Meta-skills development needs assessment among undergraduate students

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ABSTRACT

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Needs assessment is the process of measuring the gaps between current and desired states. It plays a vital role in the development of an individual's meta-skills in preparing students for the future. The objectives of this study were 1) to study the students' desired and current meta-skills and 2) to identify the priority needs in developing the meta-skills of undergraduate students. The sample consisted of 400 undergraduate students enrolled in public universities in Bangkok during the first semester of the 2020 academic year selected by multi-stage random sampling. The research instrument was the Meta-skills Development Needs Assessment Questionnaire for Undergraduate Students. Mean, standard deviation, dependent samples t test, and the Modified Priority Needs Index analysis were carried out on the data. The results showed that the mean scores of the desired major components were higher than those of the current ones at a significance level of .05. Moreover, the undergraduate students needed to develop creative problem-solving the most (PNImodi = 0.32), followed by resilience (PNImodi = 0.21) and self-awareness (PNImodi = 0.16), respectively. The results of this study can be used to design and develop programmes or policies to foster the meta-skills that are needed by students in this era of change.

1. Introduction

In an era of rapid technological development and societal disruption such as those caused by the recent global pandemic, the world of work is constantly changing, which leads to uncertainty and unpredictability in terms of the skills that individuals may require for adapting to these changes (Rangaswamy, 2021). According to Senova (2020), individuals need assistance in order to prepare themselves to be able to cope with such unpredictable changes.

Meta-skills or meta-cognitive attributes are important characteristics for the 21st century that foster a growth mindset or attitude that makes people enthusiastic about learning, solving problems, and developing new ways of doing things, which leads to lifelong learning (Razzetti, 2018). This is the definition that has been adopted in this study.

Meta-skills are different from hard skills (teachable and measurable abilities) and soft skills (one's skills in dealing with others and themselves) in that meta-skills foster a growth mindset or attitude that makes people enthusiastic about learning, solving problems, and developing new ways of doing things, which leads to life-long learning that helps prepare individuals for future change (Loshkareva et al., 2018). After reviewing and synthesising the related documents and studies, meta-skills can be divided into the following three components (Finch et al., 2012; Razzetti, 2018; Rohm et al., 2021; Skills Development Scotland, 2018):

1. Self-awareness is an individual's ability to recognise and understand their own emotions in various circumstances, accept their personal strengths and weaknesses, and believe in their own abilities. It consists of three competencies: 1) emotional awareness: the ability to recognise one's own emotions and their effects and to manage one's emotions in positive ways; 2) self-assessment: the ability to understand one's own strengths and weaknesses; and 3) self-confidence: the...
ability to acknowledge one's own worth and capacity to succeed, which leads to one's ability to make decisions under pressure and determination to persevere through difficulties (Burich, 2017; Hassan et al., 2015; Morin, 2011).

2. Creative problem-solving (CPS) is the ability to find different innovative solutions appropriate to each context. CPS was originated in 1952 by Osborn (1957) and has been revised numerous times. After reviewing and synthesising the related documents and studies, it appears that CPS consists of three components: 1) understanding the challenges: investigating and studying the challenges that are faced in order to understand all of their aspects by focusing on recognising the importance of challenges, exploring the data, and identifying or framing problems, which allows individuals to accept challenges as a normal part of life, believe that problems can be solved, and understand that problem-solving requires time and effort; 2) generating ideas and planning for action: generating as many solutions as possible without judging them as positive or negative, choosing the most promising solution by developing evaluation and selection criteria and predicting the potential obstacles and support, and formulating a concise action plan by considering all possible effects; and 3) implementing: implementation, monitoring, and modifying the CPS process, and managing personal emotions by comparing the progress with the criteria and controlling and reinforcing oneself (Miller et al., 2001; Newby et al., 2000; Trefinger et al., 2003).

3. Resilience is the emotional capacity to adapt and recover from crises or situations that cause difficulties in life. It is one of the qualities that helps individuals overcome adversity and live a happy life. Resilience consists of three components: 1) hardiness: the ability to manage and resist the effects of strong emotions in demanding situations; 2) encouragement: the ability to improve one's own morale or obtain emotional support from others in order to live through stressful circumstances; and 3) active coping: being positive, confident, and ready to resolve problems and overcome obstacles, as well as researching for information and seeking support (Sakunpong et al., 2015; Vongsirimas et al., 2017).

According to previous studies, people entering the labour market or young people studying in higher education need to learn specific skills that match the labour market's demands, especially meta-skills (Santi- teerakul et al., 2019; Senova, 2020; Skills Development Scotland, 2018; Yadollahi and Yazdani, 2020). Those entering the job market will already possess a number of meta-skills but at different levels. It is suggested that students in higher education would be better prepared for the future world of work if they received opportunities to explore and identify their meta-skills as part of their development. This would then allow them to identify the aspects of their meta-skills that need to be improved so as to better prepare them for the future world of work.

