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Aims and scope

The Journal of Problem-Based Learning is an interdisciplinary/multidisciplinary professional journal showcasing the scholarship and best practice in Problem-Based Learning.
Article topics can be any areas related to PBL and similar approaches to learning and teaching (e.g., enquiry, inquiry, abilities, practice, situation or solutions-based) that facilitate the development of a suite of metacognitive and process-oriented abilities. We are interested in scholarly papers that report on the paradigm shifts in education - experiences with, and developments in educational philosophy, curriculum design and implementation across different professions, countries, contexts, and cultures.

Articles types published by Journal of Problem Based Learning include:
Original research of all designs and methods, related to PBL and similar approaches to learning and teaching (e.g., enquiry, inquiry, abilities, practice, situation or solutions-based) that facilitate the development of a suite of metacognitive and process-oriented abilities. Data collection should have taken place within five years of submitting the manuscript.
- Systematic reviews of research evidence relating to the above
- Scholarly papers presenting in-depth analysis and discussion of philosophical, theoretical, conceptual related to PBL, critical thinking, e-technology, e-learning, etc.

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Education and the Care of Older People: Is This the Time for Renewal?

Isabel Higgins

School of Nursing and Midwifery, University of Newcastle, Callaghan, Australia

Editorial

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The final report of the royal commission into aged care in Australia, "Care, Dignity and Respect" (Royal Commission into Aged Care Quality and Safety, 2021), was handed down in February this year and tabled for public viewing. Major findings indicate a lack of funding for care and support for older people leading to poor outcomes in residential, home and community care settings. Staffing for services, clinical care and the support of family/carers has been a major concern in Australia for many years with understaffing and widespread low levels of education amongst staff including nurses, personal carers and support staff. Importantly, attempts to improve help, care and support in home settings guided by an international best practice model, consumer directed care (CDC) (Ottman, Allen & Feldman, 2013; Ottman & Mohebbi, 2014) has led to fewer hours of care per day than would be otherwise provided in other care settings.

Older people in need of care and support in any setting rarely need one form of care or support. As noted by the commissioners (2021), ageing brings with it physiological and sociological decline which in the presence of chronic co-morbidities renders a range of challenges for the older person. As physiological decline can be anticipated, so too should emotional, psychological and social aspects of life. Support and care for older people requires maintaining a level of social functionality in order to support emotional and psychological health. However, in the light of a range of complex and chronic co morbidities, health expertise is essential to focus healthy ageing with preservation of ability, disease prevention and/or mitigation and appropriate end of life care.

The CDC model of care mandates meaningful relationships with older people and skilled care to ensure safety, quality of care and support, and dignity and respect for individuals. Skillful care and support helps to maintain functionality for daily living, mitigates disease progression, and deterioration towards frailty and when needed it ensures quality at the end of life. In the absence of meaningful relationship-based encounters with health professionals and carers and a CDC approach to care, any form of support is merely a transaction of deed falling short of quality and care. The authors of the royal commission in Australia argue persuasively using many exemplars that care of older people and services are substandard in all care settings. Of concern is that these claims reflect the value placed on older people in our society.

Contemporary care of older people is mainstream care across all settings: acute, aged, community and home. However many nurses, health professionals and carers are inadequately prepared educationally to provide care and support for people who are experiencing physiological decline associated with ageing, co morbidities and decline in the ability to adapt to many life stressors. Older people, regardless of the setting or context for care require nurses and health professionals with a suite of skills to manage older people with complex intersecting health breakdown which is often confounded by polypharmacy, psychological and social concerns and a range of personal support needs. Responding to these needs and life preferences requires an holistic approach to managing and supporting changing circumstances, as well as skilled, in-

tuitive observation, communication, care, and flexibility. It requires professionals to provide leadership management and clinical supervision, to model the expectations for care, dignity and respect; to strongly advocate for the older person and his or her loved ones, and to ensure the quality standards, continuity and integration of care at all points in their life journey. It requires care and support staff to be sensitive to the needs of older people, to observe, to respond appropriately and communicate with the team of professionals and carers clearly on all matters of transaction and to act with integrity.

Professional nursing practice around the world is guided by practice standards and codes of ethics and professional conduct. Nurses, leaders in societies around the world, are advocates for people across age groups and the generations. They have a professional mandate to ensure the best possible care and support is available to all older people in any care setting. They have a mandate for humanity. Paving the way for all older people regardless of the context for care demands a multi focused educational approach: ensuring nurses are equipped with research knowledge and the best available evidence, skilled for leadership, assertiveness and advocacy, open to creativity, innovation and ongoing research. Expert care mandates the use of evidence and the application of theory in clinical practice situations. It requires the application of human and nursing sciences and the exploration and use of models and frameworks to ensure the best possible delivery of care for Quality. Quality and care afford dignity and respect and this, unequivocally, is international best practice. Above all, older people need to be the focus of learning stimuli in a range of contextual, social and cultural settings.

Readers of this journal may consider that whilst Australia is but one of many nations and that its care and systems of care of older people is both like and unlike other nations, what needs to be heeded is how easily older people can become marginalized in any society and how frailty exacerbates marginalization. Older people become objectified as a problem to be solved or a problem that is overlooked or forgotten with transactions of care falling short of quality. Problem based learning (PBL) approaches require real world learning situations generated from across settings, contexts, and cultures. The demands for better care for older people around the world are replete with exemplars for learning, of situations in need of improvement and critical analysis, of research problems that need to be investigated, tested and resolved, of the need for innovation and creativity, communication, teamwork efforts and demonstrations of humanity.

Undergraduate and post graduate studies are both important platforms for improving the care and support for older people and for more informed leadership across all settings for care. However, all levels of carer also need contemporary and ongoing education and certification using a PBL approach. Ultimately education and ongoing learning using PBL is essential for all health professionals and workers in order to appreciate the complexities of care and support needs and to ensure quality and care for older people around the world.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

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A Study of the Effectiveness of PBL and MAKER Classes Based on Flipped Learning

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Purpose: The purpose of this study was to find whether a team assignment in a Flipped Learning class using Project Based Learning PBL or MAKER has a greater effect on improving interest and class satisfaction than in the existing class.

Methods: As an alternative to increasing the level of interest in the existing Flipped Learning class, the team project activity was operated as a PBL or MAKER project. The activityrest andtiveness was investigated through the results of pre- and post-interest surveys and a satisfaction survey.

Results: The study participants in the Flipped-based PBL and MAKER classes, showed much greater interest and satisfaction than those in the existing Flipped Learning classes.

Conclusion: The study results indicated that the selection of a class application offering a wider variety of teaching methods suitable to the subject and the combined application of several teaching methods complemented the shortcomings of existing teaching methods and maximized their strengths.

Keywords: Flipped Learning; Problem-Based Learning; MAKER Education; Teaching Method

Original Article

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INTRODUCTION

In the face of the Fourth Industrial Revolution, many innovative teaching methods are emerging in education as the human resources demanded for the times change. As constructivism-based interaction, collaboration, and self-direction were emphasized, the paradigm of education changed. In the 1990s, the more learner centered PBL method appeared. STEAM,

emerging as convergence education involving science, engineering, technology, the arts and mathematics, was emphasized in the 2000s.

In the 2010s, along with the Fourth Industrial Revolution, teaching methods such as Flipped Learning and MAKER education appeared; these are the foundations of maximized constructivism, emphasizing creativity and an interactive sharing culture. Many universities are paying great attention to and investing in the introduction and application of these innovative teaching methods.

MAKER education and Flipped Learning are teaching methods that Korean universities have applied to college classes and confirmed their effectiveness in increasing academic achievement and interest (Tawfik & Lilly, 2015). Flipped Learning relies on first presenting content through videos outside the classroom and then conducting classes mainly reliant on presentations and discussions. It has been reported to have had a positive effect (Toqeer, 2013). It has also been reported that MAKER education improves academic achievement and increases interest in learning through self-direction in learning that encourages creative processes and a need to respond to the experience of failures while developing problem-solving skills (Lee & Yoon, 2017).

Recent innovative teaching methods taken up by Korean universities is divided into two op-

tions: PBL and Flipped Learning. Seoul National University, Yonsei University, and Korea University designate Flipped Learning as an innovative teaching method. Other universities, including Hanyang University, cite PBL as a major innovation in teaching methods, their development and operationalization. They are striving to spread these curriculum changes so students can strengthen their competencies suited to the future.

However, there are many differences in the effectiveness of innovative teaching methods depending on the characteristics of subjects or the learners' tendencies, necessary factors to consider to effectively introduce and appropriately apply any new methods.

Therefore, this study examined not only offline activity classes involving simple active learning but also PBL tasks that can increase problem solving ability through real life interaction and interest according to each subject's unique content. This research studied the effect of a new teaching method that combined several educational approaches by adding a Flipped-based PBL class and a Flipped-based MAKER class employing the recently highlighted MAKER approach as a class activity. This comprehensive teaching method can foster creativity in preparation for The Fourth Industrial Revolution.

The present study compared the results of the new combined approach (involving Flipped Learning, PBL, and MAKER education tailored to the subject) with those of the existing Flipped Learning class to see if the effect was maximized when innovative teaching methods are well-integrated. Given the impact of COVID-19, we conducted online project activities through Flipped Learning-interaction, and we also tried to operationalize Flipped Learning in the online mode. Surveys provided feedback on satisfaction with the innovative approach.

Research Questions

1. Are flipped-based PBL *and* MAKER classes more effective in improving interest than existing flipped learning classes?

2. Did the Flipped-based PBL *and* MAKER classes rate higher in class satisfaction than the existing Flipped Learning classes?

Study Limitations

This study targeted learners at a certain level at a specific university in a particular area. Due to COVID-19, class activities were conducted online, so there are limitations to the generalization of study results.

METHODS

To begin this section, the characteristics of the innovative teaching methods are examined before the perceptions of effects of applying Flipped-based PBL, MAKER classes, an innovation at Ulsan University, are analyzed.

Flipped Learning

The definition of Flipped Learning is literally interpreted as "upside-down learning." It is a teaching method that reverses the traditional teacher-centered education approach. As a learning model that performs tasks through action (Johnson & Renner 2012), the classroom in the present study is defined as a mixed educational environment in which an activity- centered class is conducted after pre-learning using various technologies appropriately (Crompton & Giannakos, 2014). The general characteristics of Flipped Learning and the results of various studies on its educational effects can be broadly divided into four categories.

First, Flipped-Learning is provided to learners in the form of prerequisite learning through various media (Bergmann & Sams, 2012). In general, video lectures developed and produced by instructors are actively used, but other content, lecture materials, and printed materials on the internet can also be used. Through these pre-learning materials, learners have the potential to understand the concepts to be learned.

Second, in the classroom, a team is formed, and learner activities take place based on collaboration with peers (Frydenberg, 2013). Learners who understand the concept in advance participate in in-depth learning by using and applying various types of activity for learning in the classroom. At this time, the instructor should play the role of a facilitator who provides feedback to learners through observation, not taking the role as a lecturer.

Third, the class's focus should be the learner, not the instructor (Lee, 2015). In other words, because learners voluntarily learn through various activities, both customized education tailored to the learner's level, and the adjustment of class activities according to individual learner requirements are possible.

Fourth, the interaction between learners and instructors is emphasized (Wilson, 2013). In the classroom, students, professors, and learners share opinions and solve a given task through various discussions and collaborations, thereby developing deeper thinking and problem-solving skills and promoting multilateral relationships.

To summarize Flipped Learning's features, learners are exposed to content and concepts in advance through self-directed learning activities delivered in various forms. In the class, they extend the responsibility for learning themselves through activities such as learner-centered collaboration and discussion. It can be an effective educational method that improves problem-solving skills and enhances the relationship between instructors and learners.

Problem-Based Learning

In PBL, learners seek solutions to problems through active participation and cooperation based on the development of their critical thinking and problem-solving skills. The emphasis is on practical problem solving and a less structured curriculum that is reliant on stimulus material that resembles real life (Kang, 1997).

In other words, PBL is not a simple educational strategy but is reliant on a wide range of learning and teaching methods that include problem-solving, inquiry, project-oriented teaching, and case-oriented instruction. It can be defined as a method that provides a problem-solving learning environment through self-directed, team-specific learning activities. PBL is an advantageous method for improving high-level cognitive abilities such as creativity and problem-solving skills, as well as academic achievement. Its effects have been confirmed through studies (Kim & Kang, 2013).

Unlike traditional teaching methods, the PBL learning method has various effects as learner-centered education that promotes problem-solving under multiple conditions. This has been evidenced in prior research and through learner interactions and various activities.

In conclusion, the higher order thinking skills and attitudes that can result from PBL classes are the core competencies pursued in the new 21st century educational paradigm. They are very important in university education, as they emphasize professionalism and students' autonomous learning ability. This is also an educational goal (Choi, 2007).

MAKER Education

As a keyword representative of the Fourth Industrial Revolution, makers create a new "you" out of an existing "nothing" using advanced tools such as 3D printers. This is based on imagination and creativity in the context of a rapidly changing industrial environment and the rise of digital manufacturing technology. "Maker" means a person who creates (Martinez & Stager, 2013). The maker movement means that anyone can easily invent new ideas and prints using universal 3D printers and practice cultural and social fusion.

Therefore, to solve the fusion and complex themes related to our lives on our own, MAKER education creates results that fit the subject through activities such as making, sharing, and improving using advanced digital tools and materials (Blikstein, 2013). As the MAKER movement has significantly influenced the educational field, and cultural changes with modern society are taking place, it is now called MAKER pedagogy or MAKER education, and various discussions are currently also taking place (Lee, 2017). MAKER educational approaches systematically encourage the creation or acquisition of knowledge so that students can obtain concrete and creative results using their own learning methods involving repetitive processes (Katterfeldt, 2015).

MAKER education provides a learner-led learning environment that deals with realistic problems in the forms of problem-based learning, inquiry learning, and project-based learning and produces outcomes that can solve problems based on the skills and knowledge acquired (Martinez & Stager, 2013). In addition, MAKER educational strategies take place step-by-step through tinkering, making, and 'maker-fair' activities, focusing on the creative process. MAKER education can also be interpreted as self-directed and experiential learning. Individuals make choices and decisions according to their own intentions, from thinking of ideas to acquiring the necessary knowledge and making the products themselves (Dougherty, 2013).

In addition, the act of designing and producing original and new prints on one's own is recognized as a different teaching method. It is a value that can be appreciated educationally in the social sense that it emphasizes. Recently, universities are also actively using maker education through the establishment of maker spaces. Starting with Yonsei University's maker space "Y-Valley" and Konkuk University's "Smart Factory," several universities have opened maker spaces to develop creativity and thinking skills. They are actively used with continuous improvement.

The Ulsan University-Type Flipped-based Innovation Teaching Method

The University of Ulsan has introduced and operated Flipped Learning as its representative innovative teaching method since 2016. The number of courses in operation increased rapidly every year, and 200 lectures were conducted over four years. Since the second semester of 2019, the field was called iF-PBL. It is operated in conjunction with Flipped Learning, introducing a specialized PBL teaching method that takes advantage of Ulsan University`s strengths that combine central learning and capstone design. Table 1 shows the introduction and operation of the University of Ulsan's innovative teaching method.

As a result of the researcher analyzing the University of Ulsan's Flipped Learning's operational status over the past four years, many regrets concerning qualitative developnt were evident compared to the quantitative growth in the use of the approach. Therefore, as an alternative, academics aimed to optimize the use of Flipped Learning by developing and applying a teaching method that combines Action Learning, MAKER, PBL, etc. based on elements of Flipped Learning according to student characteristics. This would increase interest in prior learning and combine the advantages of several learning and teaching methods. The design of

Table 1. Ulsan University Innovation Teaching Method Operation Status

			Flipped Learning			iF-PBL	
2016	1st	8	17	-		※ 2020-1 Flipped Learning	
	2st	9				A type 9	
2017	1st	12	42	+25		M type 6	
	2st	30				P type 35	
2018	1st	31	64	+22		※ 2020-2 Flipped Learning	
	2st	33				A type 24	
						M type 7	
						P type 29"	
2019	1st	25	67	+3		13	
	2st	42			13		
2020	1st	50	110	+42	8	19	+6
	2st	60			11		
Total			300			32	

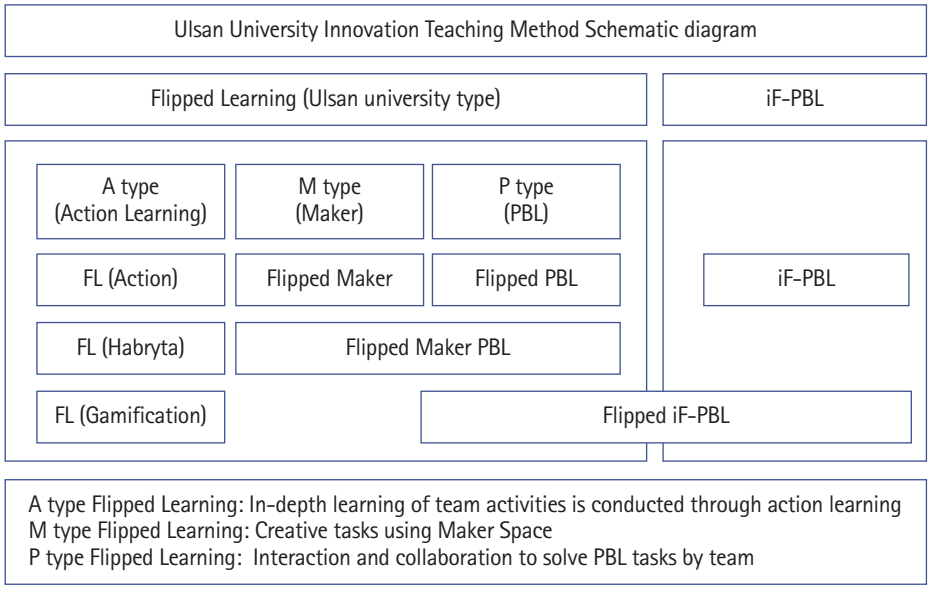

Figure 1. 2020 Ulsan University type flipped learning design (Jeong-phil Hue).

the innovative approach is shown in Figure 1 below. It has been applied and operated since the first semester of 2020.

