

## Development of a Tool to Evaluate Health Science Students' Experiences of an Interprofessional Education (IPE) Programme

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### Abstract

**Introduction:** The Rural Interprofessional Programme Emergency Retreat (RIPPER) is an educational programme collaboratively developed and evaluated by an interprofessional team from Schools within Faculty of Health Science (FHS), University of Tasmania (UTAS), Australia. The aims of RIPPER are to foster and facilitate positive and productive interprofessional learning experiences for undergraduate students in a rural setting; and to develop a firmly embedded and sustainable interprofessional healthcare module within the health science curriculum. This paper reports on the development of a reliable and valid survey tool to evaluate students' understandings and experiences of this interprofessional learning programme. **Materials and Methods:** Twenty-nine students from the Schools of Nursing, Medicine and Pharmacy of the FHS, UTAS participated in the RIPPER programme which offers a number of interactive rural emergency healthcare scenarios using high- and low-fidelity simulation. To evaluate the programme a survey which consisted of 2 main components was developed and implemented before and after the programme. The first component was designed to gather students' demographic information, their understanding of the interprofessional practice concepts, and their expectations of the RIPPER programme using open-ended questions. The second component consisted of a 5-point Likert scale for students to rank their level of agreement pre- and post- intervention with 12 statements about team working, programme evaluation and collaborative learning. Three processes were used to establish the validity and reliability of the survey. Content validity was assessed by academics and experts in health science education. Construct validity was assessed using exploratory factor analysis. The internal consistency and reliability of the survey was checked using Cronbach's alpha coefficient. **Results:** Factor analysis of the 12 statements identified 3 main factors including appreciation of professional roles and responsibilities, improved professional practice based on effective teamwork and the importance of students learning and working together for improved clinical practice. Reliability of the survey was established. The survey is able to evaluate students' understandings and experiences of this interprofessional learning programme.

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**Key words:** Interdisciplinary learning, Interprofessional practice, Rural health

### Introduction

A shortage of healthcare professionals and resources in rural areas is well documented.<sup>1,2</sup> These workforce shortages necessitate new models of healthcare in rural areas that focus on increased collaboration and communication to optimise patient care. Effective interprofessional teamwork is one solution for improving healthcare delivery and maximising healthcare outcomes. Interprofessional education (IPE) is recognised as a significant strategy within Universities as a way of preparing future healthcare professionals for effective inter-professional practice.

While effective interprofessional programmes have been shown to have a number of positive benefits,<sup>3-5</sup> it is argued that there is only limited evidence of success in measuring the long-term effects of IPE on healthcare practice and collaboration. Significantly, the need for both effective and appropriate evaluation of IPE has grown considerably in recent years.<sup>6</sup> This paper reports on the development of a reliable and valid survey tool to evaluate students' understandings and experiences of interprofessional learning and collaboration. It may provide evidence of how these experiences may shape their ability to work more effectively in a team to maximise patient and clinical outcomes.

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## Background

IPE is defined as occurring ‘when two or more professions learn with, from and about each other to improve collaboration and the quality of care’.<sup>7</sup> The concept of IPE and learning emerged in the 1960s and 1970s in the United Kingdom (UK) and the United States of America (USA). At present, interprofessional learning (IPL) activity is rapidly expanding in Australia.<sup>6</sup> Given that health practice is critically dependent on effective interdisciplinary collaboration and communication to maximise patient safety and outcomes, universities now recognise the need to incorporate IPL into health science curricula. A number of innovative undergraduate programmes are emerging in the quest for development of successful models of IPE.

In the ever changing context of healthcare, health professional practice is always evolving. For example, the ageing population and the current context of chronic disease management and care, and the move away from tertiary hospital care to “patient-centred, home based and team driven care will require new skills and collaboration between workers and patients”.<sup>8</sup> New models of health service delivery are required to deal with these “complex, interrelated and multidimensional”<sup>9,10</sup> health issues and problems.

Health professionals and in particular health educators from a variety of disciplines are powerfully positioned to develop a new healthcare discourse to deliver health services in a cohesive and collaborative manner. This is the ground on which IPE is introduced into the health curricula.<sup>11</sup> Those with responsibility for education and training within health and social care services are responding to this identified need<sup>12</sup> through the development of inter-professional programmes particularly at undergraduate level.