There is, however, limited research on meta-skills and no studies have been conducted on meta-skills development needs among undergraduate students. This research study, therefore, aimed to assess undergraduate students' needs for meta-skills development. The results will provide insights into the meta-skills that need to be developed among undergraduate students in order to prepare them to enter the future workforce.

2. Methods

2.1. Participants

The study population comprised 161,755 undergraduate students who were studying in public universities under the Ministry of Higher Education, Science, Research and Innovation in Bangkok (Ministry of Higher Education Science Research and Innovation, 2021a, b).

We calculated the size of the sample group by using the method of Krejcie and Morgan (1970). The sample size was determined using Krejcie and Morgan's formula as presented in Eq. (1).

\[
 n = \frac{z^2 \pi (1 - \pi)}{e^2 (N - 1) + z^2 \pi (1 - \pi)}
\]

where \( n \) is required sample size, \( z^2 \) is Chi-square for the specified confidence level at 1 degree of freedom, \( \pi \) is the population proportion (.50), \( N \) is the population size, and \( e \) is the degree of accuracy expressed as a proportion (.05). As a result, the minimum sample size was 383.192 students. However, the researcher added 50% more than the calculated sample group to avoid a low response rate, recommended by Salkind (1997). The final sample size was 575 students. After checking the accuracy and completion of the data from the returned questionnaires, only four hundred sets of questionnaires, accounting for 70%, were applicable for the analysis. Richardson (2005) proposed that a response rate of above 50% was adequate for analysis. Consequently, a 70% response was adequate.

The study sample consisted of university students from several public universities in Bangkok, which were selected using multi-stage random sampling (Acharya et al., 2013). Firstly, the researchers classified the fields of study in the universities according to the International Standard Classification of Education (ISCED) (UNESCO Institute for Statistics, 2015) and then randomly selected one faculty from each group using simple random sampling. Ten faculties were selected in total. Next, the researchers performed stratified random sampling to classify the students by year. The inclusion criteria were 1) a Bachelor's degree student aged between 18 and 25, being on the registration list for Academic Year 2020 in a public university in Bangkok metropolitan area, 2) hometown Bangkok and 3) having the willingness to complete the survey. The exclusion criteria were 1) refused to take part in the research, resigned or were suspended from study, 2) being an International students, or 3) 126 students who needed a special aid and possessing the Disabled Person ID Card according to the Persons with Disabilities' Quality of Life Promotion and Development Law issued by the government authority were classified into seven categories (Institute for Population and Social Research, 2017): 1) 26 students had behavioural or mental disability, 25 students had hearing or speaking impaired, 23 students had movement and physical disabilities, 17 students had autistic disorders, 15 students had visual impairment, 10 students had learning disability, and 10 students had intellectual disability (Ministry of Higher Education Science Research and Innovation, 2021a, b).

2.2. Research tool

In this study, the Meta-skills Development Needs Assessment Questionnaire for Undergraduate Students was used to collect the data. The survey was divided into two sections. The first contained a blank checklist of questions about basic information, i.e. gender, age, faculty, and year. The second explored students' desired and current states of meta-skills with a 5-point Likert scale based on Kaufman, Rojas, and Mayer's (1993) needs assessment concept and Razzetti's (2018) meta-skills concept. Using a dual response format, the questionnaire consisted of 45 items, each of which consisted of two parts. That is, the respondents were required to rate their desired and current states of meta-skills for each item (Wongwanich, 2007). Firstly, students assessed the existing level of these meta-skills, with 5 = the highest level and 1 = the lowest level of a particular meta-skill. Secondly, students were asked to rate what they perceived to be the desired levels of these skills, with 5 agreeing that it was very necessary and 1 being not required. Thus, data was collected on two aspects; firstly, the existing levels of meta-skills that the students currently assessed themselves to possess and secondly, the meta-skills that they felt were desirable. For the development of the Meta-skills Development Needs Assessment Questionnaire, the content validity was reviewed by three experts based on the indices of item-objective congruence (IOC), which ranged from 0.67 to 1.00, indicating that they were acceptable (Rovinelli and Hambleton, 1977). In addition, the coefficient value of the overall questionnaire was tested, resulting in a Cronbach's alpha coefficient of 0.78, which indicates a high level of reliability (Tavakol and Dennick, 2011).
### 2.3. Data collection

This study obtained a certificate of approval for research involving human subjects No. SWUEC-476/2563E from the Strategic Wisdom and Research Institute, Srinakharinwirot University. To protect the participants, the researchers explained the objectives, procedures, and data protection to the participants and always sought their consent before collecting data. The research contacted the students for permission and built a relationship with them before explaining the significance of the research method and details of the questionnaire. The researcher distributed the QR Code to the students who were willing to participate in the research via mobile phone and explained the objectives of the research, and instructed how to answer the questionnaire. The students then scanned the QR code on their mobile phones to complete the online questionnaire via the developed Google Form. The questionnaire took 10–15 min to complete. The researcher waited until the student completed or submitted the questionnaire and rechecked the completion to get accurate and completed questionnaires for the analysis.