The instructional models of Flipped Learning-based PBL and MAKER classes are shown in Figures 2 and 3.

The instructional design was consistent with the basic instructional design of Flipped Learning. Before class, learner-centered activities, interactions, formative evaluation, performance evaluation, etc, were implemented to check learning status and support video learning in advance. After class three stages were designed for the purpose of creating reflection journals and sharing results. Decisions included whether to conduct class as a general learning activity class or to operate it with another innovative teaching method such as PBL or MAKER. The detailed instructional design model is shown in Figure 4 below.

Teachers who applied for Flipped Learning were asked to select the type of activity class according to the research subjects' characteristics and prepare a lesson plan and a study guide suitable for the type of model. In Flipped Learning class design, the learning guidance plan is divided into "Before Class," "In Class," and "After Class." The composition is shown in Table 2 below.

Due to COVID-19, the activity class was operated in a form that allows online interactive activities using Zoom or Webex. In the 110 courses that were operated during the two 2020 semesters, there were three types of online activity classes. First, team-based task activities are a type of group-by-group approach conducted through real-time online video conferences. The second type is a task activity performed by teams through SNS-based interaction. The third and final activity type, combining the two

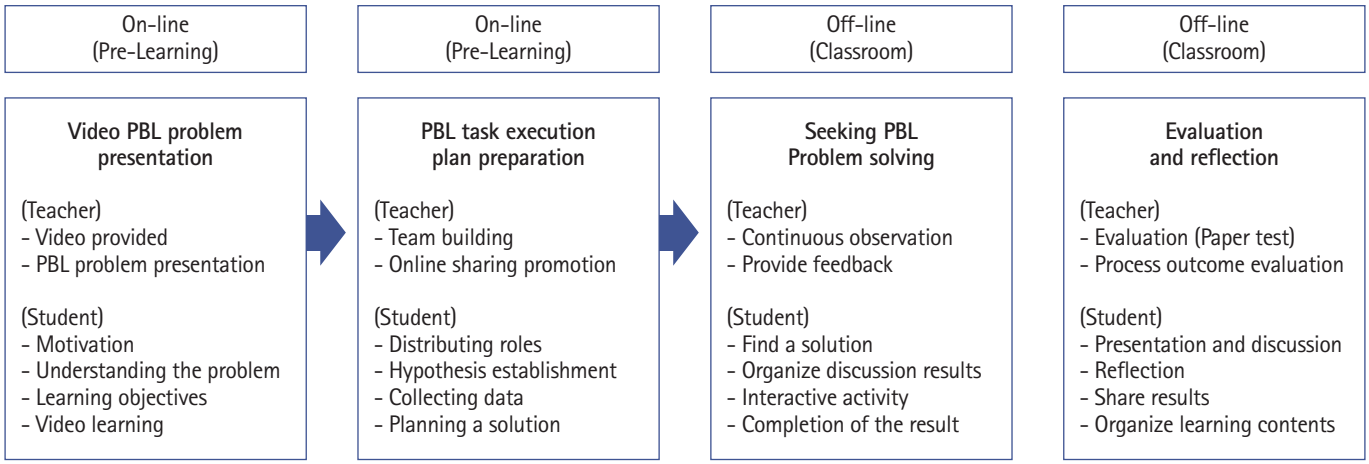

Figure 2. Flipped Learning-based PBL class model (Jeong-Phil Hue, 2017).

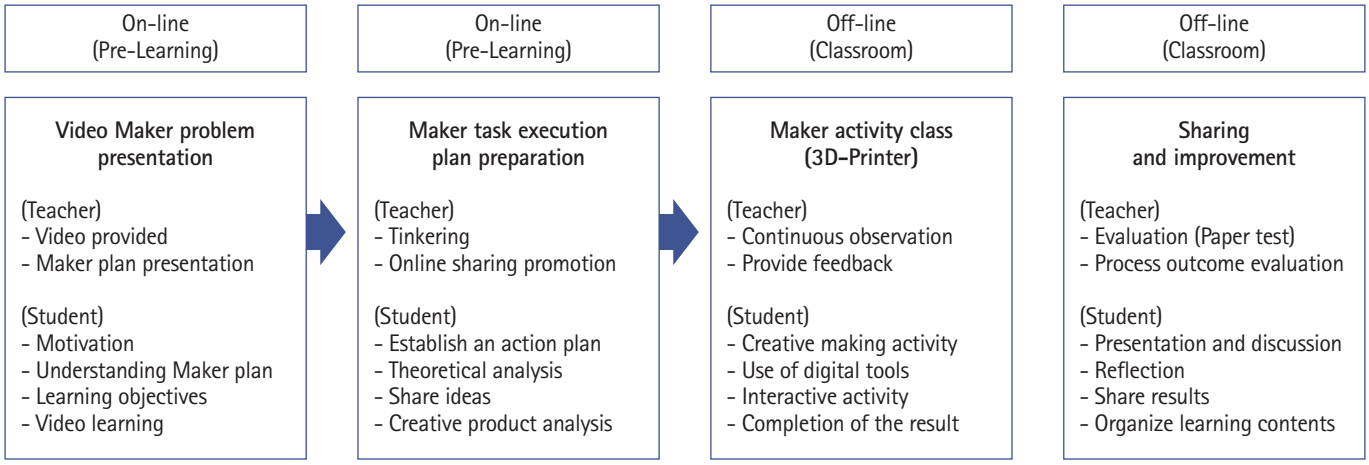

Figure 3. Flipped Learning-based MAKER class model (Jeong-phil Hue, 2019).

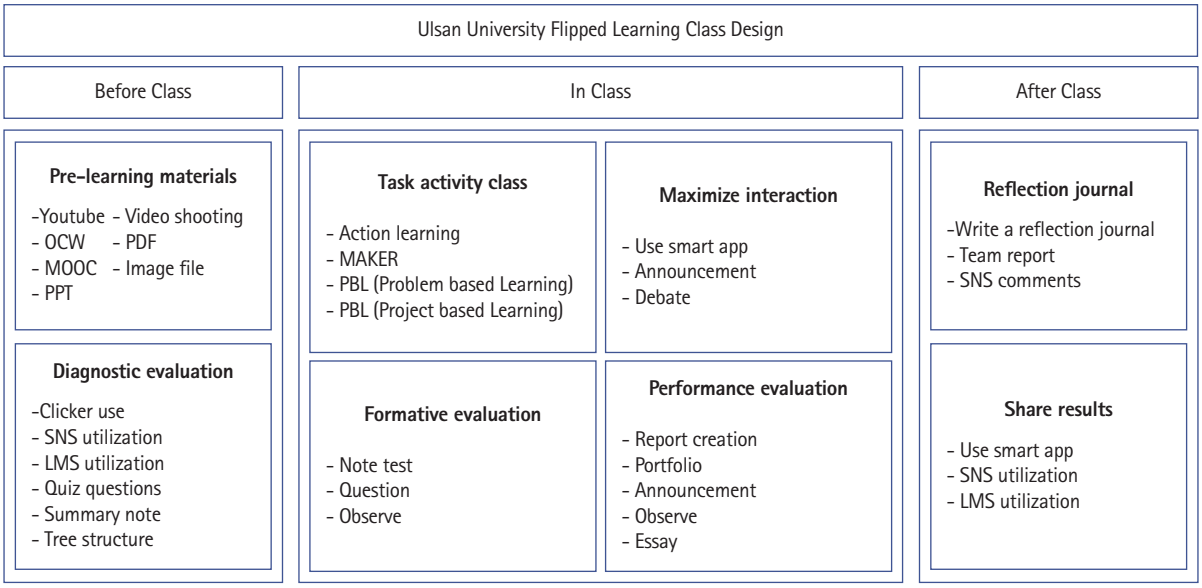

Figure 4. Class design according to flipped learning operation activities

Table 2. Flipped Learning-based PBL, MAKER class instruction plan

Class step	Learning contents	Teaching and learning activities		Place
		Teacher	Student	
Before Class	Video pre-learning	-Introduction and lecture on theory through video -Team Building	-Preparation of lessons through video pre-learning	Home
In Class Introduction (15ro	Learning activity Presenting problems	-Presentation of learning goals -Unit learning activities Introduction to the problem	-Understand your learning goals -Identify problems in learning activities -Activity problem analysis	Class
In Class deployment (60lo	Team task Performing activities	-Role of facilitator -Immediate feedback -Helper role	-Collaboration through interaction -Active task team activity -Self-directed learning	Class
In Class summary (45mm	Presentation discussion reflection evaluation	-Direction of presentation and discussion -Evaluation through comparison of pre- and post-written tests -Reflection through the reflection journal	-Participate in presentations and discussions -Participation in post-writing test -Evaluation between teams and individual evaluation -Reflection through the reflection journal	Class
After Class	Task execution	-Preservation of class homeostasis by presenting assignments	-Perform tasks through continuous learning	Home

outlined above, is a video conference after team activities. The detailed activity class process is shown in Figure 5 below.

Research method

The study subjects were students in the 110 Courses and teachers who applied for a course operated by Flipped Learning for the first and second 2020 semesters. The study period comprised two semesters, from March 2020 to December 2020. Consistent with the University protocols for the conduct of research, all participants consented to be involved in the study. The researcher and teachers also provided reflections on the learning processes and outcomes.

To compare the effectiveness of existing Flipped Learning and newly applied Flipped-based PBL and MAKER classes, as a research tool, a pre- and post-interest survey questionnaire was administered to learners. Its purpose was to understand changes in learners' level of interest and their satisfaction with innovative teaching methods. For this purpose, questionnaires surveyed the satisfaction of learners and instructors. The interest rate test paper employed by Jeong-mi Lee (2007) was modified to suit this study's purpose, and its validity was tested after review by five educational engineering experts.

As for the validity test result, the total number of items on the interest scale was composed of 24 items. The scale's overall reliability was very high at 0.996, indicating that there was an internal agreement of the scale. Sub-factors included emotional motivation, class content, communication, learning activities, expected effects, and satisfaction. Emotional motivation was composed of four questions -reliability 0.980; class content - three questions,

Table 3. Question composition for each sub-area of the interest test sheet

Sub-factor	Question number	Number	Reliability (Cronbach's ro)
Interest	1-24	24	0.996
Emotional motivation	1, 2, 8, 23	4	0.980
Class content	3, 12, 14	3	0.965
Communication	5, 13, 16	3	0.967
Learning activity	4, 9, 17, 21, 22	5	0.982
Expected effect	11, 15, 18, 24	4	0.971
satisfaction	6, 7, 10, 19, 20	5	0.975

reliability 0.965; communication three questions - reliability 0.967; learning activity - five questions - reliability 0.982. The expected effect was

4. The reliability was 0.971, and five questions focused on satisfaction, with reliability of 0.975. All sub-factor scales had

reliability of 0.900 or higher, which can be said to show internal consistency of the scale. The composition of questions by sub-area of the interest level test sheet is shown in Table 3 below.

In summary, this study selected 110 courses for the classes using Flipped-based PBL and Flipped-based MAKER within Ulsan University in 2020. Through the results of the survey concerning the level of interest and satisfaction with the classes, their effect compared to the existing Flipped Learning was studied. The results focus on their effectiveness and alternatives by analyzing the advantages of grafting together teaching methods with different strengths to bring synergistic effects and identifying what teaching methods fit a subject's characteristics.

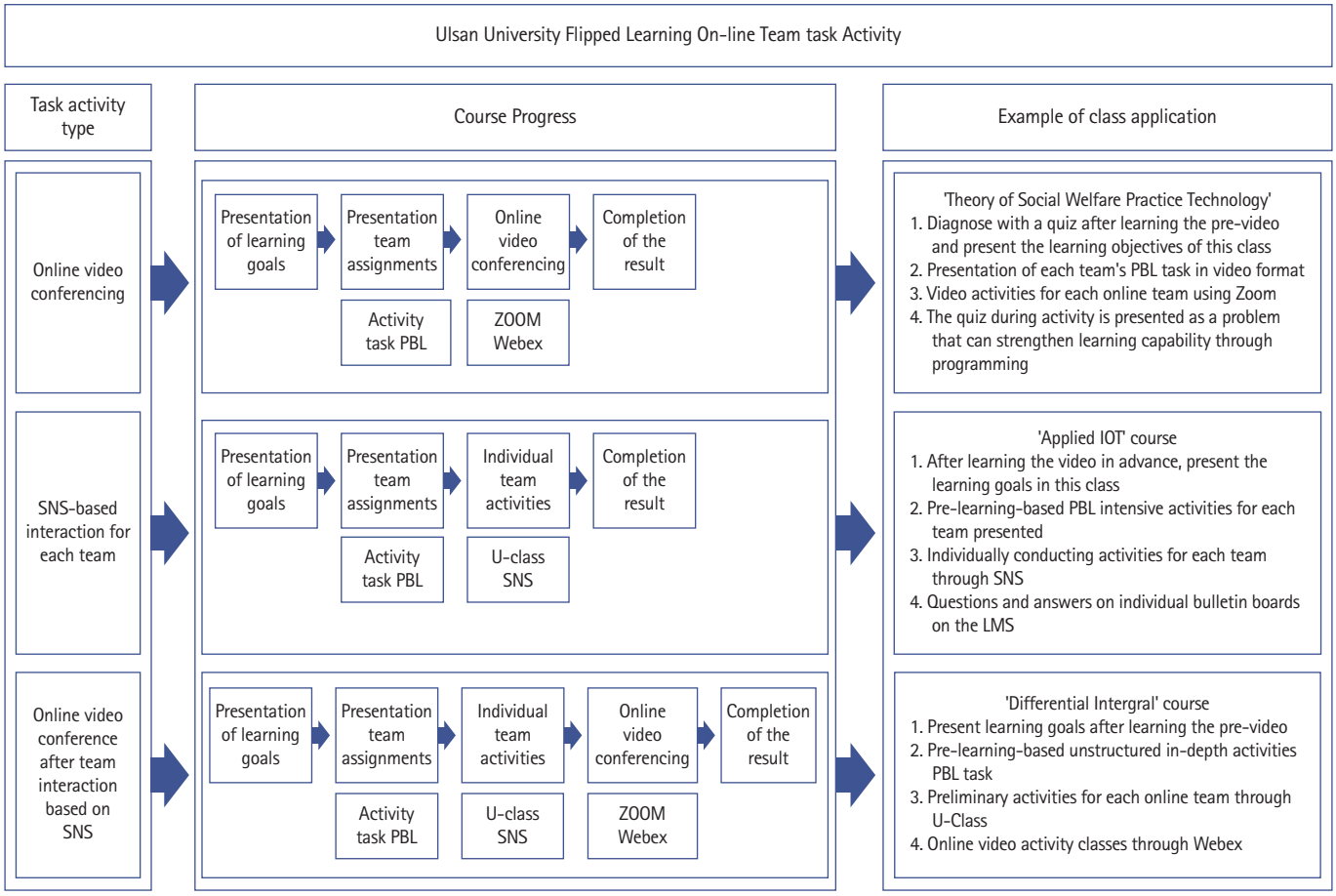

Figure 5. Online team homework activity class.

RESULTS

Satisfaction with Flipped Learning Class

In order to find out the effectiveness of the application of the Flipped-based innovative teaching method, which was implemented from 2020, a survey was conducted for the instructor who operated the Flipped Learning class and the learners who participated in the class. These results were compared with the results of the 2019 Flipped Learning class satisfaction survey.

This satisfaction questionnaire used a Likert-style 5-point scale, and the results of the survey were divided into 2019 and 2020 using a t-test. The average analysis results for the satisfaction of Flipped Learning classes in 2019 and 2020 are shown in Table 4.

In the case of instructors, the satisfaction with the class increased by 0.62 points from 4.19 points in 2019 to 4.81 points in 2020 ($p < .001$), and for learners, the satisfaction with classes increased 0.39 points from 4.23 points in 2019 to 4.62 points in 2020. The increase ($p < .001$) was statistically significant. In addition, the overall class satisfaction, including both instructors and learners, increased 0.51 points from 4.21 points in 2019 to 4.72 points in 2020 ($p < .001$), which was statistically significant. In summary, the overall satisfaction of the new flipped-based teaching method class was higher than that of the existing flipped learning class, and in particular, teachers rather than learners showed greater satisfaction with the new flipped-based teaching method class.

Table 4. Ulsan University Flipped Learning Class Satisfaction Survey Results

Survey target	2019		2020		t	*p*
	M	SD	M	SD		
Teacher satisfaction	4.19	1.05	4.81	.95	-24.64	0.000*
Student satisfaction	4.23	1.07	4.62	1.09	-19.36	0.000*
Total satisfaction	4.21	1.06	4.72	1.01	-20.15	0.000*

*$p < .001$.

Flipped-based PBL and MAKER classes (Pre and post interest survey results)

Pre- and post-interest surveys of 110 lecturers in 2020 focused on whether flipped-based PBL (N = 64 courses) and MAKER

classes (N = 13 courses) have an effect of improving interest compared to flipped learning classes with action learning alone (N-33 courses) as an educational event. The results of each survey were classified into pre- and post-test using t-test, and the average analysis results are shown in Table 5.

First, in the case of Flipped Action, which used the existing Action Learning as an activity class, the degree of interest increased by 0.17 points from 3.04 beforehand to 3.21 after. ($p > .05$), but it was not statistically significant.

Next, in the case of Flipped MAKER, which operated the activity class as a MAKER design based on Flipped, the degree of interest increased by 1.02 points ($p < .001$) from 2.72 points before to 3.74 points after, showing a significant improvement and being statistically significant.

Finally, in the case of flipped PBL, which operated the flipped-based activity class as PBL, the degree of interest increased by 0.59 points from 2.93 points before to 3.52 points after ($p < .001$), and it was also statistically significant.

In summary, in all types of flipped learning classes, results suggested interest was improved compared to the pre-investigation results, but the result for the existing action learning approach was not statistically significant.

DISCUSSION

Many universities have introduced innovative teaching methods according to the changes and demands of the Fourth Industrial Revolution; each has strengths and weaknesses. Educational designs are applied collectively at the school level. However, it is not easy to find one teaching method that fits all the various subjects in many university fields. Therefore, it is necessary to select and apply different teaching methods with proven effectiveness according to the individual characteristics. In this study the survey results showed that flipped learning class activities improved interest in the learning processes.