Health science education has tended to approach teaching and learning by segregating disciplines. This separation may lead to little knowledge amongst disciplines of the skills, knowledge, roles and responsibilities of other health professions. In addressing these concerns, IPE aims to encourage students to learn with and from one another, to develop mutual respect, to increase understandings of the roles and values of other health professionals and to increase awareness of the importance of collaboration and team working skills.<sup>3,13,14</sup>

In recognition of the value of IPL to undergraduate health science programmes, the University of Tasmania (UTAS) has increasingly looked at opportunities to develop IPE. The Rural Interprofessional Programme Emergency Retreat (RIPPER) is a health education pilot programme developed by an inter-disciplinary team at the UTAS's Faculty of Health Science. Students from the disciplines of medicine, nursing and pharmacy participated in a number of learning

stations using interprofessional case-based scenarios. The first RIPPER programme was run in 2006 in rural Tasmania with a second iteration in 2007. To facilitate students learning with and from each other, RIPPER offers a number of interactive rural emergency healthcare scenarios using high- and low-fidelity simulation. Students are expected to develop their knowledge and skills through the immediate management of the emergency events, discussion and reflection on their management of the event including relevant issues such as interprofessional teamwork, development of management guidelines, and strategies for prevention and follow-up care.

IPE programmes have received positive reception in terms of its improvement of interdisciplinary awareness and collaborative team work and healthcare outcomes; however, there is little evaluative evidence to support its effectiveness.<sup>15-18</sup> It is reasonable to hypothesise that measuring students' experiences of IPL and collaboration may provide evidence of their willingness to work more effectively in a team to maximise patient and clinical outcomes.

The Readiness for Inteprofessional Learning Scale (RIPLS) is one well recognised tool for evaluating interpfesional education due to its established validity and reliability.<sup>11</sup> RIPLS had a strong influence on the development of the questions for this study. However, this paper is not focussed on the students' attitudes to IPE in general, as predominantly measured using RIPLS. Rather, this paper reports on students' participation in RIPPER and on their experiences. In order to evaluate RIPPER, it was therefore necessary to adjust RIPLS.

Despite the abundance of literature reporting IPE initiatives, the evaluation and research remains deficient. The need for sound evaluation on IPE has grown in line with the increased provision of IPE programmes in higher education, especially at undergraduate level.<sup>12</sup>

## Materials and Methods

The RIPPER was evaluated by using a pre- and post-quasi-experimental design as a method of evaluating students understanding and learning experiences of interprofessional practice. It measures changes in the learners' understanding resulting from participation in an IPE programme. Participants were asked to complete the questionnaire shortly before and shortly after the programme.

### Participants

Students from the Schools of Nursing, Medicine and Pharmacy in the Faculty of Health Science, University of Tasmania were invited to participate in a weekend retreat in rural Tasmania. There were 29 students from these 3

disciplines in the 2007 programme. Response rate for the pre-questionnaire was 96.5% and 93.1% for the post-questionnaire with 95% confidence intervals.

### *Survey Instrument*

A questionnaire was developed to evaluate student's understanding and experiences of IPL before and after the programme. The first component of the questionnaire requested demographic data regarding participants' backgrounds and 3 additional items used open-ended questions to gather information on participants' understanding of interprofessional practice, roles and responsibilities of health professionals and learning expectations of the programme. The second component of the questionnaire consists of 13 statements on team working, programme evaluation and collaborative learning. Respondents were instructed to indicate how strongly they agreed or disagreed with each statement on a Likert scale of 1 (strongly disagree) to 5 (strongly agree).

The 2007 programme was the second iteration of the 2006 pilot programme. The initial 2006 questionnaire consisted of 23 items with 16 statements using a Likert scale. The questionnaire was piloted with staff and students from 3 schools (medicine, nursing and pharmacy) and their feedback was sought on the appropriateness of the items, number of questions and question wording.

RIPLS had a strong influence on the development of the questions for the survey. We replicated questions 11, 13 and 16 from the RIPLS survey. These questions focussed on the RIPLS subscale of effective teamworking skills and professional identity. Two other questions – 15 and 18 – were also adapted from this survey and related to the subscale of positive professional identity and working relationships with other health professionals.<sup>19</sup> The final version of the 2007 pre- and post-questionnaire included 20 items on the pre-programme questionnaire and 23 on the post-questionnaire. Additional question items in the post-questionnaire were for comments regarding the most positive and negative aspects of programme and one for general comments.