### 2.4. Data analysis

After checking the data set for missing data, the means and standard deviations were calculated. The Modified Priority Needs Index (PNImodified) was used to compare the differences between the means of the desirable and current states using Wongwanich’s formula as presented in Eq. (2):

\[
\text{PNI}_{\text{modified}} = \frac{(D - C)}{C}
\]

(2)

Where D = the mean of the desirable states, and C = the mean of the current states (Wongwanich, 2007).

These results were then used to prioritise the needs identified in each category. Moreover, dependent samples t-tests were conducted to determine the differences between the university students’ desired and current meta-skills. The differences detected were then prioritised, leading to the identification of the most urgent needs.

### 3. Results

#### 3.1. Part 1: analysis of participants’ general information

The four hundred participants were classified according to personal characteristics, i.e., gender, age, and field of study, and the frequencies of occurrence and percentages were calculated. The results are as follows: 261 participants were female (65.25%) and the average age of the participants was 19 years. The sample group were students enrolled for Semester 1, academic year 2020, 9% from the Education programme, 9.25% from the Arts and Humanities Programme, 9% from the Social Sciences, Journalism and Information programme, 9% from the Business, Administration and Law programme, 6.25% from the Natural Sciences, Mathematics and Statistics programme, 6.25% from the Information and Communication Technologies (ICTs) programme, 6.25% from the Engineering, Manufacturing and Construction programme, 6.25% from the Agriculture, Forestry, Fisheries and Veterinary programme, 32.5% from the Health and Welfare programme and 6.25% from the Services programme.

#### 3.2. Part 2: meta-skills development needs among undergraduate students

The results indicated that the meta-skills comprised three major components: creative problem-solving, resilience and self-awareness. The means of the current and desired major components were 3.41, 3.78 and 3.89, respectively (at moderate levels), and 4.51, 4.59 and 4.53, respectively (at high levels). Also, the means of each component were compared between the current and desired states. The results showed that the means of the desired major components were higher than those of the current ones at a significance level of .05. The results from applying the Modified Priority Needs Index (PNImodified) are shown in Table 1 in order of priority from high to low according to the PNImodified values. This shows that the highest need for undergraduate students was to develop creative problem-solving (PNImodified = 0.32), followed by resilience (PNImodified = 0.21) and self-awareness (PNImodified = 0.16), respectively.

When considering the individual components, creative problem-solving can be divided into three sub-components: understanding the challenges, generating ideas and planning for action, and implementing. The means of the current sub-components ranged from 3.31 to 3.51 (at moderate levels). Understanding the challenges had the highest mean, followed by implementing, and generating ideas and planning for action, whereas the means of the desired sub-components ranged from 4.49 to 4.53 (at high levels). Implementing had the highest mean, followed by understanding the challenges, and generating ideas and planning for action. The means of the desired sub-components were higher than those of the current ones at a significance level of .05. Moreover, the students most needed to become better at generating ideas and planning for action (PNImodified = 0.36), followed by implementing (PNImodified = 0.33) and understanding the challenges (PNImodified = 0.28), respectively.

The component of resilience can be divided into three sub-components: hardiness, active coping, and encouragement. The means of the current sub-components ranged from 3.56 to 3.89 (at moderate levels). Encouragement had the highest mean, followed by active coping and hardiness, whilst the means of the desired sub-components ranged from 4.54 to 4.61 (at high levels). Encouragement had the highest mean, followed by active coping and hardiness, whereas the means of the desired sub-components were higher than those of the current ones at a significance level of .05. Moreover, the students most needed to develop hardiness (PNImodified = 0.28), followed by active coping (PNImodified = 0.19) and encouragement (PNImodified = 0.18), respectively.