Flipped-based PBL Class

The core approach of the PBL class analyzed by this researcher presents the problem first and provides an interactive class for learners to solve problems through teamwork. However, in some actual classes, various problems became apparent due to lack of prior knowledge during classroom activities. As a result, active participation in PBL assignment activities did not occur. There were also problems with students not watching the pre-video well or passively participating in the actual activity of the Flipped Learning class. Therefore, Flipped-based PBL activity classes can increase pre-learning interest by delivering a certain amount of prior knowledge through pre-video learning and adding PBL task introduction to video learning. In addition, even in the actual offline activity class, there is an advantage of increasing the level of interest in the activity class by doing the PBL assignment activity based on an interesting topic in life.

Table 5. Ulsan University Flipped Learning class pre and post interest survey results

Survey target	Pre		Post		t	*p*
	M	SD	M	SD		
Flipped Action	3.04	1.03	3.21	.69	-7.02	0.689
Flipped MAKER	2.72	1.05	3.74	1.02	-38.15	0.000*
Flipped PBL	2.93	1.07	3.52	.95	-28.47	0.000*

*$p < .001$.

Flipped-based MAKER Class

Activity classes in Flipped Learning generally have many forms of general action learning. In the process of simply organizing a group and presenting through discussion, many learners did not actively participate, making it challenging to obtain the expected effect. However, if the activity class is conducted by MAKER Education, it is possible to use the latest technological equipment such as 3D printers, and at the same time, there is an effect of maximizing interest in the activity of creating creative creations using various tools.

In the study of the MAKER Education mathematics classes conducted by this researcher, it was seen that many learners were actively participating in activities such as using 3D printers and laser cutterand it was found that there was a statistically significant effect on improving interest and academic achievement. Therefore, it is believed that the teaching method incorporating MAKER with Flipped Learning can have a positive effect on academic achievement and interest.

CONCLUSION

It is not easy to find a single teaching method that fits all the various subjects in many university fields. Therefore, it is necessary to select and apply various teaching methods with proven effectiveness according to the subject's characteristics.

The purpose of this study was to discover whether new teaching methods that combine several teaching methods can be applied to suit the characteristics of the subject to show a greater effect. Therefore, through the results of this study, it is expected that the new teaching methods will complement the shortcomings of each teaching method, as well as the possibility of maximizing the strengths of each teaching method, as well as the possibility of se-

lecting a variety of teaching methods.

This study was conducted on learners of a certain level at a specific university in a particular region. Satisfaction surveys themselves have limitations. Therefore, generalizing the results can be an issue but in future specific guidelines can be applied to the learning processes to make it more likely that goals for optimal student learning are realized.

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Afghan Lecturers' Perception of Problem-Based Learning: A Case Study of Takhar University

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The study investigated the lecturers' perceptions of problem-based learning (PBL); their attitudes towards PBL, their views of effects of PBL on the learning process and the factors for not employing PBL in their courses. A survey questionnaire was used to collect data from 40 randomly selected lecturers from Takhar University. Descriptive and inferential statistics were used to analyze the data. The findings showed that lecturers had strong positive attitudes towards PBL and they were interested in utilizing PBL in their teaching activities. They were aware of the effects of PBL on the learning process particularly students' learning. They believed that PBL could help students develop a variety of generic skills, e.g., communication and problem-solving skills, which are necessary for employment. However, most of the participants did not make use of PBL in their courses for various reasons such as large number of students in their classes and lack of appropriate infrastructure. The lecturers' gender, level of education and years of teaching experiences did not have any significant impact on their responses.

Keywords: Problem based learning; Generic skills; Active learning; Teaching methods

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INTRODUCTION

Problem based learning (PBL) is a teaching and learning approach that begins with a problem scenario in which students are required to identify a number of learning topics for further exploration and research. Students work in small groups to explore the solutions for the problem (Savery, 2015). One of the main features of PBL is that it allows and encourages several solutions (Camp et al., 2014). In PBL, students construct meaning through engagement in meaningful activities and interaction with their teachers and peers (Yew & Gew, 2016). According to Watson (2001), students work together to come up with solutions for problems, which help them acquire knowledge and develop their problem-solving, reasoning, communication and self-assessment skills. PBL creates a learning environment in which teachers coach students' thinking and guide their inquiry, which facilitates their deeper understanding of the subject matter (Torp & Sage, 2002). Azman & Shine (2012) argue that PBL lets students acquire an integrated body of knowledge from many different subject areas and it helps them develop their teamwork skills.

Problem-based learning is a student-centered approach in which students take responsibility for their own learning and identify what they need to know in order to better understand and manage the problem presented in the learning event. Furthermore, they need to decide on where to obtain the required data (e.g., books, journals, tutorials, and websites) and evaluate their reliability. This allows students to personalize learning and focus on what is limited in their knowledge and understanding. In addition, learning occurs in small groups. Students work together in small groups to find a solution for a problem or an appropriate response to it

(Barrows, 1996). In PBL, the teacher acts as a facilitator and she/he identifies an issue that is interesting, relevant, and new to the students. The problem should be in line with the concepts and the ability of the students, and it should not be so difficult that students cannot solve it nor should it be so easy that it can be solved easily and without research. Another responsibility of the teacher is to place students into groups, supervise their work, and provide them with her/his feedback. Students play a major role. They work together and consider all aspects of the problem until they reach a possible solution. To reach the possible solution, students have to do a series of activities. They narrate, analyze, combine, discuss, think critically, present, actively listen, report, evaluate, and resolve differences among themselves (Kurt, 2020; Papinczak et al., 2007). Hmelo-Silver (2004) asserts that the teachers do not only facilitate students learning but they also ensure that students achieve the intended learning outcomes. Unlike traditional teaching methods, teachers using PBL actively involve students in the learning process and encourage their active participation throughout the learning process (Azer, 2011).

Many studies have shown that PBL is more effective than traditional teaching methods in which teachers are the sole source of learning. Van den Bossche et al (2004) studied the impact of PBL on business education. They divided the participants into two groups. One group was taught using traditional teaching methods, mainly lectures, and the other group was taught through PBL. They gave knowledge and case-based tests to both groups of students to measure the impact of PBL on their learning. The findings showed that students who experienced PBL performed better than those who were taught through lectures. Students who were taught through PBL had a more accessible knowledge base than those who studied in traditional ways. Argaw (2016) investigated students' skills in solving physics problems. The participants were categorized into two groups: PBL and traditional methods. The researcher concluded that students who were taught through PBL had better problem-solving skills than those who were taught through traditional methods. Othman et al. (2016) reported that students who were being taught through PBL were able to present their arguments in a more critical manner in the post test essays and provide sufficient supporting material to illustrate their arguments. Mahmood et al. (2017) found that PBL increased students' motivation and promoted higher order thinking. Katwa et al. (2018) concluded that self-direct learning, which is one of the features of PBL, has helped students become life-long learners. Prince and Felder (2006) reported that PBL fostered students' teamwork skills. Ghimire and Bhandary (2014) reported that the majority of their participants found PBL very useful for improving their generic skills and expressed their interest in having more courses to be delivered through PBL.

Afghan higher education made great strides before the Taliban came to power. The number of girls and women attending higher education rose in the 1980s and they accounted for 40% of the student body by the early 1990s (Giustozzi, 2010). However, it did not last and it came to almost a standstill when the Taliban rose to power in 1996. They barred girls and women from going to school and universities (Chuang, 2004; Orfan, 2021a; Orfan, 2021b; Noori et al., 2020; Noori & Orfan, 2021). After the arrival of the international community in Afghanistan in 2001, schools and universities reopened and a growing number of students have been attending schools and universities since then. Conventional teaching approaches and methods that place teachers in the center of the learning process have been prevalent in primary and higher education in Afghanistan.

The Afghan Ministry of Higher Education has taken various initiatives to improve the quality of higher education in the country one of which has been the incorporation of outcome-based education and student-centered learning (OBE-SCL) into higher education. They introduced OBE-SCL to universities in 2015 (Akramy, 2021; Alimyar, 2020). Since then, efforts have been made to institutionalize OBE-SCL in higher education. Training workshops on OBE-SCL are provided for lecturers every year, one component of which is problem-based learning. Due to the heavy load of the workshops and time constraints, enough attention is not paid to problem-based learning. The current study investigates Afghan lecturers' perceptions of problem based learning in Afghan higher education. It studies the lecturers' attitudes towards the use of problem based learning, their perception of the effects of PBL and their reasons for not employing PBL in their courses. Moreover, it explores the impact of the lecturers' gender, level of education and years of teaching experiences on their responses.

METHOD

Design

This is a quantitative study, using a survey questionnaire to collect data. The authors used a focus group to identify and develop questionnaire items for the study. They had a discussion with three lecturers about PBL, its effects and factors for not employing the approach at the university. They developed 16 questionnaire items from the focus group discussion. They also carried out a thorough literature review to identify more questionnaire items. They adapted nine questionnaire items from other studies (Abdelkarim et al., 2017; Singh et al., 2014; Dube et al., 2014; Ahmed & Malik, 2013). The questionnaire consisted of four parts. The

first part sought the respondents' demographic information - gender, level of education and years of teaching experience. The second part consisted of 10 items which aimed to explore the lecturers' attitude towards problem based learning. The third section, composed of 10 statements, elicited the participants' responses about their perception of PBL effects. The last part consisting of five items inquired the participants' response about factors affecting their use of PBL. The participants were required to respond to the items on a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree).

Prior to the data collection, the authors gave the questionnaire to three of their colleagues in the English Department to read it for revision and improvement. The problematic items were identified and revised based on their feedback. They conducted a pilot test with seven lecturers to ensure the consistency of the items. As Table 1 shows, the reliability value for each category is over 0.7, which indicates that the items were appropriate for the study. The authors translated the questionnaire into Dari (the lingua franca of the country) since English is a foreign language in Afghanistan and many people cannot speak English (Orfan, 2020). The Dari questionnaire was given to three lecturers of Dari Department to ensure its comprehensibility.

Table 1. Reliability value of questionnaire items

Category	Number of Items	Cronbach's Alpha
Attitudes	10	0.742
Effectiveness	10	0.708
Reasons	5	0.781

Procedure and analysis

The authors collected data from 40 randomly selected lecturers from Takhar University. They presented a copy of the questionnaire along with a consent form to each participant. They explained the research and its purposes to the participants and they were requested to read and sign the consent form if they were willing to participate in the study. The consent form ensured them of the confidentiality of their responses and that their participation was voluntary. The participants were required to read the instruction for each section and complete it accordingly. The researchers encouraged the participants to ask about any vague or ambiguous items. It took the respondents on average 10-15 minutes to complete the questionnaire.

The researchers numerically coded the data in an Excel spread sheet and imported this to SPSS version 26.0 for analysis. They closely examined the completed questionnaires to make sure the participants filled them out appropriately. Three questionnaires were excluded from the analysis since the participants failed to complete them appropriately. The authors conducted descriptive statistics to determine the mean and percentage of the items. They also ran Independent Samples *T*-test and One-Way ANOVA test to determine the differences between the participants' gender and level of education.

RESULTS

Participants

There were 40 participants who were randomly selected from Takhar University for the study. The authors obtained the list of lecturers, who received OBE-SCL training, from the Professional Development Center (PDC) of Takhar University, and 85 lecturers received the training. Out of 85, 27 were not accessible since they were pursuing their higher education (master's degree, doctoral degree) at the time of the study. The authors wrote the names of 58 lecturers and they picked 50 of them after shuffling and reshuffling. They distributed the questionnaire to 50 lecturers; 40 of them returned the completed anonymous questionnaire. The participants were teaching in various faculties of Takhar University: engineering, agriculture, economics, education, language & literature, sharia and law. Around 20% of the participants were female while 80% of them were males. The participants had 1-15 years of teaching experiences at the time of the study. The vast majority of the participants (85%) held a master's degree while a small fraction of them (15%) had a bachelor's degree at the time of the study.

Lecturers' attitudes towards PBL

The authors conducted descriptive statistics to determine the lecturers' attitudes towards problem based learning. As Table 2 shows, the overall mean score for the attitude is 4.08, which indicates that lecturers have strong positive attitudes towards problem based learning. Furthermore, 90% of the participants (36) believed that PBL is better than traditional methods, creates interest in topics, makes topics interesting and it is an effective learning method. Over 80% of the respondents stated that PBL is a student centered and scientific method and that it encourages independent thinking. Moreover, over 70% of the respondents believed that they were interested in using PBL in their courses and that PBL facilitated interaction and encouraged students to learn in context.

PBL effects

Descriptive statistics were used to explore the lecturers' perceptions about effects of problem based learning. As Table 3 demon-

Table 2. Lecturers' attitudes towards PBL

No	Statement	% A & SA	Mean
1	PBL creates interest in topic.	95	4.23
2	PBL makes the topic more interesting and fun.	92.5	4.2
3	PBL is better than a traditional teaching method.	91.5	4.16
4	PBL is an effective learning method.	90.7	4.1
5	PBL encourages students' independent thinking.	87.5	4.1
6	PBL is students centered learning.	87.5	4.18
7	PBL is more scientific way of teaching.	81.2	4.05
8	I am interested in using PBL in my courses.	77.5	3.98
9	PBL facilitates interaction with peers.	75	4.05
10	PBL encourages students to learn in context.	72.5	3.98
	Overall attitude		4.08

Table 3. Lecturers' perception of PBL effects

No	Statement	% A & SA	Mean
1	PBL enhances students' understanding of the subject.	95	4.3
2	PBL facilitates self-learning.	92.3	4.13
3	PBL increases students' involvement in the learning process.	91.6	4.18
4	PBL strengthens students intrinsic motivation	87.5	4.2
5	PBL improves students' problem solving skills.	85	4.28
6	PBL helps students to identify their strengths and weaknesses	85	4.05
7	PBL increases students' participation in the learning activities.	85	4.1
8	PBL enhances students' teamwork skills.	79	3.93
9	PBL improves students' communication skills.	77.5	4.08
10	PBL enhances students' critical thinking skills.	72.4	3.83

Table 4. Factors affecting PBL at the university

No	Statement	% A & SA	Mean
1	There is a large number of students in my courses.	85.6	4.21
2	The infrastructure at the university does not support the use of PBL.	71.3	3.79
3	I do not have the required knowledge of applying PBL.	65	3.59
4	PBL is not applicable in my courses.	73.2	3.93
5	The curriculum does not support the use of PBL.	57.7	3.07

strates, over 90% of the participants believed that PBL would enhance students' understanding of the subject, facilitate self-learning and increase students' involvement in the learning process. Over 80% believed that PBL would reinforce students' motivation, improve problem-solving skills, help students identify their strengths and weaknesses and increase students' participation in the learning activities. Furthermore, over 70% stated that PBL would enhance students' teamwork, communication and critical thinking skills.

Factors affecting the use of PBL at the university

The last part of the questionnaire sought the participants' response about factors affecting their use of PBL in their courses. As Table 4 shows, over 70% of the participants stated that large number of students in classes, lack of appropriate infrastructure and inapplicability of PBL in their courses are the major reasons why lecturers do not use PBL in their courses. Moreover, 65% of the participants did not have the required knowledge to use PBL in their courses. Around 58% believed that their curriculum did not allow the use of PBL in their course.

Participants' demographic profile

The authors conducted Independent Samples *T*-test and One-Way ANOVA test to determine the differences in lecturers' responses by their gender, education level and years of teaching experiences. As Table 5 shows, the p-value for all three variables is

Table 5. Participants' attitudes by gender, education and teaching experiences

Variables		N	Mean	SD	*p*-value
Gender	Female	8	4.21	0.275	0.420
	Male	32	4.03	0.619	
Education Level	Bachelor	6	4.15	0.152	0.697
	Master	34	4.05	0.615	
Years of teaching experiences	1-5	20	4.13	0.558	0.777
	6-10	14	4.01	0.692	
	11-12	6	3.98	0.256	

Table 6. Effects of PBL by gender, Education level and experiences

Variables		N	Mean	SD	*p*-value
Gender	Female	8	4.14	0.227	0.950
	Male	32	4.13	0.541	
Education Level	Bachelor	6	4.13	0.250	0.975
	Master	34	4.13	0.526	
Years of teaching experiences	1-5	20	4.17	0.462	0.842
	6-10	14	4.06	0.620	
	11-12	6	4.15	0.235	

greater than the alpha level (0.05). Furthermore, the p-value for all three variables with respect to PBL effects are greater than the alpha level (Table 6). Thus, it is concluded that the lecturers' gender, education level and years of teaching experiences did not have any significant impact on their responses.

DISCUSSION

The study investigated Afghan lecturers' attitudes towards problem based learning, their perceptions of the effects of PBL and issues around not employing PBL at the university. It also examined whether the lecturers' gender, level of education and years of teaching experiences had any significant impact on their responses. The results of the study showed that lecturers had strong positive attitudes towards PBL and the majority of them were interested in utilizing PBL in their teaching and learning activities. The finding is on a par with the results of the study by Ahmed and Malik (2013) and Aboonq (2015) who reported that their participants had strong perceptions towards the use of PBL.

The results also showed that lecturers were aware of the effects of PBL in the learning process particularly on students' learning. The vast majority of them believed that PBL would enhance a wide range of students' generic skills, which are considered necessary for employment after graduation. They believed that PBL would improve students' team work, communication, critical thinking and problem-solving skills. Furthermore, they believed that PBL would increase students' participation and engagement in the learning process and strengthen their motivation for learning. These findings resonate with those of the studies carried out by Abdelkarim et al. (2018) and Aziz et al. (2014) who found that their participants knew the positive impacts of problem based learning on the learning process.

In addition, the findings revealed that lecturers could not employ problem based learning in their teaching and learning activities for various reasons. They did not utilize problem based learning due to a large number of students in their classes and lack of appropriate infrastructure at the university. It can be accounted for by the fact the number of students has been substantially increasing in Afghan higher education and there are too many students in classrooms, for example 150. Lecturers particularly in provincial universities have to teach at least four courses and they have no assistants to help them with course planning, organization and instruction. They have to do everything related to their courses by themselves.