- Items 1 – 8 (8 items) included demographic details of participating students' reasons for participating; open-ended questions were used to gather information about their understanding of interprofessional practice, professional roles, and expectations of the programme.
- Items 9 – 20 were statements using a Likert scale about the students' perceptions and experiences of IPL and working in teams.

Respondents were instructed to indicate how strongly they agreed or disagreed with each statement on a Likert scale of 1 (strongly disagree) to 5 (strongly agree).

### *Statistical Methods for Data Analysis*

**Validity:** Validity of the questionnaire was assessed in terms of content validity and construct validity. Content validity was assessed by discussion with academics, experts in the health science education field and students who piloted the questionnaire, whereas construct validity was done by exploratory factor analysis.

The exploratory factor analysis identifies: (i) if there is a single dimension or are multiple dimension underlying the 12 questionnaire scale items; and (ii) if there are items not associated with identified factors that might be eliminated from the measure because they are irrelevant.<sup>20</sup>

The adequacy of the sampling for factor analysis is calculated by the Kaiser-Meyer-Olkin (KMO) statistic; its value ranges from 0 to 1. Kaiser<sup>21</sup> recommends KMO values which are greater than 0.5 as acceptable measure for sampling adequacy.

Factor Analysis was conducted on all scale items in 2 stages: factor extraction and factor rotation. Factor extraction involves the scree plot<sup>22</sup> to plot a graph of each eigenvalue against the factor with which it is associated. Kaiser<sup>23</sup> recommended retaining all factors with eigenvalues greater than 1 as it represented a substantial amount of variation. When factors have been extracted, factor rotation involves a calculation on what degree variables load onto these extracted factors. Generally, the most variables which have high loadings are loaded onto the most important factor and small loadings on all other factors.<sup>24</sup> This process makes it clearer which variables (question items) relate to which factors.

Statistical measurements such as Alpha reliability and Factor Analysis were determined using the Statistical Package for Social Science (SPSS) version 15, on the Likert scale items.

**Reliability:** The internal consistency reliability of the questionnaire was tested using Cronbach's Alpha coefficient. Reliability analysis gives an idea of the extent to which items in the same scale are related to each other. The Cronbach alpha reliability coefficient measures the internal consistency and is based on the average inter-item correlation. All values above 0.6 obtained through this calculation are considered to be acceptable.<sup>25</sup>

The statistical measurements for Alpha reliability and Factor Analysis were determined using the SPSS version 15.

## **Results**

### *The Sample Characteristics*

There were 29 students from Nursing, Medicine and Pharmacy who participated in the weekend RIPPER

programme completing the pre- and post-workshop questionnaires. The small number of incomplete questionnaires or “missing data” was excluded from the analysis. Table 1 indicates the characteristics of the sample.

Table 1. Participants' Characteristics

Discipline		Gender		Total
		Male	Female	
Nursing	n	0	11	11
	%	0%	37.9%	37.9%
Medicine	n	7	5	12
	%	24.2%	17.2%	41.4%
Pharmacy	n	3	3	6
	%	10.3%	10.3%	20.7%
Total	N	10	19	29
	%	34.5%	65.5%	100%

The majority of the participants were Nursing (11 or 37.9%) and Medical (12 or 41.4%) students. Of the 29 participants, 10 or 34.5% were male and 19 or 65.5% were female. The proportion of male and female students from Pharmacy was equal (10.3%), whereas students from Medicine had a higher proportion of male (24.4%) than female (17.2%) and students from Nursing had no male participant.

### Reliability

In this study, the Cronbach alpha reliability coefficient was 0.903 for the pre-workshop questionnaire and 0.928 for the post-workshop questionnaire; each indicates satisfactory reliability.

### Validity

In Table 2, the KMO statistic indicates the sampling for pre-questionnaire is adequate (KMO = 0.699), whereas the KMO value of the post-questionnaire (KMO = 0.453) lead us to either collect more data or rethink which variables to include in the questionnaire.

Table 2. Measure of Sampling Adequacy

	Pre-questionnaire	Post-questionnaire
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.699	0.453

Factor analysis was conducted on all 12 items of the pre- and post-RIPPER questionnaires in 2 stages: factor extraction and factor rotation.

The factor analysis on the pre-workshop questionnaire items indicated that there were 3 components with eigenvalues greater than 1. The factor loadings and eigenvalue values that are listed for components 1 to 12 (Fig. 1 and Table 3) showed that 3 factors explaining 65.95% of the total variance was appropriate for the collected data.

