health and social care: Where are we now? *Journal of Interprofessional Care* 16: 335–47. doi: 10.1080/1356182021000008265
- Thomas A & Law M (2013) Research utilization and evidence-based practice in occupational therapy: A scoping study. *American Journal of Occupational Therapy* 67: 55–65.
- Thomas A, Saroyan A & Dauphinee WD (2011) Evidence-Based Practice: A review of theoretical assumptions and effectiveness of teaching and assessment interventions in health professions. *Advances in Health Sciences Education* 16: 253–76. doi: 10.1007/s10459-010-9251-6
- Towns E & Ashby S (2014) The influence of practice educators on occupational therapy students' understanding of the practical applications of theoretical knowledge: A phenomenological study into student experiences of practice education. *Australian Occupational Therapy Journal* 61: 344–52. doi: 10.1111/1440-1630.12134
- Verloo H, Desmedt M & Morin D (2017) Beliefs and implementation of evidence-based practice among nurses and allied healthcare providers in the Valais hospital, Switzerland. *Journal of Evaluation in Clinical Practice*. 23: 139–48.
- Villanueva EV, Burrows EA, Fennessy PA, Rajendran M & Anderson JN (2001) Improving question formulation for use in evidence appraisal in a tertiary care setting: A randomised controlled trial [ISRCTN66375463]. *BMC Medical Informatics and Decision Making* 1: 4–9. doi.org/10.1186/1472-6947-1-4
- Westwater-Wood S, Hendrick P & Diver C (2014) Can 'Evidence Based Practice' be taught in a way that is meaningful to the student for practice? *Health and Social Care Education* 3: 44–5. doi: 10.11120/hsce.2013.00037
- Wong G, Greenhalgh T, Westhorp G & Pawson R (2012) Realist methods in medical education research: What are they and what can they contribute? *Medical Education* 46: 89–96. doi: 10.1111/j.1365-2923.2011.04045.x
- Zhang Q, Zeng T, Chen Y & Li X (2012) Assisting undergraduate nursing students to learn evidence-based practice through self-directed learning and workshop strategies during clinical practicum. *Nurse Education Today* 32: 570.

Zwolsman SE, van Dijk N, te Pas E & Wieringa-de Waard M (2013)  
Barriers to the use of evidence-based medicine: Knowledge and skills,  
attitude, and external factors. *Perspectives on Medical Education* 2: 4–  
13. doi: 10.1007/s40037-013-0039-2