Moreover, the infrastructure in many public universities fails to meet the basic requirements for learning. For instance, classrooms aimed to house 40 students in a session, are used to house 80 students; this makes it impossible for the lecturers move around the class let alone conduct group activities in the classroom. This finding is similar to that of the study by Hashemi (2021) who reported that less ICT infrastructure in public universities was one of the challenges of conducting online teaching in Afghanistan. Most of the participants could not make use of PBL in their learning and teaching activities because they lacked the knowledge of

PBL application in their courses. It can also be accounted for by the fact that there are not sufficient capacity building programs for lecturers particularly with regard to modern teaching approaches and methods. In addition, most of the lecturers did not use PBL in their courses because they believed that it was not applicable in their courses. The authors believe that their low level of knowledge about PBL and its principles led the lecturers to believe that the PBL was not applicable in their courses. The lecturers believed that the curriculum did not support the use of PBL. It can be accounted for by the fact that the curriculum obliges the lecturers to teach certain topics by the end of a semester. There were not any statistically significant differences between the lecturers' responses by their gender, level of education and years of teaching experiences.

CONCLUSIONS

The study revealed that the lecturers had strong positive attitudes towards the use of problem based learning in their teaching and learning activities. They believed that the use of PBL in courses could have positive impacts on the learning process particularly on students' learning and it could improve a wide variety of students' soft skills, for example communication and problem-solving skills which are necessary for employment. The lecturers did not use PBL in their teaching and learning tasks for various reasons, including huge number of students in their courses. The lecturers' gender, level of education and length of teaching experiences did not have a significant impact on their responses.

PBL is one of the most innovating teaching and learning approaches and it has proven to be effective in higher education. Many studies reported that PBL had significant impact on the learning process. More importantly, PBL helps students acquire a wide variety of generic skills such as communication, negotiation and problem-solving, which are deemed necessary for employment after graduation and good performance in the work. Curriculum design needs to be consistent with producing graduate outcomes that is consistent with the needs of contemporary contexts. Therefore, the authors suggest Afghan universities provide the lecturers with training workshops in order to enable them make use of the elements of PBL (student-centered and self-directed learning, processes of enquiry and critical thinking, investigation of real world problems) and incorporate them in their teaching activities in order to boost students' learning and motivation. The study is limited in two ways. It is a case study at one Afghan public university. The sample size is also small and that does not support generalization to all Afghan higher education institutions. Therefore, the authors suggest further studies and they should have a larger sample from various public and private higher education institutions. They should also utilize interviews for data collection.

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A Study on Key Components of Problem-Based Learning through Literature Review

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With problem-solving capacity continuously gathering prominence in professional field, Korean universities are deviating from traditional rote-teaching to a teaching method which ensures development in problem-solving ability among students. As part of several new teaching methods, problem-based learning (PBL) has emerged as an effective means for education. For successful implementation of PBL within university curricula, pinpointing components required for PBL program is necessary, and yet essential components of PBL have not been specifically identified according to studies. Thus, this study conducted a literature review to identify key components which are necessary for effective application of PBL in university courses.

Keywords: Problem-based learning; Component; Korea; University; Education

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INTRODUCTION

The World Economic Forum's "The Future of Jobs" (2016) report, states that 'complex problem-solving' has been assessed as the most important competency for future society. In "The Future of Jobs Report 2018," the World Economic Forum continues to highlight complex problem-solving as a skill in demand, along with capacities such as analytical thinking and innovation, critical thinking and analysis, active learning and learning strategies, and reasoning, problem-solving and ideation. The Korean Ministry of Education has suggested that education which i) manifests the learner's potential, creativity, and problem-solving capacity, ii) fully exhibits learner's interest and aptitude, and iii) makes much of mankind and contributes to social unification, as three major directions for Korea's educational development in response to the Fourth Industrial Revolution.

Nowadays, universities within Korea are asked not only to play a role as research centers but are also requested to educate students into professionals equipped with problem-solving capacities well fit for industry within society. However, it is reckoned that rote-teaching has limits in educating present-day students, who differ in approaches to reaching learning capacity and cultural characteristics compared to those of the past. Thus, creative educational attempts to ensure acquisition of specialized knowledge and progress in on-site capability are required now more than ever. Various education methods digressing from the established rote-teaching method have been examined previously, including major-based capstone design, problem-based learning, experimental learning, project-based capstone design, and multi-disciplinary approaches.

Among newly emerging teaching methods receiving attention, problem-based learning (PBL) features as a measure which aims to solve problems through cooperation and discussion in a professor-student or student-student context. PBL has been emphasized by scholars as an effective method to improve the traditional education paradigm and therefore has been selected for further examination. This study aims to conduct a literature review of domestic and foreign academic studies and come up with essential components of PBL, which would provide assistance in devising a model adequate for contemporary situations within universities in Korea. To do so, this study analyzed components of PBL described in existing studies within the literature.

METHODS

Research subject and data collection

The research focused on domestic and foreign qualitative and quantitative studies published in academic journals from January 2015 to December 2020. The search was conducted on primary databases used in the Healthcare field, which included Google Scholar, KISTI, EMBASE, PubMed, KISS, RISS, and KMBASE. Search terms for the studies included "problem-based learning" "PBL," "PBL education" "PBL university". Under such conditions, 164 foreign studies have been retrieved primarily through searches in Google Scholar, EMBASE, and PubMed, and 26 domestic articles have been identified through searches in KISTI, KISS, RISS, and KMBASE, resulting in a total of 190 studies. Excluding 37 duplicates, the remaining 153 studies had their abstracts screened and 69 articles were deemed irrelevant to the study and were excluded. With the remaining 84 studies, the full-text was assessed, and those not including PBL components or implementation methods were excluded: 23 studies have remained for qualitative synthesis, 5 which were used for establishing the theoretical background of this study and 18 studies which were included for thorough qualitative analysis (Figure 1 and Supplementary material 1).

Theoretical and methodological frameworks presented by Sim-

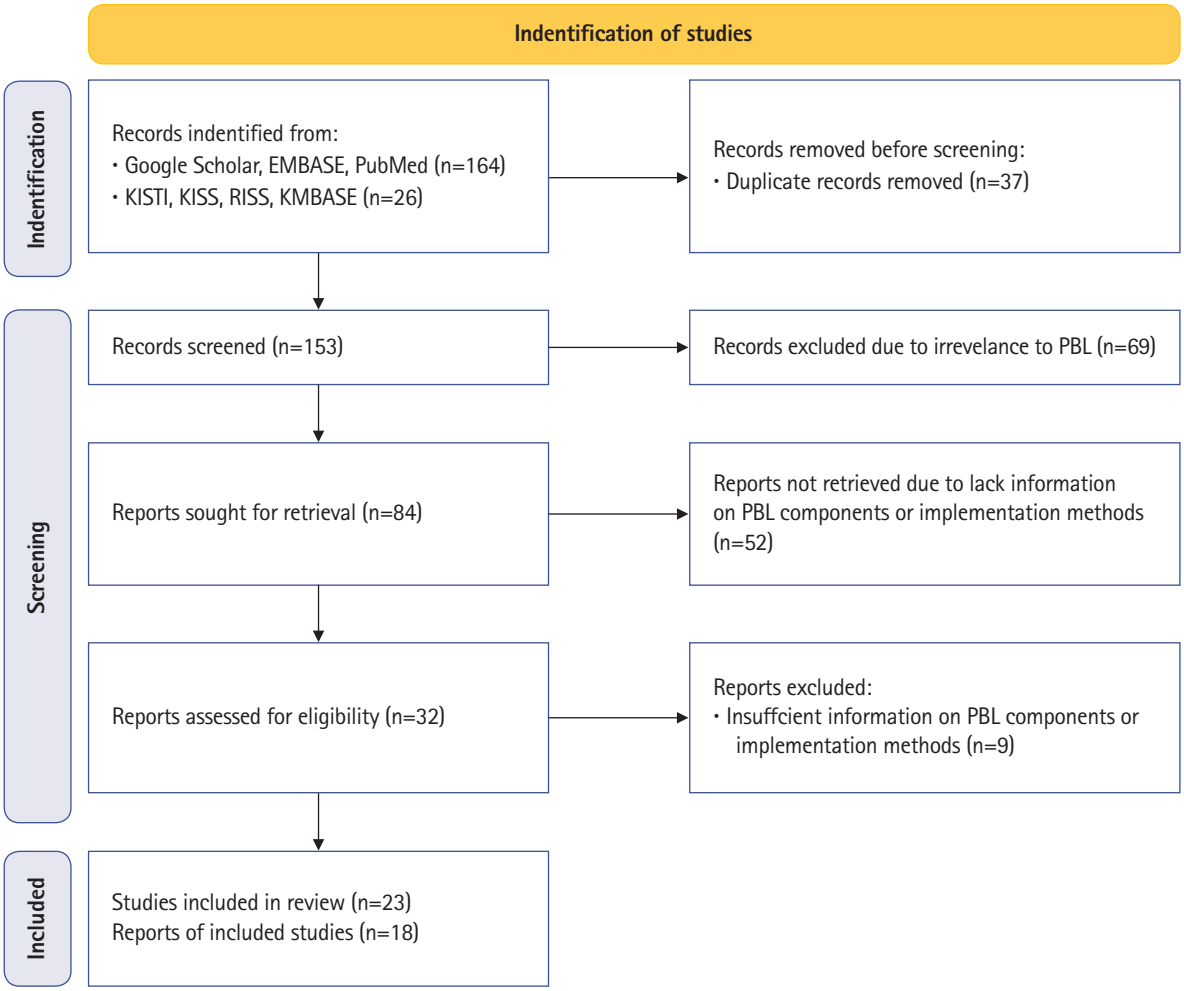

Figure 1. PRISMA flow diagram for inclusion of studies

one C. dos Santos in her 2017 piece "PBL-SEE: An Authentic Assessment Model for PBL-Based Software Engineering Education" were used as reference for coming up with key components of PBL. The framework has been selected for this study because of the relevance and expertise dos Santos has in the PBL field, having published more than 20 articles on PBL since the year 2000. In the article, dos Santos mentions five elements of the PBL approach:

1) Problem, selecting actual problems, whose complexity is treated as a significant aspect;
2) Environment, creating an actual real-world work environment;
3) Human Capital, having professional experts as teachers and tutors, with the students as actors and real clients involved in the teaching process;
4) Content, compiling an innovative syllabus whose content closely reflects actual problems;
5) Process, implementing an authentic assessment process based on the teams' results and the students' knowledge, and, from a technical and market perspective, a tight control enforced by monitors. (p. 121)

With these elements in mind, key components of PBL have been perused in the selected eighteen articles.

RESULTS

Through analysis, certain elements of PBL have been highlighted within the studies. The selected studies were examined again to determine whether the highlighted elements were included in each piece. After analysis, the final selection of PBL components includes 1) incorporation of real-life problem, 2) collectiveness, 3) solution formulation, 4) learner proactiveness, 5) evaluation by the learner, 6) integration of a planning process, and 7) facilitation by the instructor. While 8) efficient time management was included in three articles as another component of PBL, it was excluded for further discussion because it was deemed irrelevant or with minor importance. Supplementary material 2 provides an overview of each article and the components of PBL that the article incorporates.

1. Incorporation of real-life problem

Incorporation of real-life problem places emphasis on the characteristics of the problem; problems presented in PBL must be challenging, and yet should also be pragmatic and applicable to actual situations. Hallinger and Bridges (2017) highlight that in PBL, "learning is stimulated by and organized around a high impact problem that students are apt to face in the workplace." As Rodríguez González and Fernández Batanero (2016) recommend, a realistic problem is essential because "the work is seen to be relevant and is infused with an intrinsic motivation" for the student. In other words, because the problem is relevant to students' interests and provides functional knowledge in a field of interest, students are likely to become immersed in the learning process and thus acquire better understanding of the course and subject (dos Santos, 2015).

2. Collectiveness

All studies included collectiveness as an essential element of PBL. Hung and Lin (2015) in their version of PBL curriculum, required students to participate in group discussion for them to systematize new information into acquired knowledge. Based on social constructivism, students obtain knowledge better in a collective setting, and they tend to display better motivation and greater confidence in doing so (Jaleniauskiene, 2016). Study results also show that through team discussions, "students become more capable of recognizing problems and enable themselves to seek appropriate solutions for those problems," naturally leading to the actual problem-solving process itself (Huang & Wang, 2020). Thus, Rodríguez González and Fernández Batanero (2016) describe collectiveness as an element of PBL which offers great improvement in problem-solving capacity as well as guaranteeing professional development among students.

3. Solution formation

Solution formation involves formulating a feasible resolution to the problem provided. Perhaps solution formation is the most crucial element of PBL, as it is one feature differentiating PBL from traditional rote learning. Kim (2018) accentuates that PBL emerged because rote-teaching failed to stimulate connection between new and existing knowledge within students. Hence, as Hallinger and Bridges (2017) claim, students should "'demonstrate' simulated solutions to the problem (rather than just analyses) and receive formative feedback on their efforts." It is through this conversion of fundamental information to demonstration where higher levels of expertise can be accomplished by the learner (Hung & Lin, 2015). In short, students have to come up with a solution by merging new knowledge with prior knowledge, and such exercise acts as an effective measure for securing freshly learned information (Huang & Wang, 2020).

4. Learner proactiveness

Learner proactiveness is another component of PBL which explains that students should feel responsible for their learning and accordingly act constructively. Students, as Tortorella et al. (2017) describes, "must be conscious of what information is already

known about the problem, which information they need to know to solve it and possible strategies to apply." Another study places high emphasis on learner proactiveness, in that "intrinsic motivation is of utmost importance in students' learning in blended learning events, and students who are motivated intrinsically are more prone to finish tasks, and perform better in comparison with the extrinsically motivated pupils" (Almulla, 2019). Alrahlah (2016) also states, due to learner proactiveness, students are likely to gain expertise, as they are attaining knowledge in the similar manner that professionals do.

5. Evaluation

Evaluation implies assessment of solutions or procedures incorporated during the learning process. Dos Santos (2017) stresses a need for frequent evaluation to determine if the actions are in agreement with the learning objective and to see whether improvements can be made for future reference. According to Tortorella et al. (2017), "the reflective components of PBL can also contribute to higher levels of individual interest in helping students explicitly articulate their growing comprehension of the real work," indicating a potential positive connection between evaluation and learner proactiveness, the 4th component of PBL. Furthermore, Almulla (2019) states that progress in reflective skills through PBL also results in improvement of research skills on the course subject.

6. Involvement of planning process

As explained by Kang et al. (2019), problem-solving involves a self-planned process where the learner selects adequate resources with respect to the learning objective and executes a strategy for learning achievement. In essence, a major difference between PBL and other forms of learning is that it relies, not on the evaluation of the learning result, but predominantly on the acquisition of knowledge through the learning process (Shin & Kim, 2019). It is through such process where focused thinking occurs, as Wosinski et al. (2018) describes, where students devise a periodical plan for research to solve the problem and act accordingly. Dos Santos (2015) elaborates further when she describes "the essence of PBL is that it is process-oriented," and that "it is important to maintain alignment between the stages of the PBL process to ensure its effectiveness."

7. Facilitation by instructor

Facilitation by the instructor is another unique component of PBL when compared to other learning methods in that it becomes the major, perhaps the only, role of the instructor. According to Jaleniauskiene (2016), "the role of a tutor or an instructor changes into a facilitator of students' learning," and so "students have to become self-directed and self-regulated in the process of learning." Instructors, based on their experience and knowledge of the actual professional environment, hold significant roles in providing guidance and assessing the practicality of solutions given by students (Salinitri et al., 2015). The importance of such roles is highlighted through metacognitive communication, where the instructor provides students with questions on how to improve their thoughts regarding the course subject (Alrahlah, 2016). Moreover, Kim (2018) asserts that facilitation by the instructors is significant because under poor assistance, students may not acquire essential learning resources at appropriate times, establish inapt hypotheses, and have low learning interest due to unnecessary wasting of time.

DISCUSSION

While variables do exist among essential factors of successful PBL implementation, a thorough literature review of 18 domestic and foreign academic studies in this study provides a list of major components required for PBL learning which could be utilized for the development of curriculum design that is adequate for implementing PBL within Korean universities. The study has identified seven elements as essential factors of successful PBL application in university courses -incorporation of real-life problem, collectiveness, solution formulation, learner proactiveness, evaluation by the learner, integration of a planning process, and facilitation by the instructor. While efficient time management has been highlighted in several studies, there was not sufficient data to confirm its importance.

CONCLUSION

This study has provided evidence of reports on the elements necessary for successful implementation of PBL methodology. Once these elements are all considered in the design and implementation of a university curriculum, the following results are anticipated:

1) Improvement of self-directed problem-solving capacity through learners' proactive involvement in learning.
2) Enhancement of learners' integrated thinking and creative aptitude.
3) Augmentation of learners' communication skills and presentation skills
4) Development of learners' strategic thinking proficiencies.

Thus, it is recommended that Korean universities, divert away from the traditional rote-teaching method to provide a more effi-

cient and meaningful means to assist students with meaningful knowledge acquisition and application; employing PBL methods in their curriculum will achieve the learning outcomes listed above. When doing so, the incorporation of key PBL components as highlighted in this study is necessary for successful implementation.

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SUPPLEMENTARY MATERIALS

Further details on supplementary materials are presented online (available at https://doi.org/10.24313/jpbl.2021.00045).

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Development of a Framework for Problem Domain Transference in Health-Related Problem Based Learning and Assessment

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Purpose: Investigate the capability of a knowledge-based framework and architecture, used in a specific health domain problem that can utilise transfer learning, to speed virtual patient development for problem-based training and assessment in other health domains.
Methods: Analysis of a case study, based on a virtual patient used in the training of pharmacy students, to discover the viability of using generic, ontological knowledge capable of transfer to virtual patients in other health domains.
Results: Areas of the virtual pharmacy patient knowledge-base were identified, along with corresponding expected student questions, that are generic to other health domains. Using the framework from the case study to develop a new virtual patient for problem-based learning and assessment in a new health domain, these generic target questions could be utilised to speed up the development of other learning stimuli in future projects involving different health domains, such as nurse training in pain management.
Conclusions: With some modification, the framework of the case-study virtual patient was found to be capable of supporting generic expected student questions capable of re-use in virtual patients with new clinical conditions.