Similarly, the factor analysis on the post-workshop questionnaire items revealed that there were 2 components with eigenvalues greater than 1. The factor loadings and eigenvalue values that are listed for components 1 to 12 (Fig. 2 and Table 4) showed that 2 factors explaining 67.21% of the total variance was appropriate for the data.

In both the pre- and post-workshop questionnaires, the factors were rotated using the Varimax rotation method with Kaiser normalisation to identify and interpret the extracted factors. Examination of the scree plots indicated that a 2- or 3-factor solution would be appropriate (Fig. 1 and Fig. 2). Questionnaire items loaded on these 3 factors are shown in Table 5. High loadings (greater than 0.5) are loaded onto the most important factor.

The results showed that none of post-questionnaire items loaded on Factor 3. This could be attributed to the inadequate sample size (due to missing data) required for factor analysis. However, we still used the 3 factors that have emerged in the pre-questionnaire survey given that factor 3 contained the theme considered most vital to the reason for the implementation of IPL and practice. That is the theme related to learning and working together for improved clinical practice and patient outcomes. The validation of this factor will be examined in the 2008 programme.

Factor 1 is about learning with other students, improved

Table 3. Total Variance Before and After Extraction and Rotation for Pre-workshop Questionnaire

Factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	6.15	51.29	51.29	3.83	31.94	31.94	2.82	23.52	23.52
2	1.54	12.83	64.12	3.45	28.74	60.69	2.73	22.79	46.31
3	1.21	10.13	74.26	0.63	5.26	65.95	2.35	19.64	65.95

Extraction Method: Maximum Likelihood.

Table 4. Total Variance Before and After Extraction and Rotation for Post-workshop Questionnaire

Factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	7.00	58.36	58.36	4.70	39.22	39.22	4.09	34.09	34.09
2	1.88	15.71	74.08	3.36	28.02	67.24	3.98	33.15	67.24

Extraction Method: Maximum Likelihood.

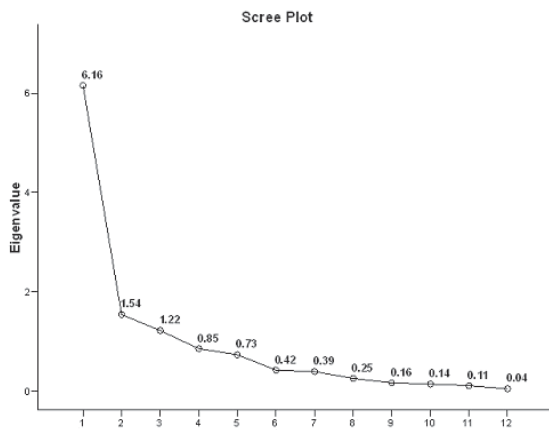


Fig. 1. Scree plot of eigenvalues for pre-workshop questionnaire.

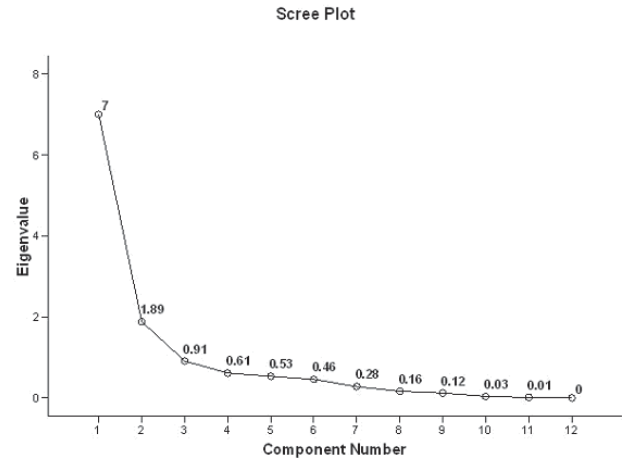


Fig. 2. Scree plot of eigenvalues for post-workshop questionnaire.

appreciation of professional roles and responsibilities, and the importance of a team approach. Four items (13, 18, 19, and 20) loaded on this factor.

Factor 2 emphasises the recognition of improved future professional practice based on effective teamwork and mutual respect. Five items (9, 10, 14, 16, and 17) loaded on this factor.

Factor 3 is about the importance of students learning and working together for improved clinical practice (question items 18, 19, 20 are loaded on this factor). Three items (11, 12, and 15) loaded on this factor.