Keywords: Transfer learning; Virtual patient; Virtual reality; Problem based training; Health education; Assessment; Nurse training

Concept Analysis

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INTRODUCTION

Problem-based learning (PBL) is a major pedagogical approach in education for healthcare. It uses real-life case scenarios, interactivity and guidance to help students develop skills in critical thinking, knowledge transfer and problem-solving (Wood, 2003).

There has been a long history in the development of learning paradigms in healthcare, with some differences in their interpretation and implementation. In some instances, PBL and case-based learning (CBL) have much in common, although PBL stimulus material is more exploratory and CBL is more often intensively guided by an instructor:

"CBL uses a guided inquiry method and provides more structure during small-group sessions unlike PBL which is an open inquiry approach where facilitators play a minimal role and do not guide the discussion, even when learners explore tangents" (Seitia et al., 2011).

Learner satisfaction and educational attainment resulting from the paradigms often depends

on the nature of implementation and this can produce difficulties in comparison and evaluation. While a study on fourth-year medical students comparing CBL and PBL approaches to learning a topic involving eating disorders found no significant difference in learning outcomes between the two approaches (Katsikitis et al., 2002), more recent studies with medical students comparing CBL (implemented as guided inquiry) and PBL (implemented as open inquiry), found CBL was preferred to PBL (Srinivasan et al., 2007;Seitia et al., 2011).

Problem-based learning in nurse education

The aim of PBL in nurse education is to "improve clinical reasoning skills through problem solving and critical thinking among students" (Wosinski et al., 2018). An early meta-analysis study of the literature around PBL in nurse education concluded that the methodology had positive effects on learner training satisfaction, education and skills (Shin & Kim, 2013). However, other studies from that time reported inconclusive results regarding improvements from the use of PBL in nurse education (Zhang, 2014). The recent 2018 systematic review of undergraduate nursing students' satisfaction with PBL and its effectiveness as a teaching method indicated that there were inconsistent results reported in the literature, which may have been related to a "…lack of homogeneity of PBL practice in nursing education, the tutor's role, activities performed and the personal learning environment" (Wosinski et al., 2018, p.68). The systematic review of Sayyah et al (2017) showed that "using PBL may have a positive effect on the academic achievement of undergraduate medical courses" and suggested that "…teachers and medical education decision makers give more attention on using this method for effective and proper training" (Sayyah et al., 2017, p.691).

While PBL has been introduced as part of a useful paradigm shift in current nursing programs, its implementation sometimes intersects with Case-Based Learning (CBL). A recent systematic review of PBL in undergraduate nursing programs, undertaken by Wosinski et al. (2018), included among their five findings that during PBL "the nursing tutor models clinical reasoning and leadership skills", "nursing students acquire skills that foster clinical reasoning" and when "used as intended, nursing students understand its purpose and process" (2018, p. 67). They also concluded that tutors needed to be trained to guide students through the PBL process. The pure PBL paradigm is intended for unguided exploration of learners, with feedback and assessment of the quality of their learning decisions. It can be useful to provide some guidance through feedback at various stages of a PBL process. This allows the learner open choices for their ongoing progression, but also provides them more information for their subsequent choices in decision-making.

Problem-based learning and technology in health education

Virtual Learning Environments (VLEs) and Virtual Patients (VPs) include a broad range of IT tools and systems that may be implemented in differing modalities, and can address differing learning areas, competencies and educational roles (Harmon et al., 2021). Virtual patients are based on artificial intelligence (AI) architectures and knowledge-model frameworks (Colloc & Sybord, 2003) and are implemented in various ways in health and medical applications, such as chatbots in disease education and prevention (Pereira & Diaz, 2019). The term 'virtual patient' in healthcare education is used as a "broad umbrella term for computer-based programs to simulate real-life clinical scenarios" (Hege et al., 2019).

According to Bearman & Cesnick (2001), the aim of a virtual patient (VP) is to respond and answer questions from a student, in much the same way as a real patient would. The difficulty in the design and implementation of a VP is that the student can ask a question in many ways, including ways not directly related to the condition that the VP is simulating. Historically, VP design involves a lot of variety, but two major approaches have included: i) a narrative structure, based on decision-trees and cause-and-effect scenarios, with a student being guided through correct/incorrect choices; or ii) a problem-solving structure developing clinical reasoning and accuracy in diagnosis, where a student has to collect information and make a decision based on their findings (Bearman & Cesnick, 2001).

Traditional methods of improving student's interpersonal and history-taking skills in the health and medical professions included the use of actors being employed as a simulated patient in both tutorial practice sessions, assessments and oral examinations, such as the objective structured clinical assessment/examination (OSCA/OSCE) in medicine, health and nursing (Serpell, 2009;APHRA, 2020). The literature has long evidenced the educational advantages of this practice, especially the ease with which VP repetition provides for standardisation in the scenarios (Wind et al, 2004;Tamblyn et al, 2007;Zayyan, 2011). There are significant resource advantages in using computerised VPs rather than actors, such as a reduction in training time, lower costs compared to employing real actors, and the ability for easy modification of the VP appearance, involving characteristics such as race, gender and age.

Technology has been integrated into contemporary health education; in PBL methods this facilitates more automation of feedback and guidance. For example, the use of case-of-the-week (COW) problems is widespread in both formative and summative clinical online assessment (Marques & Correla, 2017). A

COW is an on-line clinical exercise, developed as a clinical vignette of a real-world problem. The COW is presented to students, (individually or teams), who are then required to find the most appropriate answers, often to multiple-choice questions relating to the problem (Marques & Correla, 2017).

Peddle et al (2019) studied the effects of undergraduate nursing students exposure to web-based virtual patients. They concluded that the interactions influenced students' knowledge, attitudes and practices of non-technical skills, encouraging students to learn through making mistakes and providing socialisation towards their future professional role.

Virtual patients are being used to improve communication and interpersonal skills, which are vital for students in the health professions (Banski, 2018). Advances in artificial intelligence (AI) technology and techniques have enabled VPs to be designed to develop medical students' information gathering and history-taking skills. For example, a VP that presented a 3-D patient image and used natural language recognition (NLR) to test Ohio State University medical students' interview skills in differential diagnosis achieved a 79%-86% level of accuracy in its responses to student questions (Maicher et al., 2017). The web version of the VP was constructed with a Unity game creation engine and students typed questions to the VP, which responded with text to the students.

Research in question generating systems is promising, but these generally create questions using natural language processing (NLP) methods that require underlying natural language understanding (NLU) systems. The NLU systems are either rule-based systems, such as that of Maicher et al. (2017), which may be limited to very specific domains, or those based on machine learning, exemplified by Kenny et al. (2010), or deep learning, exemplified by Zini et al. (2019), that require a large amount of data for training and implementation.

Normally in deep learning applications a large amount of data that has been labelled (supervised learning) for specific categories is required. 'Transfer learning' is an artificial intelligence machine learning technique, in which an already trained machine learning model is applied as a basis to a different, but related problem. It can be used to enhance development time of new deep learning neural networks, especially when limited training data is available for a new application. The weights and architecture of a deep learning network that has been trained on a general problem, e.g., tuberculosis detection in lung X-Rays, can be utilised to form the basis of the architecture with pre-trained weights for a new problem, such as detection of coal workers' pneumoconiosis (CWP) in lung X-Rays.

METHODS

This paper investigates the possibility of applying transfer learning to re-use the knowledge of an existing VP that was successfully used for PBL with pharmacy students (Newby et al., 2011). Training the VP to simulate different conditions in the specific pharmacy domain was very time consuming. The framework and knowledge base developed for the pharmacy VP was intended to be expandable and have the ability to be reused in other health domains to alleviate the time-consuming training necessary for a new VP in a different health domain.

This paper investigates a case study of an earlier design and implementation of a VP, the Virtual Pharmacy Patient (VPP), to determine if it contains generic content that may be applicable for transfer to VPs that are based on a similar framework but used in other health domains. The generic content to be investigated is in the ontology of the VPP knowledge-base, consisting of a domain lexicon and knowledge of domain questions, their appropriate answers and also their sequencing and interaction with other domain questions and answers.

The VPP incorporates a proven framework that was successfully implemented in practice, and had multiple Human Computer Interface modes (designers, learners, implementers, administrators) that provide a high degree of generality as a PBL framework for applying it to other health domains. This case study focused on the design and teaching principles of the VPP. The VPP was chosen to see if the principles and architecture that comprise its existing knowledge-base framework could be applied to the development of virtual patients, using a similar framework, in different health domains. Thereby shortening the VP development time, providing an initial labelled training data set for VP's that may employ other architectures than the VPP, such as deep learning.

The VPP had different interfaces for i) the problem learners (university pharmacy students) who accessed the VPP for real-time interviews and problem solving exercises and who received feedback from the VPP on their performance, ii) the problem designers (university lecturers in the pharmacy domain) who provided the domain problems, the learner questions that should be expected from the students and appropriate VPP answers to the questions and, iii) the implementers and moderators (university tutors and course administrators) of the learning experience when the VPP was provided to students, and who receive feedback and analysis of both individual and class learner performance. Using the feedback generated by the VPP to individuals and for aggregated class performance, tutors and lecturers provide additional feedback and guidance to individual students and to the class.

Case study: the virtual pharmacy patient system

The VPP, used for assessment of pharmacy student' communication, history taking and diagnostic skills, was developed under an Australian Learning and Teaching Council (ALTC) grant. It was alpha tested at the University of Tasmania and later successfully implemented as an assessment tool at three other Australian universities in 2010 (Newby et al., 2011). Even though a learning mode for the VPP was developed, it was not activated in the model employed at the university pharmacy student assessments. The activation of this learning mode would have allowed the VPP to adjust its recognition of student questions to include wide variations of questioning and incorrect grammar, something that the pharmacy domain experts did not want as they expected correct grammar from students. Overall, in the three university implementations for pharmacy student assessments, the VPP took free speech student questions as input and achieved a question recognition accuracy of 62% for domestic students and 52% for international students, which was competitive with world's best recognition at the time (Newby et al., 2011, p8 and p56), those being the DIgital ANimated Avatar (DIANA), created by the University of Florida (Lok et al., 2006) and the Keele University avatar (Connelly, 2008;Keele University, 2007), built for Monash University as part of its ePharm program as demonstrated in 2009 at the Monash Pharmacy Education Symposium in Prato, Italy.

The main reason for choosing the VPP as the basis for this case study is that its design strategy was scalable and generically designed for transfer to other health domains. Although the domain scenarios (health conditions) used for the VPP initial implementation were limited to three conditions, specifically conditions that are diagnosed by pharmacists, the virtual patient system itself is scalable to conditions and domains other than those related to pharmacy. The domain content is initially determined by the domain teachers in their roles as administrators of the knowledge content of the system domain; however, the knowledge base of the virtual patient system can be expanded by both domain teachers and by students when it is used for formative training. This gives the virtual patient system the potential to be used in most health disciplines where structured questioning is important. In addition, the architecture provides for detailed individual and aggregated assessment and feedback for both the learner and the assessor, as well as providing an assessment of the appropriate sequencing and style of student questions regarding the patient's condition (Summons et al., 2009;Summons et al., 2011; Park & Summons, 2013).

The initial concept for the VPP was to develop it as an AI application, using training data from past pharmacy objective structured clinical examinations (OSCEs). However, there were no labelled examples of oral OSCE videos or transcripts available that would enable neural net supervised learning, so the development included building a generalised system that would construct an ontology for a domain, in this case the pharmacy conditions, consisting of a domain lexicon and knowledge of domain questions and appropriate answers, that may later be used for AI student question recognition techniques and training. Hence, the framework design for the VPP system took into account portability and scalability into other health domains.

In the VPP, pharmacy domain experts identified typical patient assessment questions regarding a health domain condition (cough, constipation and gastro-oesophageal reflux disease for the VPP). The VPP framework termed these expected questions as 'target questions'. Responses to these questions were developed with domain experts for each of the conditions and also for varying severities of the conditions (mild, moderate and acute).

Variations in the way in which a target question could be phrased and alternate ways of asking the target question, were termed 'alias questions'. For a specific domain, there can be many aliases associated with a particular target question, however each target question was matched against only one aspect of the domain. One key aspect of the VPP architecture was for the provision of generic target questions that could be transferred to other domains.

The main problem in communications between a pharmacy student user and the VPP system, as with other virtual patient systems, was allowing students to ask questions in free speech rather than selecting from a limited question set, requiring the VPP to recognise the question that a student asked. The students' conversation was not limited to questions and so may not have been specific to the health domain under consideration. For example, a student might greet the VPP and say 'hello, my name is Peter, how can I help you?', or 'good morning, how are you?' The student's conversation, especially a question relating to the domain, had to be recognised by the VPP to enable it to be mapped to a specific target question, if applicable, so that the VPP could provide a suitable response to the student, or answer a student's specific domain question.

As indicated earlier, the learning mode was not included in the VPP initial testing, however, the VPP design does incorporate a learning mode capability. The VPP learning mode capability is based on the artificial intelligence simple hill-climbing approach (Javatpoint, 2021), to learn new alias questions for an existing target question. When a user repeatedly asked a question that the system could not recognise, the VPP assumed that the student was either asking a question to which it had no target question, or that it was asking alias questions for a target question but that the latter were not in its knowledge base.

The design assumption was that the student is asking a question related to 'something', which corresponds to an existing target question. If the student phrasing of the question was not recognised by the system, then the student will re-phrase the question but will still be asking about 'something', albeit in a slightly different way. If a correctly recognised question is entered the student will be presented with all their unrecognised questions (since their last correctly recognised question) and asked to indicate if any of the unrecognised questions correspond to the currently entered and recognised question. In this manner the VP acts in a training mode and 'learns' alternative phrasing for its list of expected target questions, thus adding new alias questions that match a target question and building its lexicon for future matches between student questions and expected questions. Any unknown questions that are unmatched to existing target questions are flagged to be investigated later by the teacher or knowledge engineer/assessment creator, who can liaise with domain experts to either add a new target question, together with the appropriate alias questions, or add the student's questions to a more appropriate existing target question's set of aliases.

Virtual pharmacy patient user interfaces

The VPP has three interfaces corresponding to each of the participant roles in the assessment: assessment creator/ manager (teacher), assessment moderator (tutor or instructor), and assessed learner (pharmacy student).

Student (Learner) interface

The VPP has an interface for students who are being assessed on their style of communication (selection of closed-ended and open-ended questions, repetition and sequencing of questions) and their ability to ask questions pertinent for the information gathering required to diagnose three specific conditions (cough, constipation and gastro-oesophageal reflux disease or GORD) and their severities (mild, moderate, and acute) for the VPP assessments. In the VPP trials, students did nine patient assessment sessions. In each assessment they were presented with an image of a person (a 3-D talking head with limited expressions) having a specific condition and severity, until all nine combinations of the three conditions and three severities had been assessed. The VPP student interface, with male and female example patients, is shown in Figure 1. Students input their questions to the VPP as typed text, due to the vagueness of speech recognition at the time and also classroom assessment environment of multiple students being assessed simultaneously, with the VPP answering as audio speech. Based on the questions asked, individual students received written feedback at the end of each assessment session as to the effectiveness of their communication and indications of areas that needed to be worked on (Figure 2).

This feedback allows students to examine areas that have been missed during their assessment (Figure 3A), along with providing them with feedback on more appropriate questioning style with open or closed questions (Figure 3B).

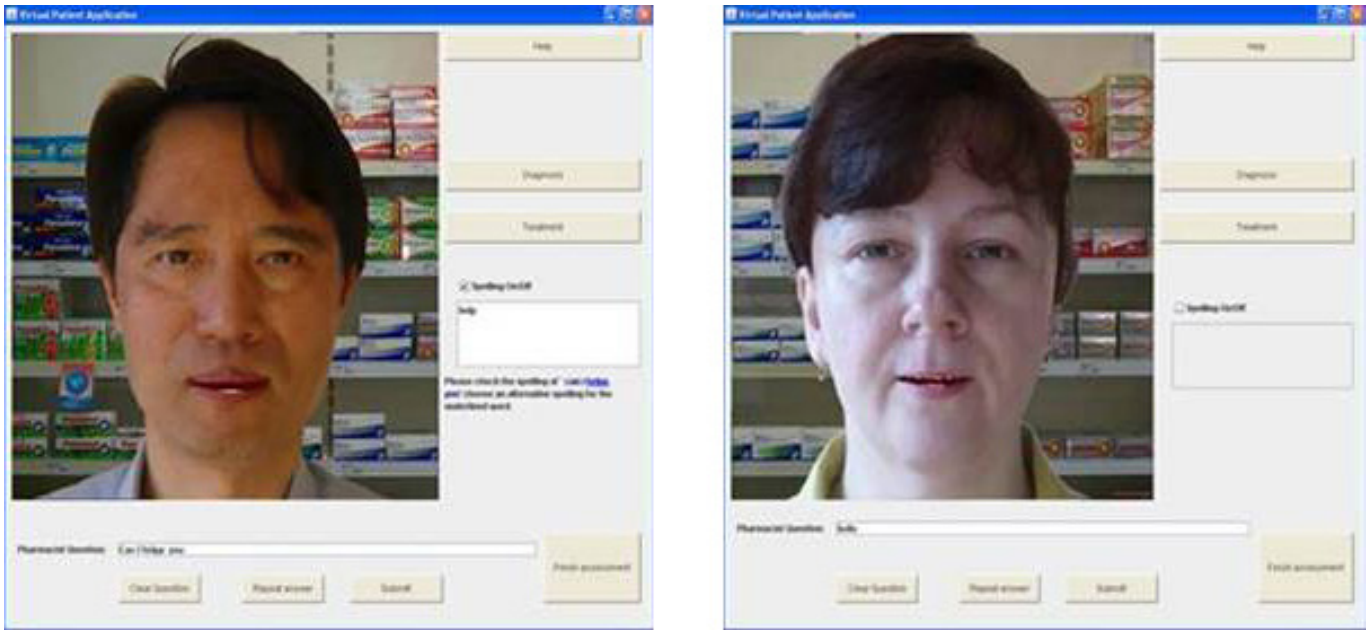

Figure 1. Male and female virtual patients for the virtual pharmacy patient student assessment.

Tutor interface

The VPP provides reports to tutors, acting as assessment moderators, and to pharmacy lecturers as overall class managers. The reports provide details of individual student performance concerning specific patient condition assessments, individual student transcripts of assessments, and of aggregated class performance over specific conditions, categories and sub-categories. The aggregated report indicates how many students attempted each category for each condition/category/sub-category. This allows the class teacher to get an overall view of the class performance and indicates areas in which they require remediation. An example of the aggregated report is shown in Figure 4.

Individual student performance reports allow a tutor to see what conditions and what severities have been attempted for a particular student. An example of the assessment history of specific student's (student ID 32-N002) is shown in Figure 5. The tutor can examine a complete transcript of each assessment session for that student, showing the actual text of the questions that student entered to the VPP and the VPP responses, as well is a report that indicates the target questions that were matched by the VPP for the student questions and the answer given by the VPP. These re-

Figure 2. Individual student feedback.

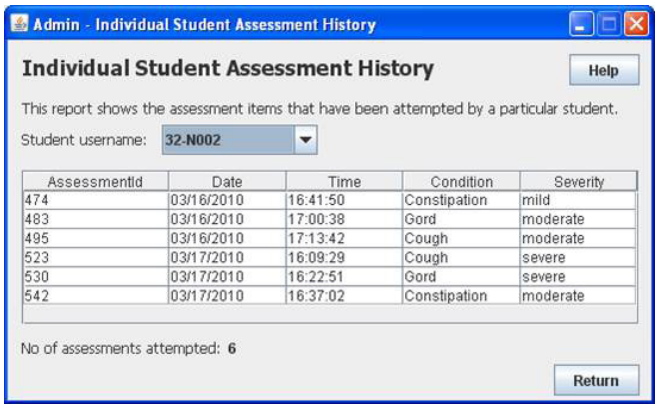

Figure 4. Aggregated class assessment data reports.

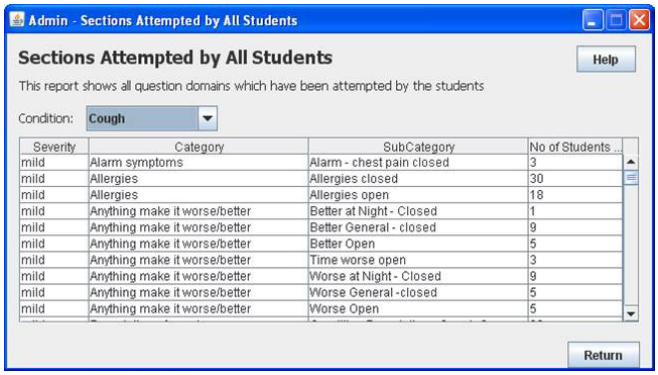

Figure 5. Student assessment History.

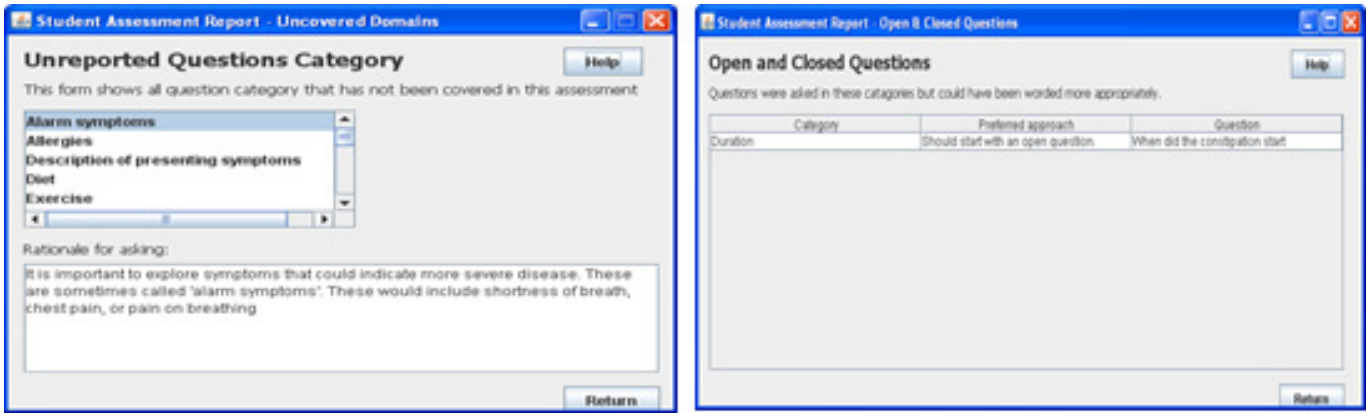

Figure 3. Unreported Questions (A) and Open/Closed Question (B) feedback.

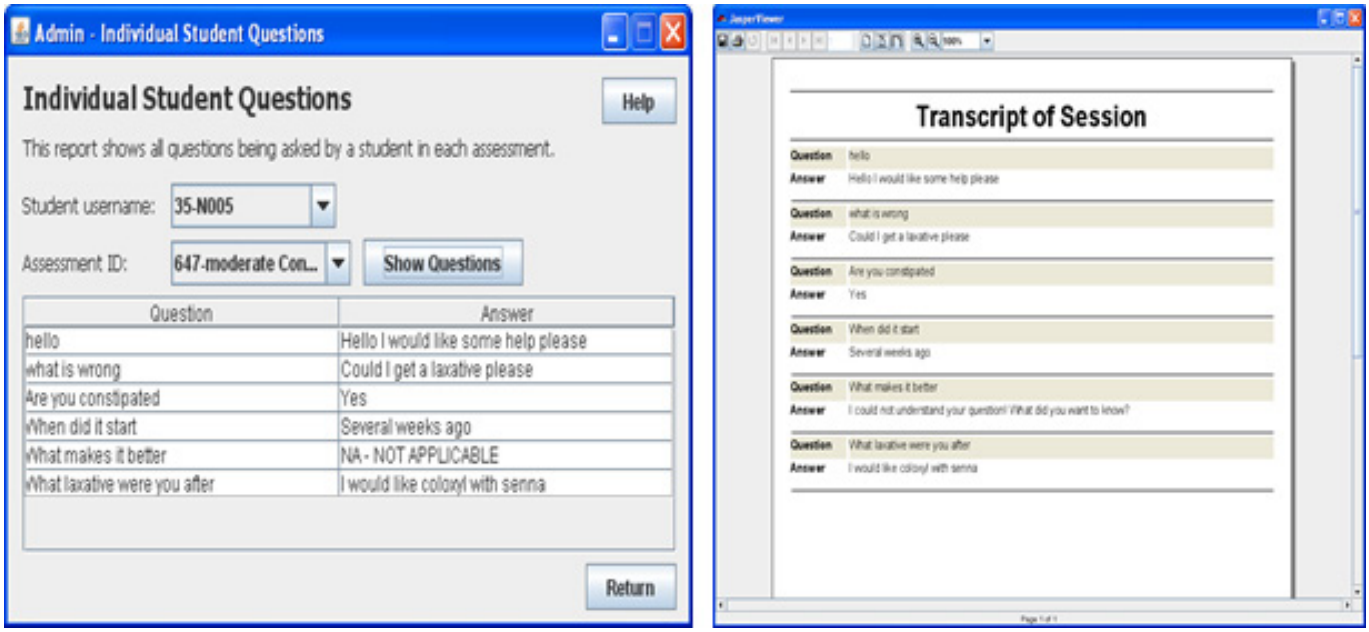

Figure 6. Individual Student Questions covered and actual Student text transcript.

ports are shown in Figure 6.

Assessment domain creator/manager interface

Teachers/Lecturers take the role of Assessment creators/managers and are system administrators responsible for the content of the clinical domains that are to be assessed. They can easily create new or modify existing condition domains, categories and subcategories (Figure 7A), specify and modify the types of expected target questions associated with particular conditions/categories/sub-categories, as well as creating/modifying the answer (VPP response), answer type (closed or open ended), and the text label for the patient image facial expression (a description sent to the image software module, such as 'smile' or 'frown') to be generated by the virtual patient image for different severity levels of a condition (Figure 7B), or specify alternative or 'alias' questions for target questions (Figure 7C).

Other screens allow teachers to indicate the style of questions required from the student for a particular assessment category or domain (starting with open-ended questions, or a greeting, etc). They can specify the assessment of a student's question sequence by indicating what questions are required as follow-up questions when specific VPP answers are given. The VPP provides teachers with a list of unmatched questions from specific assessments (Figure 7D). After examining the results of assessments, this provides the ability for teachers to add alias questions to existing target questions, or to create a new target question with appropriate aliases, for future assessments. This illustrates the scalability of the VPP, maintaining a dynamic ontology and increasing recognition of student questioning, especially to questions that were not anticipated by the domain experts. The ability of the VPP framework to increase its ontology with use also potentially provides a richer source of transfer learning to other domains.

RESULTS

The VPP framework was found to be advantageous in terms of its assessment and feedback to both students and instructors. The VPP target questions were analysed to investigate commonalities between the three assessment conditions in its knowledge base. There were several areas that were found to be generic in the nature and content of their corresponding target questions.

Domain experts converted the domain dimensions of health and medical conditions into the framework of the VPP, structured as categories and sub-categories that were expected to be investigated by a student during the assessment. Although categories and sub-categories were created for a specific health domain, new categories and/or sub-categories could be created depending on the analysis of assessment results by domain experts as indicated previously. Some categories consisted of standard areas that might apply, and which would be expected to be questioned by a student, across many conditions, thus facilitating transfer learning. These included areas such as 'Medications Taken', 'Duration' (of condition), 'Other Symptoms' and 'General Opening Questions'. These categories were also broken down into sub-categories; for

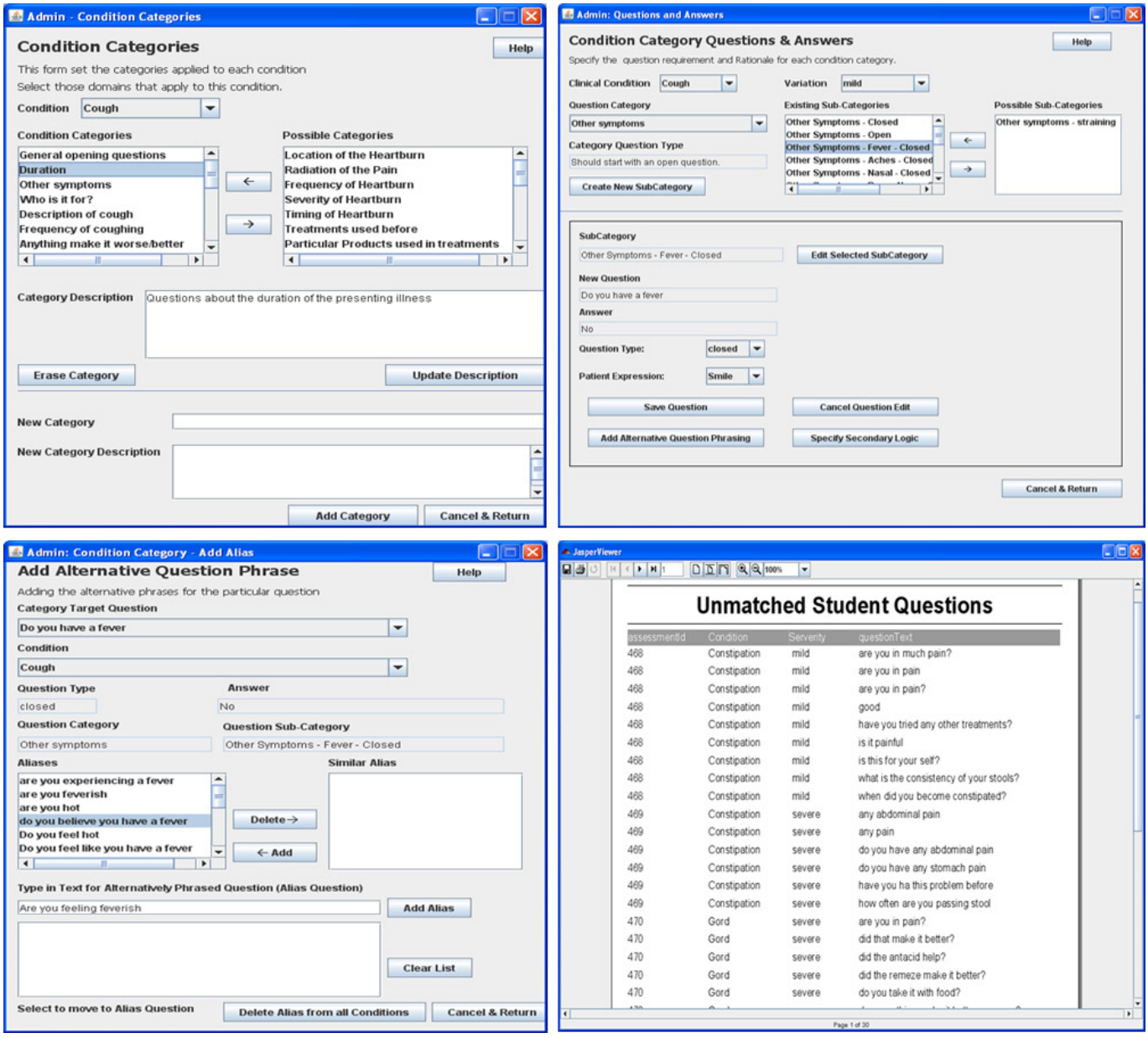

Figure 7. (A-D) Assessment creation and management interfaces.

example, the category 'Duration', was broken into sub-categories 'Start' of Condition, 'Existence' of condition and 'length' of condition. Sub-categories enabled finer reporting, allowed for scalability and transferability from the pharmacy domain, and catered for analysis logic to determine appropriate sequencing and style (open-ended or close-ended questions) of student questions. Sub-categories were sometimes created to distinguish the open-ended and closed-ended expected questions contained in the category, for example the 'Frequency of Cough' in the cough condition was subdivided into 'Frequency of Cough-Closed' and 'Frequency of Cough-Open'. Other categories were particular to a specific condition, such as the categories of 'Normal Bowel Movements' for the constipation condition, thus the VPP framework was able to accommodate areas particular to new health domains.

The VPP categories were populated with (target and alias) questions that were expected to be asked by a student to ensure they had investigated that category. There are many dimensions that are common across healthcare and medical scenarios. These dimensions have specific target questions that can be applied generically across these scenarios. The most fundamental area, consisting of variables from many dimensions, is that used when taking the demographics and history of a patient. Details of gender,

age or date of birth, name, address, height, weight and many other variables contribute to this area of information gathering. In many cases additional information that may not be available from a real patient, such as blood type or BP may be input to the system as part of the scenario to be provided from a VP, either in the form of responses to a student questions, or as a prepared medical chart/history displayed by the VP.

One of the fundamental dimensions, common to all systems, is that of time. Temporal relationships form the basis of many clinical questions (Colloc & Summons, 2015). The system used in the case study VP is based on the interval algebra developed by Allen (1983), modified by temporal anchor points. Common target questions relating to a specific condition X that establishes then existence of a condition (association of the condition with a person), an anchor point (the beginning of the condition) and a duration for the condition (to the present time) would include:

Do you have X? When did X begin? and How long have you had X?

There would be many questions that correspond to the target questions, such as:

When did you first notice X? and Have you had X for a long time?

The foundational work of James Allen (Allen, 1983) defined an interval algebra, consisting of thirteen interval relations, that provided a calculus for temporal reasoning based on relationships between time intervals. Allen's interval algebra (1983) can be used to express relationships between symptoms or signs that may occur before, starting with, during, or even after, a specific condition X. The temporal duration measurements are generally expressed as ordinal, interval, or ratio, however there can be times when a nominal value is sometimes used implicitly to indicate an interval, such as 'pregnancy', where the classification is 'pregnant' or 'not pregnant' to a question of "are you pregnant?".

Another fundamental target question dimension is the magnitude or intensity of a specific condition X. This may be expressed either in ranges or by an absolute value. The magnitude dimension can be expressed by variables that come from either ordinal (advanced, moderate, mild), interval (temperature reading), or ratio scales (pain score).

Frequency is another target question dimension. It can be expressed either as the number of occurrences/repetitions of the condition X, or as a measurement for a factor or variable related with condition X. It can be expressed as ordinal (never, sometimes, often) or ratio (heartrate).

There are other questions that may be more specific to the domain under consideration but are still considered generic in nature. These may include questions regarding medication, any presenting symptoms, things that relieve or aggravate condition, request for a description of a symptom, sign or condition, allergies and questions regarding past medical history.

An example of questions requiring open-ended (O), close-ended (C), or both (DB or double-barrelled) answers from the VPP case study is given in Figure 8.

While most of the dimensions above are easily translated into new domains or new clinical conditions, there are also questions in the VPP that may have dependencies within, or between, the categories/sub-categories for a specific clinical condition, The VPP framework provides the capability, as shown in Figure 9, for the assessment creator to create reasoning logic and potential for sequencing questions that are required to be asked following a specific question being asked from the same category (intra-category logic rules) or from a different category (inter-category logic rules). These enforce logic rules for the expected sequencing of student questions. The rules depend on the answer from the virtual patient to a student question. For example, if a specific question such as 'Are you on medication?' is asked by the student and the virtual patient's answer is 'Yes', then follow-up questions regarding the nature of the medication, or of what symptoms the medication is for, are generally required from the student. The converse is also true, if a symptom is described by the VPP then the student would be expected to provide follow-up questions on whether medication is being taken for it. These rules are generally specific to a domain but there are generic question forms that can be generated, for instance, 'What medication do you take?' as an expected target question.