**Discussion**

The importance of IPE has been recognised in healthcare education literature as a way to prepare health science students to work effectively in teams with the ultimate goal of improving healthcare delivery.<sup>19,26,27</sup> With the growing acceptance and implementation of IPE programmes, including an emerging evidence base of interprofessional practice demonstrating positive effects on health outcomes<sup>18</sup> the need for both effective and appropriate evaluation of IPE has grown considerably. The key focus of this paper is to develop a tool to measure students' views on the basis of their IPEal experience. The analysis of the results indicates that 3 factors emerged from the survey. Each factor is based on the composite content of related items in the survey.

Factor 1 focuses on learning with other students, improved

appreciation of professional roles and responsibilities, and the importance of a team approach. It is important for students of different health disciplines to have the opportunity to interact together. This interaction enhances students' awareness of collaborative interpersonal relationships. It gives them some understanding of the roles and responsibilities of people working in different health professions. To make IPE more effective consideration should be given to multiple exposures and the different demands of the health science curriculum.

Factor 2 highlights recognition of improved future professional practice based on effective teamwork and mutual respect. It helps students to develop an understanding of the resources and networks required in healthcare, promotes positive views of other health professionals and enhances professional practice. In rural areas, health workers may take a variety of roles due to the shortage of health professionals. Therefore, it is important for students to gain some understanding of interprofessional roles in the clinical setting. Exposure to IPL opportunities is particularly relevant to rural practice especially in light of an under-resourced rural workforce where a positive learning experience could enhance the recruitment and retention of staff in rural areas.

Factor 3 emphasises the importance of students learning and working together for improved clinical practice. In a clinical setting, patients can benefit a great deal from health team work. Thus, it is important for students of different

Table 5. Factor Loadings for Pre- and Post-workshop Questionnaire Items (N = 29)

Questionnaire Items	Factor loadings					
	Factor 1		Factor 2		Factor 3	
	Pre	Post	Pre	Post	Pre	Post
9	It is important to develop an understanding of the resources and networks required to assist people with health-related problems in the rural community.		0.96	0.82		
10	It is important for me to think positively about other healthcare professionals.		0.57	0.52		
11	Patients ultimately benefit if healthcare students work together to solve patient problems.				0.74	0.77
12	Learning with other students helps me become a more effective member of a healthcare team.				0.80	0.82
13	Learning with other students helps me in becoming a more effective member of a healthcare team.		0.57		0.60	
14	It is important for nurses, pharmacists and doctors to work closely together.		0.94	0.58		
15	Learning with other healthcare students increases my ability to understand clinical problems.				0.58	0.66
16	Team-working skills are essential for all healthcare students to learn.		0.59	0.55		
17	Working with other health professionals enhances my professional practice.		0.70	0.46		
18	Peer learning among healthcare students could improve working relationships after training.		0.85	0.74		
19	Learning with students from other health professions gives me a better understanding of roles and responsibilities.		0.75	0.99		
20	I want to have a greater understanding of my profession in a healthcare team approach to rural health issues.		0.63	0.74		

healthcare orientations to work together to improve their skills and understanding of clinical problems. When students enter a health profession, they are expected to work effectively as a team member. It is important for them to have an awareness and experience how health professionals work as a team to deal with patients and function in a complex health system.

The reliability and validity findings indicated the tool was suitable for measuring students' understanding and experiences of an interprofessional educational programme. Future studies should re-examine the items in Factor 3 (the importance of students learning and working together for improved clinical practice) and ensure they are adequately represented in the post-questionnaire. One way to achieve this is that future studies should ensure there is a sufficiently large sample size to differentiate students based on previous IPE learning experience programmes.

## Conclusion

This study is an attempt to provide some evidence in support of IPL through the development of an evaluation tool to measure the effectiveness of the implementation of an innovative model of IPE for undergraduate health science students.

The analysis revealed 3 underlying scales in the questionnaire that may relate to genuine sub-components of students' understanding of the importance of IPE. The use of factor analysis is purely exploratory. It should be

used to inform the researchers about the patterns within data sets or to guide the future hypotheses. The inadequate sample size in the post-workshop questionnaire leads us to collect more data to increase the reliability of factor analysis.

Data analysis provided evidence of validity which identified factors including the importance of learning with and from other students, the importance of effective team work, development of mutual respect and appreciation of roles and responsibilities and ultimately working together to improve clinical practice particularly in a rural setting with limited resources. The reliability was found to be adequate. The questionnaire is therefore able to measure student attitudes to IPL experiences.

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