The VPP framework was found to be advantageous in terms of its assessment and feedback to both students and instructors. It was seen to be capable of providing a rich ontology in terms of generic expected student questions, associated VP answers and generic reasoning logic that included sequencing and interrelationships between expected student questions and also between questions expected to be asked by a student following specific VP answers. The VPP structure supported the creation of generic target questions, which could be transferred to Virtual Patients employing the VPP framework, but for different clinical conditions. The transfer would include all alias questions mapped to the generic target questions, as well as the reasoning logic for sequencing of expected target questions, and also for reasoning regarding student questioning following VPP responses, for example indicating that the VPP had already responded to a repeated student question, or expecting close-ended or follow-up questions to a VPP question response. There would be some additional, but minimal, programming required to translate the generic target and alias questions to a specific condition, to transfer the 'X' in a target

Question domain	Way students may ask question	Question type (Open, Closed, or Both)	Answer 1 Mild condition (cough)	Answer 2 Moderate condition (cough)	Answer 3 Severe condition (cough)
General opening questions	Describe what has been happening	O	I have had this cough for about three days	I have had this cough for about a week	I have had this cough for about 2 months
	Tell me more about the cough	O	I have had this cough for about three days	I have had this cough for about a week	I have had this cough for about 2 months
	Tell me about what has been happening	O	I have had this cough for about three days	I have had this cough for about a week	I have had this cough for about 2 months
Duration	How long have you had it (the symptoms)?	O	Three days	A week	About 2 months
	When did it (the symptoms) start?	O	Three days ago	A week ago	About 2 months ago
	Have you had it (the symptoms) long?	C	No	Yes	Yes
	How long have you had it (the cough)?	O	Three days	A week	About 2 months
	When did it (the cough) start?	O	Three days ago	Three days ago	About 2 months ago
	Have you had it (the cough) long?	C	No	Yes	Yes
	How long have you been feeling like this?	O	Three days	A week	About 2 months
	When did you start feeling like this?	O	Three days ago	Three days ago	About 2 months ago
	How many days have you had (it/the cough/the symptoms)	O	Three days	A week	About 2 months
	When did you first notice (it/the cough/the symptoms)	O	Three days ago	Three days ago	About 2 months ago
Frequency of coughing	How often are you coughing do you cough?	O	A few times a day	A few times an hour	A few times an hour
	Are you coughing a lot? or a little?	DB	A few times a day	A few times an hour	A few times an hour
	How much are you coughing do you cough?	O	A few times a day	A few times an hour	A few times an hour

Figure 8. Examples of virtual pharmacy patient alias questions and answers.

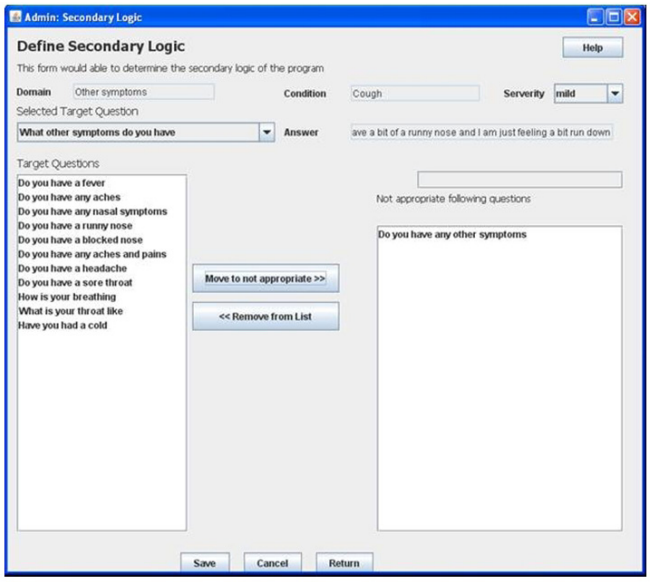

Figure 9. Reasoning logic rule creation for expected question sequencing.

question from cough to pain for example.

These could be incorporated through transfer learning within the knowledge-base of a VP, that employed the same framework and architecture as the VPP, but in a different health domain. Alternatively, if the new domain VP was based on another architecture, such as a machine learning neural net, or a deep learning model, then the alias questions could be used a labelled input dataset for supervised learning. The target questions would be the desired outputs representing classifications in the new domain that corresponded to generic VPP categories and sub-categories. Both results would significantly hasten virtual patient development in the new domain.

CONCLUSIONS

This paper used a VPP framework and architecture as a case study in a specific health domain to investigate if it possessed mechanisms capable of providing parts of an ontology that could be used to shorten development of VP's in different health domains. The scalability of the VPP knowledgebase for a specific

domain was demonstrated, in terms of mechanisms to maintain and expand its expected student target questions, categories and sub-categories, as well as its capability for increasing student question recognition and associated VPP answers through evolution of its alias questions for specific target questions through its learning ability. The scalability and learning ability that would apply to the generic components of the VPP increase the ontology that can be created and would be available for transfer other domains. The framework and the implementation of the VPP was seen to be capable of generating generic components that may be applied across health domains for different clinical conditions.

Future work is indicated to provide proof-of-concept assessment of the efficiency of the transfer learning. This might be achieved through an implementation of the pharmacy VPP and a test of the generic components that could be transferred to a VP in a new health domain, for example, a VP used in a PBL formative assessment of nursing students knowledge of acute pain management for a gastro-intestinal patient.

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Conceptualising Recovery in Mental Health Nursing: A Word, A Journey or A Philosophy of Nursing Care?

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Purpose: It is important for undergraduate mental health nursing students to develop an understanding of what recovery means in contemporary mental health nursing in order to practise in accordance with current models of care. However this concept can prove challenging for some. This paper looks at one particular undergraduate mental health nursing course with the aim of evaluating how effectively recovery is embedded in the course.
Methods: Course material related to recovery and possible barriers to understanding of recovery, including both those contained in this particular undergraduate mental health nursing course and those which come from external factors, are discussed.
Results: Ways to promote a better understanding of recovery-oriented mental health nursing care are suggested.
Conclusions: To promote a greater understanding of recovery in mental health nursing there needs to be a better match between the consumer experience, educational materials provided in the course, tutor perspectives, student focus and assessment methods.

Keywords: Psychiatric nursing; Education; Rehabilitation; Recovery

Concept Analysis

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INTRODUCTION

The core skills of mental health nurses include empathic listening, developing a therapeutic relationship, de-escalation, fostering recovery and advocacy. Delaney (2012) argues that the recovery of individuals within the mental health system relies on the ability of mental health nurses to value these skills. If nurses do not recognise their own skills or value them, this can impact on a focus on recovery, and in the wider community, can also impede an understanding of what is distinct and unique about this branch of nursing. It can also mean that students, when taught by these nurses, can fail to grasp what is involved in contemporary recovery-oriented mental health nursing practice, especially if their first course in mental health nursing as part of the Bachelor of Nursing does not embed this concept strongly.

This paper looks at one such course with a view to evaluating how strongly the concept of recovery is emphasised. In this course recovery is defined and discussed in the first tutorial, and there is a lecture by a man with lived experience of schizophrenia who works as a Consumer Representative. Chiovitti's (2011) work on protective empowering is also a focus in one of the tutorials, where students are invited to consider whether protective empowering aligns with recovery. However apart from the initial discussion of recovery in the first tutorial, the consumer lecture (presented live until COVID restrictions necessitated its move to an online delivery) and some supplementary information on recovery available at Course Materials, students do not focus on recovery in depth and it is not stressed throughout all course material. The teach-

ing videos used in the course come from the Wiimali website, a dynamic virtual community, which was created to help students understand threshold concepts such as social justice, patient safety and person-centred care. A mental health consumer is introduced to demonstrate mind-body-spirit connection (Levett-Jones et al., 2015) but none of the videos selected for the course focuses on recovery because when they were created it was with a general teaching purpose in mind. One assignment in the course assesses students' understanding of recovery-oriented mental health nursing as one component of the marking criteria; however students often fail to understand what recovery in contemporary mental health nursing practice means and so cannot demonstrate their understanding in their assignment. This paper discusses some possible reasons for this.

DEFINING RECOVERY

McKenna et al. (2016) differentiate clinical recovery, with its emphasis on symptom reduction and improved social function overseen by mental health professionals, from the contemporary understanding of recovery where personal recovery is "the unique journey of the individual toward a life worth living" (p. 168). This journey involves a continuous journey, hope, autonomy, collaborative partnerships, holistic and personal care, and community participation, which for students only familiar with clinical recovery from their experience in medical-surgical nursing, or for students whose understanding is that a mental illness is chronic, not easy to treat and likely to require some sort of institutional care eventually, requires some reflection and eventually a shift in outlook.

TEACHING RECOVERY-ORIENTED MENTAL HEALTH NURSING

Recovery approaches can help students to understand and appreciate "the humanness of patients" (Hunter et al, 2015, p. 32). A priority for developing the future workforce needs to be not just that nurses are skilled but also that they are recovery-focused (Happell et al. 2018).

People with a mental illness have not chosen their illness, they are people like anyone else, with dreams, fears, needs and so on, who we should give opportunities to so they can live a life that is as normal as possible. (Respondent I7 in Rodriguez-Almagro et al., 2019); however in spite of one nursing student in the study showing a good understanding of recovery, the study overall showed a moderate level of stigma towards people with mental health disorders among Spanish nursing students.

An Australian study differentiated between personal recovery and clinical recovery but a small number of nursing students who responded sometimes confused the two both at the start and at the end of a clinical placement in mental health, though final results showed positive attitudes to recovery at the start of a clinical placement and improved attitudes after its completion along with consistent understanding of personal recovery (Foster et al., 2019). Another Australian study (McKenna et al., 2016) identified a tension between psychosocial rehabilitation where clinical staff decided on the skills which their patients or clients required to recover, and a true recovery-focused service, and found that staff struggled with the difference between clinical recovery and personal recovery. When student nurses on a short placement see people in the acute phase of a mental illness they do not factor in recovery as a probability or even as a possibility.

An attempt to show alternatives was provided by one nursing program in the US, which added a community placement to the acute placement, and also included contact with people with lived experience of particular disorders being studied, and reflections by the students on personal experience with mental illness, self-identified personal stigmatising attitudes and those in the wider community (Carroll, 2018).

That there can be a mismatch between the understanding of an experienced mental health nurse working with a recovery focus and that of an undergraduate student is demonstrated by the following:

I have been a MHN for 12 years. During that time I have worked a variety of locations and services, which as you can imagine had their own philosophies and standards of care. I learned very early that my outlook of what a Mental Health Nurse should offer and what was being offered in Mental Health Acute settings didn't align. Someone asked me the other day what they would need to be a MHN and I said, that it's easy really, you just have to be kind. And I believe that wholeheartedly, you have to be kind and particularly in the Recovery sense, you have to believe that people are capable of making decisions for themselves and be able as an MHN to support that. I am kind, and I care a lot for people. I don't believe acute MH settings care for people, and that why I and my recovery orientation don't fit in those settings (experienced mental health nurse working in Rehabilitation).

The understanding of a student is more focused on illness, provision of appropriate referrals and supports, and working towards a clinical recovery. The goal is for "a better mind set" but it is still staff who "get the patient set up".

Recovery in mental health refers to getting the patients back to a stable mental health or to their base line function. It includes providing them with coping mechanisms to help them recognise when symptoms are happening again and how to get back on track to minimise the chances of relapse.

Recovery also focuses on getting the patient set up for when they leave the ward. This may include getting social workers in to help with accommodation or help get a resume in place for when they leave to get a job.

Recovery in mental health is important and is when the patient has a better mind set and can make informed, sensible and rational decisions for themselves (Heidi Aarons, student nurse).

A very different viewpoint comes from a man with lived experience of schizophrenia:- *My experience of knowing many people living with schizophrenia has been that performance levels are often higher than might typically be expected (and health professionals and textbooks imply). For many people recovery is experienced as a struggle to get by; but it is worth the effort!* (Simon Swinson in Hazelton & Swinson (2018) p. 301).

The experience of limited performance expectation is a common theme described by consumers (Hancock et al., 2018). Lietz et al. (2014) similarly report that upper limits and future capacity can be viewed negatively by health professionals; with limiting beliefs, language and expectations particularly damaging for the personal hope of the consumer. With this in mind, it is interesting to see that the student's perspective on recovery includes a relatively passive approach from the consumer and a more active role of the nurse. This could be viewed as a reflection of this expectation limitation as described by the consumer above. Whereas the experienced mental health nurse promotes capability and independent decision making, the student nurse describes disability and an inability to make rational decisions without support. However this philosophical difference in understanding is not surprising, given that in 2015 a study demonstrated that even experienced mental health nurses will sometimes have a clinical view of personal recovery. This belief can be influenced by other nurses, theoretical misunderstanding and organisational priorities which serve the organisation over the individual (Coffey et al., 2019;Le Boutillier et al., 2015). It is understandable, when viewed in this context, that there is a philosophical mismatch seen in universities if it is also present within mental health services and organisations.

STIGMA

An awareness of the pervasive influence of stigma on personal and community attitudes, and so on an understanding of recovery in mental health nursing, is important for student nurses to develop. Stigma begins as a public view when the population as a whole believes and endorses stereotypes about a particular group with resultant discrimination against them, and then becomes self-stigma where an affected person also believes these prejudiced ideas and internalises them (Corrigan & Nieweglowski, 2019). From prejudiced and stereotypical negative beliefs comes a negative response and this is followed by discriminatory behaviour.

"Stigma cuts into the core of recovery because it oppresses the very spirit that is essential to the recovery process" (Delaney, 2012, p. 333). To provide recovery-focused care nurses need to be person-centred and promote the autonomy of the person with the mental health disorder; stigmatising attitudes cut into the very heart of this process as nurses bring negative perceptions into their practice. Where there is no hope and an environment which fosters this lack of hope, recovery cannot flourish.

Clinical placements which are autonomy-supportive (i.e. which support student autonomy) have been found to decrease stigmatising attitudes (Perlman et al., 2020). Authentic role plays where nursing students acted an exaggerated stigmatising response towards people with mental illness, and real-world contact with stable patients, decreased stigmatising attitudes among Chinese nursing students (Gu et al., 2021). A study of Indian nursing students found that while students held positive attitudes towards people with mental illness, they still maintained negative stereotypes about mental illness (Poreddi et al., 2015). Another Indian study found nursing students rated highly on stereotyping of people with mental illness and pessimistic prediction for them (Sreeraj et al., 2017); but in a comparison between medical and nursing students nursing students were more positive about treatment of and reintegration into society of people with mental illness (Poreddi et al., 2017).

A PBL-based mental health nursing education program produced a positive change in student attitudes towards mental illness compared with a traditional learning method (Duman et al., 2017). Problem-Based Learning (PBL) provides practice in realistic clinical scenarios which students are likely to encounter during clinical practice (Happell, 2009). Authentic stories from clinical practice may be used in the same way (Treloar et al., 2018). More personal and professional exposure to people with mental illness produces subjectively more positive attitudes in nursing students, with personal exposure being a stronger influencing factor (Hawthorne et al., 2020). In a study of nursing students in Singapore, based on a negative correlation between close contact with people having mental illness and stigma, it was recommended that nursing students have more contact with these people before clinical placement (Samari et al, 2018).

HOW DO ATTITUDES AND VALUES INFORM UNDERSTANDING OF RECOVERY?

Attitude involves an evaluation, the objects of that evaluation, and the tendency to respond either positively or negatively based

on past experience (Happell & Gaskin, 2012).

Common beliefs about poor prognosis of psychiatric patients are seen as demonstrating both the ineffectiveness of psychiatric treatment and the lack of a scientific foundation for the discipline, but embracing a holistic framework consistent with nursing's person-centred and recovery oriented principles and the integration of mental and physical health services are strategies which could combat these misconceptions (Flaskerud 2018). A focus on what recovery means can also change these negative attitudes; whereas allowing the objectivity of science to carry more weight than lived experience is a barrier to this change of negative attitudes.

If people with lived experience are involved in the development of nursing curricula the course will educate student nurses to be more responsive to the actual needs of consumers and will also give student nurses insights into consumers as people rather than just as service users (Happell et al., 2011). Attitudinal change is an important component of a nursing course though a study in India found that Indian nursing students had a pessimistic attitude towards recovery and rehabilitation of people with a mental health disorder (Poreddi et al., 2014).

IS RECOVERY IN MENTAL HEALTH NURSING A THRESHOLD CONCEPT?

Students enter a liminal space when they struggle to understand a new concept which is not part of their own personal or clinical experience or their professional knowledge. Such a concept has been described as a threshold concept. Recovery can be a new concept to undergraduate mental health nursing students if their outlook is based on stigmatising attitudes gained in the community and can prove challenging if their idea of recovery is restricted to clinical recovery as seen in medical/surgical wards. They need to expand their view and move from a specific idea of recovery to one which is broader and has a different focus.

The liminal space is described by Reeping (2020) as a place between two existential planes. It is one of the key attributes of threshold concepts which he lists as:

Bounded (may have only a specific purpose in a discipline)
Discursive (can involve an extended or enhanced use of language)
Integrative (brings together several disparate concepts, perhaps in an unexpected way)
Irreversible (can be difficult to 'unlearn')
Liminality (there is no straight path in learning the concept; involves a conceptual back-and-forth)
Reconstitutive (may cause a shift in the student's subjectivity)
Troublesome (likely to be an issue for the student to learn; may be counterintuitive).
Transformative (changes the way the student sees/thinks about the discipline).

Hedges (2015) argues that transformation in students may not be emphasised in teaching and is not measured in assessment items; it involves a shift in world view. More recent additions to these descriptors of threshold concepts include integration of new discipline-specific mental or verbal language (Nicola-Richmond et al., 2018). Assessing a shift in world view and in the language used to express this is difficult to assess objectively.

Brown et al., (2021) remind us that threshold concepts are not the same as course learning outcomes and recommend that they be used as less prescriptive reflective prompts to stimulate discussions. They note that floating signifiers can mean different things to different people and that prescriptive application of threshold concepts can create power imbalance between staff and students as faculty determine what body of knowledge is essential to acquire; these authors also call into question the role of threshold concepts in the formation of professional identity. Yet threshold concepts can offer a way to streamline what is taught in a way that is valuable to both teachers and students even though students do not always know what they need to learn (Barradell, 2013).

One study in Turkey noted that nursing students mostly found mental health patients to be "unpredictable, dangerous and incurable" (Inan et al., 2019, p. 201) and that though perceptions of dangerousness changed after the mental health nursing module was run, there was no change in scores for views on incurability and disturbances in interpersonal relationships. Perceptions of dangerousness and incurability changed after clinical placement; and after an anti-stigma program was run, perceptions about all three changed positively.

The move from viewing mental health patients as "unpredictable, dangerous and incurable" to people capable of choosing their supports so that they can live their best possible life even with some continuing symptoms is what is needed if students are to embrace recovery-oriented mental health nursing care to the full.

Stacey and Stickley (2012) argue that recovery in mental health nursing is a threshold concept because it asks students to re-assess their beliefs and prejudices, saying that students may fail to gain more than a superficial medically-determined understanding because of "the ambiguous and subjectively determined meaning of recovery" (p. 536). Nurse educators and tutors may underestimate how difficult it can be for students new to mental health nursing and without their own lived experience of mental illness to shift their view of recovery. What tutors take for granted can be a new area for reflection and learning for students.

A student-centred educational approach recognises challenges to learning experienced by students (Kistler & Tyndall 2021). Rec-

ommendations byHunter et al. (2015) are to use existing curricula to provide a more comprehensive view of the role of the mental health nurse, to involve service users in teaching, and to include guided critical reflections and simulated illness experiences.

TEACHING RECOVERY IN MENTAL HEALTH NURSING

Van Manen (1990) identified the need for anticipatory reflection, i.e. thinking before starting teaching. After this comes contemporaneous reflection based on what happens as we teach, and this allows best use being made of the teachable moment. This is followed by what McLeod and Reynolds (2007) call reflection on action as what has been taught is evaluated; these authors describe anticipatory reflection as reflection for action and contemporaneous reflection as reflection in action, saying that if the right questions are asked throughout the teaching cycle reflection can then become the catalyst for change in teaching and learning. A clarification of values is central to the teaching of recovery as values underpin the importance of actions and beliefs (McLeod & Reynolds, 2007) and are a composite of concepts, philosophy and aims. Negative or stigmatising attitudes will affect values.

"Effective teachers consider what they are trying to achieve, how they intend to achieve it and why they are doing it" (McLeod & Reynolds, 2007, p. 69). The. undergraduate mental health nursing course aims to achieve an understanding of recovery-focused mental health nursing care. However this concept is not embedded in all course material; rather it appears to be an addition. Students are introduced to the topics of anxiety, major depressive disorder and schizophrenia through the teaching videos from the Wiimali website. These vignettes, although providing a realistic basic portrayal of people trying to manage these conditions, are not specifically recovery-focused which means that students only see these people in the acute phase of their illness and never see them as they recover. The role of the mental health professional is key and the focus is on risk management, patient safety, and appropriate medication. If students then have a clinical placement in an acute area they are never introduced to rehabilitation and recovery, with the result that their perception and impression of mental health patients may remain stuck on "incurable".

Assessment is divided into diagnostic, formative and summative (McLeod & Reynolds, 2007). Diagnostic establishes a starting point for new learning, formative focuses on the process of learning and in this feedback to learners is essential. Summative assessment deals with the final product and to be dependable it should show reliability (no errors in formulation or assessment of the task, fair for a diverse range of students, with some certainty that similar results would occur at a different time and place, and manageable); and valid (related to the appropriate outcome, with information to guide future learning, with both teacher and learners aware of what the procedure aims to achieve and with the content appropriate for the outcome). Significantly, authentic assessment requires learners to demonstrate what they have learned in ways similar to how it is demonstrated in the broader community and involves an integrated approach which uses knowledge, skills and values from several outcomes and content areas. Learners need to be both self-directed and able to reflect on their learning, and to produce, rather than reproduce, knowledge (McLeod & Reynolds, 2007). However if students do not meet consumers who are recovering or access teaching materials which are predominantly recovery-focused, a final assessment requiring demonstration of their understanding of recovery-oriented mental health nursing is likely to be taxing.

MODIFYING TEACHING MATERIALS TO EMBED RECOVERY

The focus on recovery-oriented mental health nursing care in the course was not embedded in the course from when it was first developed and the teaching videos used do not depict people in recovery. If a student's clinical placement takes place in an acute setting there will be no opportunity to explore the concept there either, even if academic teaching staff demonstrate their own recovery focus during classes.Recovery cannot be an "add-on"; it needs to be a core concept in the whole course and demonstrated in all course material.

RECOMMENDATIONS

In order to show recovery-focused mental health nursing the course needed to have this concept embedded from the beginning and more emphasis placed on recovery throughout the course. Teaching videos should show people recovering in the community in partnership with mental health professionals. The course should use recovery-oriented language and avoid terms which are negative or which perpetuate stigma. The consumer experience should be part of all course materials rather than a single stand alone lecture as it is currently. Tutors should have current clinical practice roles as well as teaching roles so that they can demonstrate a recovery focus. Assignments should be specific about how the student's understanding of recovery is to be demonstrated and emphasise that this should be a personal understanding based on several weeks of reflection rather than a textbook definition added at the end of the assignment.

CONCLUSIONS

To a student beginning mental health nursing, the word recovery suggests clinical recovery, and understanding is based on previous experience in medical/surgical nursing; to a consumer with lived experience it is part of a journey towards a better future even if this involves some struggle; to an experienced mental health nurse it calls for reflection on type of nursing care to be offered, aims and how it should be delivered.

Each of the reflections above (from a student, from a consumer with lived experience, from an experienced mental health nurse) demonstrate aspects of recovery. The student is still formulating her ideas but knows that nurses help people get back on track so that eventually they can make decisions for themselves; the consumer writes of struggle but says that this struggle is worth it; the mental health nurse speaks of needing to believe that people are capable of making decisions for themselves with the support of nurses who are kind;

A course which effectively embeds recovery in teaching materials needs to allow opportunities to reflect on and develop understanding of these ideas so that even if the clinical placement is in an acute mental health setting students can still look for this personal recovery orientation or identify when it is not present.

Recovery camps are one way to achieve this. Going on holiday implies many skills and attributes not always associated with mental health consumers. There is a sense of wellness and hope, independence, the ability to engage, to plan and organise, and possibly to be accompanied by others with whom the person has strong relationships even if they are not intimate relationships. There is the anticipation of enjoyment and the ability to enjoy. Recovery camps have been used to demonstrate in a practical and experiential way to student nurses what recovery means today (Tapsell et al., 2021) and are a way to marry the consumer experience, with both teaching and learning, and clinical placement.

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Instructions for Authors

General

The Journal of Problem-Based Learning is an interdisciplinary/multidisciplinary professional journal showcasing the scholarship and best practice in Problem-Based Learning . This peer-reviewed journal offers information for evidence-based practice and innovative strategies for Problem-Based Learning. It is published twice per year. Please read the instructions carefully for details on the submission of manuscripts, the journal's requirements and standards.

Ethical Guidelines

1. Authors must strive to protect participants from harm arising as a consequence of their participation in research. This requires that participation should be voluntary and as fully informed as possible and no group should be disadvantaged by routinely being excluded from consideration. All studies using human or animal subjects should include an explicit statement in the Material and Methods section identifying the review and ethics committee approval for each study.
2. Editors reserve the right to reject papers if there is misconduct of the research involved in proposing, performing, or reviewing research, or in reporting research results.
   1) Fabrication: Making up data or results and recording or reporting them as factual results.
   2) Falsification: Manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.
   3) Plagiarism: The appropriation of another person's ideas, processes, results, or words without giving appropriate credit, including those obtained through confidential review of others' research proposals and manuscripts.
3. Authors submitting a paper do so on the understanding that the work and its essential substance have not been published before and is not being considered for publication elsewhere.
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Submission

1. Type of Article
   1) Review articles
   2) Research articles
   3) Others: Discussion paper, Professional opinion, Concept analysis, Q-methodology, Meta-analysis and etc.
2. Authors will need to check Research and Publication Ethics before submission. If the manuscript does not meet these requirements, it will not be accepted for consideration.
3. Manuscripts should be submitted electronically via the online submission system at http://ejpbl.org
4. Authors will set up an account through the web-site which will be used to upload files as new submissions. Authors will also be able to log on to the web-site and check on the status of submissions. When setting up the account, the corresponding author will answer a series of questions which were previously addressed with the certification pages. These questions must be answered in order for the submission to be considered.
5. Authors will receive notification of the receipt of the manuscript within a few weeks of submission. Further assistance can be obtained from emailing: jpbleditor@gmail.com
6. Journal of Problem-Based Learning reserves the right to edit all manuscripts to its style and space requirements and to clarify the presentation.
7. When the manuscripts are accepted for publication, Copyright Transfer Agreement must be signed by all authors and returned to International Society for Problem-Based Learning via Fax (+82-64-741-7431) or email to jpbleditor@gmail.com.

Manuscript Format and Style

1. The manuscript must be written in English.
2. Manuscripts must not exceed 20 pages, including abstract, text, references, tables, and figures.
3. Manuscripts should be in Hancomsoft or MS Word, on A4 size paper, 12point Times New Roman font or equivalent, double-spaced, with standard margins (about 1 inch) on all sides. Fancy typefaces, italics, underlining, and bolding should not be used except as prescribed in the APA guidelines.

4. Manuscripts must adhere to the format and style described in the Publication Manual of the American Psychological Association, 6th edition (2017), unless otherwise indicated in organization of the manuscript below.
5. If any material in the manuscript is from a previously copyrighted publication, include a letter of permission to reproduce the material from both the author and the copyright holder.
6. Authors should be sure to obtain permission for the use of study instruments from each individual or publisher identified as a source of the instruments.

Manuscript Structure

1. All manuscripts submitted to Journal of Problem-Based Learning should be organized in the following order: title page, acknowledgement, abstract, text, references, tables, and figures. Do not use appendices.
2. Title Page
   1) Title Page must contain a descriptive and concise title of the paper (no more than 30 words), names and qualifications of all authors, their affiliations.
   2) On the title page, a corresponding author must be designated and a complete postal/mail address, telephone and fax numbers, and e-mail address of corresponding author must be provided.
   3) The title page must also contain details of the source(s) of support in the form of grants, equipment, drugs of all of these.
   4) The keywords need to be entered in title page up to six: Use MESH key words (http://www.nlm.nih.gov/mesh/meshhome.html) when possible.
3. Abstract should not exceed 200 words and should accurately reflect the content of the paper. The abstract should not include references or abbreviations and should be provided under the headings: Purpose, Methods, Results, Conclusion, and Keywords.
4. Text should be structured as follows: Introduction, Methods, Results, Discussion, and Conclusion. Articles may need subheadings within some sections to clarify their content.
   1) Introduction: Clearly state the need of this study and main question or hypothesis of this study. Summarize the literature review or background in the area of the study.
   2) Methods: Describe the study design, setting and samples, and measurements, procedure, analysis used.
   3) Results: Describe the main results in a concise paragraph. This section should be the most descriptive. Note levels of statistical significance and confidence intervals where appropriate.
   4) Discussion: Make discussions based only on the reported results.
   5) Conclusion: Describe recommendations for further study needed. Do not summarize the study results.
   6) Acknowledgments: Limit acknowledgements to key contributors if needed.
5. References verify all information included in references carefully; it is essential that readers be able to look up the cited material. References should be styled according to the guidelines in the Publication Manual of The American Psychological Association (APA 6th edition 2017), and the specific guidelines of International Journal of Problem-Based Learning.

Table

- Each table should be placed on a separate sheet.
- Each table must be numbered (consecutively in the order mentioned in the text) and titled. Each column within a table should have a heading.
- Abbreviations must be explained in a footnote. Footnotes to a table are typed immediately below the table. The reference marks are superscript small letters with the footnotes. They should be provided in the left lower corner of the table and arranged in the following order: ‡, , , §, , , #, **, , Asterisk (*, **) are used only to indicate the probability level of tests of significance. Do not indicate placement of tables and figures in the text-the editor will automatically place your tables and figures.

Figures

- All graphs, drawings and photographs are considered figures and should be numbered in sequence with Arabic numerals.
- Each figure should have a legend and all legends should be typed together on a separate sheet and numbered correspondingly.
- If all or parts of previously published illustrations are used, permission must be obtained from the copyright holder concerned. It is the author's responsibility to obtain these in writing and provide copies to the Publisher.

Preparation of Electronic Figures for Publication

- Although low quality images are adequate for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit EPS (ling art) or TIFF(halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented programmes. Scans (TIFF only) should have a resolution of at least 300 dpi(halftone) or 600 to 1200 dpi (line drawings) in relation to the reproduction size.
- Please submit the data for figures in black and white. EPS files should be saved with fonts embedded (and with a TIFF preview

if possible). For scanned images, the scanning resolution (at final image size) should be as follows to ensure good reproduction: line art: > 600 dpi; halftones (including gel photographs): > 300 dpi; figures containing both halftone and line images: > 600 dpi. Use the symbols of ●, ■, ▲, ◆, ○, □, △, ◊ respectively in a figure.

In-Text Citation

- References in the text are shown by citing in parentheses the author's surname and the year of publication. Example: "… a recent study (Park, 2006) has shown…" If a reference has two authors the citation appears in the text. Example: "…. a recent study (Maas & Specht, 2001) has shown…"
- When a reference has more than two authors and fewer than six authors, cite all authors the first time the reference occurs; in subsequent citations, and for all citations having six or more authors, include only the surname of the first author followed by "et al." If more than one publication in the same year by a given author or multiple authors is cited, distinguish citations by adding, a, b, etc. to the year of publication. Example: "… a recent study (MAAS, 200a) has shown…."
- Multiple references cited at the same point in the text are separated by semicolons and enclosed in one pair of parentheses. The order within one pair of parentheses is alphabetical by first author's surname or if all by the same author, in sequence by year of publication. Example: "Recent studies (Jones, 1996; Reed, 1992) have shown…" "Recent studies (Reed, 1992a, 1997b)…"
- Avoid citation of personal communications of unpublished material.

References

These should start on a separate page following the text. Total numbers of references must not exceed 30. Check all references for accuracy and completeness. List all authors, but if the number exceeds 6, list only the first 6 authors followed by et al. Please follow the format and punctuation shown in the following examples:

- Journal article: Last name and initials of authors; year of publication; title of article (capitalize only the first word, proper names, and abbreviations normally capitalized; no quotation marks); journal title (italicize) year of publication; volume (italicize); inclusive page numbers.

  Example : Cosgrove, L., & Riddle, B. (2003). Constructions of femininity and experiences of menstrual distress. Women's Health, 38(3), 37-38, Kim, H. W. (2006). The effects of a PMS nutritional education program for college students. Journal of Korean Academy of Nursing, 36, 1164-1174.
- Books : Last name and initials of authors; year of publication; title of book (italicize); edition number (if after first edition); city and state of publication; publisher.

  Example : Maag, J. W. (2004). Behavior management: From theoretical implications to practical applications (2nd ed.). Belmont, CA: Wadsworth-Thomson.
- Online References: Author(s); year of publication; title of the specific item cited (italicize); date the Web site was accessed; full URL

  Example : National wage data. (2004). Bureau of Labor Statistics. Retrieved January 19, 2005, from http://www.bls.gov/bls/blswage.htm#National
- Thesis

  Example : Kilgore, L. (2004). Beyond the merit of test scores: Gatekeeping in elite college admissions. Unpublished doctoral dissertation, Brown University, Providence, USA, Hamilton, J. A. (1998). University women's experience with and perceptions of premenstrual syndrome. Unpublished master's thesis, University of Winsor, Ontario, Canada. Other than as specified above, manuscripts should be prepared according to the Publication Manual of the American Psychological Association (5th ed.).

Review Process

1. All manuscripts submitted to Journal of Problem-Based Learning will be reviewed by at least two or three experts in the subject of the manuscript. All submitted manuscripts are subject to peer review on the basis of clarity, scientific accuracy, breadth of appeal, and timeliness. After the process of peer review, the manuscripts will be reviewed by editorial board members and then final decision for publication will be made by Editor-in-Chief of Editorial Committee.
2. Journal of Problem-Based Learning uses double-blinded review. The names of the reviewers will thus not be disclosed to the author submitting a paper and the name(s) of the author(s) will not be disclosed to the reviewers. The average time from manuscript submission to the author's receipt of the editor's decision about publication is approximately 3 months. Authors who are responsive to the suggestions of the reviewers are well placed to have their manuscripts accepted for publication.

Authorship

An "author" is generally considered to be someone who has made substantive intellectual contribution to a published study or scholarly work. Many journals now request and publish information about the contributions of each named author. Consequently, each author should have participated sufficiently in the work to

take public responsibility for appropriate portions of the content. Authorship credit should be based on:

1. Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
2. Substantial involvement in drafting the manuscript or critically revising for important intellectual content;
3. Final approval of the version to be published.
   Note: Authors must meet at least two of the above conditions.
4. When a group has conducted the work, the group should identify the individuals who accept direct responsibility for the manuscript. These individuals should meet the criteria for authorship defined above.

Contributorship

1. All contributors who do not meet the criteria for authorship will normally be listed in an acknowledgments section of the paper. Examples of those who might be acknowledged include a person who provided advice, technical help, writing assistance, statistical support or who meet with the group but did not contribute substantially.
2. Corresponding authors should declare whether they had assistance with study design, data collection, data analysis, or manuscript preparation. If such assistance was available, the authors should disclose the acknowledge individuals who provided this assistance. Financial and material support should also be acknowledged.
3. See more at International Committee of Medical Journal Editors. (2008). Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication, accessed at http://www.icmje.org on March 9, 2009

Author's Checklist

- ☐ Sequence of title page, abstract and keywords, introduction, materials and methods, results, discussion, references, and tables and figure legends. All pages should be numbered consecutively starting from the title page.
- ☐ Title page : (1) manuscript title, (2) type of manuscript (Category), (3) full authors' names (first name family name) and affiliations, (4) information about funding sources, (5) corresponding author's name, address, telephone & fax numbers, and e-mail address, (6) short running head, and (7) conflicts of interest of all listed authors.
- ☐ Abstract in structured format (Objectives; Methods; Results; and Conclusions) of 250 words maximum for original articles. Unstructured abstracts are allowed for other types of papers.
- ☐ Key words with no more than 6 from the list provided in Index Medicus under "Medical Subject Heading (MeSH)."
- ☐ Reference in proper format, numbered in order as cited in the text.
- ☐ Tables and figures in separate pages for each with their titles and all tables and figure numbers should be found in the text.
- ☐ Approval of IRB (When reporting results of human subjects or animal experiments) should be mentioned in the text.
- ☐ A covering letter stating its scientific significance, the material has not been published previously, and will not be submitted for publication elsewhere.

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Print name	Signed	Date

Co-authors

Print name	Signed	Date