Finally, the self-awareness component can be divided into three sub-components: self-confidence, self-assessment, and emotional awareness. The means of the current sub-components ranged from 3.73 to 4.00 (at moderate levels). Self-assessment had the highest mean, followed by emotional awareness and self-confidence. Meanwhile, the means of the desired sub-components ranged from 4.60 to 4.42 (at high levels). Self-assessment had the highest mean, followed by self-confidence and emotional awareness, respectively. Again, the means of each sub-component were compared between the current and desired states, and similarly, the results showed that the means of the desired sub-components were higher than those of the current ones at a significance level of .05. The students most needed to develop self-confidence (PNImodified = 0.22), followed by self-assessment (PNImodified = 0.15) and emotional awareness (PNImodified = 0.12), respectively.

| Meta skills | The desirable condition | The existing condition | PNImodified | Rank |
|-------------|-------------------------|-----------------------|-------------|------|
| Creative problem-solving | 4.51 0.02 | 3.41 0.10 | 0.32 1 |  |
| - Generating ideas and planning for action | 4.49 0.09 | 3.31 0.14 | 0.36 | |
| - Implement | 4.53 0.08 | 3.42 0.10 | 0.33 | |
| - Understanding the challenge | 4.51 0.07 | 3.51 0.06 | 0.28 | |
| Resilience | 4.59 0.04 | 3.78 0.19 | 0.21 2 | |
| - Hardiness | 4.54 0.15 | 3.56 0.27 | 0.28 | |
| - Active coping | 4.60 0.04 | 3.88 0.16 | 0.19 | |
| - Encouragement | 4.61 0.04 | 3.89 0.09 | 0.18 | |
| Self-Awareness | 4.53 0.09 | 3.89 0.14 | 0.16 3 | |
| - Self-confidence | 4.57 0.05 | 3.73 0.12 | 0.22 | |
| - Self-assessment | 4.60 0.06 | 4.00 0.22 | 0.15 | |
| - Emotional awareness | 4.42 0.22 | 3.95 0.11 | 0.12 | |
4. Discussion

Regarding whether the undergraduate students had different expected Meta-skills, both creative problem-solving, resilience and self-awareness to the actual level or not; the research results showed that the level of expected Meta-skills, both creative problem-solving, resilience, and self-awareness of the undergraduate student differed from the actual level, which was corresponded to the hypothesis. It represented the gap between the expected level and the actual level, considered the essential need. The wider gap implied a higher need (Long, 2009; Sleezer et al., 2014). As a result, it led to the priority for Meta-skills development to determine the guidelines for Meta-skills development. Moreover, Santiteerakul et al. (2019) proposed that Meta-skills was one of the essential sets of skills for the Industry 4.0 era. To develop the Meta-skills, the needed skills identification should be planned by conducting a survey of the essential needs, reviewing the documents, or having in-depth interviews as Meta-skills development required time for learning and training. Importantly, it was difficult to enhance the Meta-skills of the students at the higher education level. The university must provide the facilities and set the guidelines for appropriate learning for Meta-skills development.

The findings of the study indicate that the meta-skills of undergraduate students have a major need for development, especially with regard to creative problem-solving, which is the highest priority in the set of development, followed by resilience and self-awareness, respectively. Moreover, it was observed that the greatest deficit in meta-skills in these undergraduate students is related to creative problem-solving, especially in the areas of generating ideas and planning for action. These results are consistent with a study by Kumsuansin et al. (2020), who reported that there was a need to develop the ability to solve problems in new ways among undergraduate students in Thailand. They also concur with the findings of Amran et al. (2019), who showed that creative problem-solving is one of the significant deficiencies in the 21st century among Malaysian undergraduate students, which possibly results from the fact that university students are accustomed to listening to lectures and taking in knowledge without challenge, and they are thus too afraid or embarrassed to express their thoughts. Eubanks et al. (2010), however, found that most university students in the United States also lacked the capacity to establish a connection with a problem and generate new solutions, so this may not be a culturally specific issue in undergraduates and is worthy of further exploration. Creative problem-solving is not a new skill. It is considered as an essential higher order thinking skill, which can be fostered by integrating critical thinking, creative thinking, and problem-solving thinking, and creating both formal and informal learning settings that encourage learners to practice and develop their ability to think and formulate solutions independently (Amran et al., 2019; Boopphan et al., 2012). It is a meta-skill that is normally expected to be developed in an undergraduate programme.

The second meta-skill that undergraduate students needed to develop is resilience, which is a necessary skill for university students who are entering the fluctuating labour market. It also plays a vital role in individuals’ mental health and success (Brewer et al., 2019). According to the results, hardness is the aspect of resilience that undergraduate students needed to develop most. This is consistent with a study by Inoura et al. (2017), which found that undergraduate students with low levels of resilience have difficulty managing strong emotions in demanding situations and that age and social support from friends are significant factors that positively affect resilience. Given the current concerns about the mental health of students and the general population, improving undergraduate students’ resilience would seem to be a priority.

The meta-skill that undergraduate students needed to develop the least is self-awareness. This finding corresponds with a study on self-awareness levels among undergraduate students conducted by Boonyaprapun (2020), whose research found that Thai undergraduate students have high levels of self-awareness, both overall and in every dimension, because they have been trained to understand themselves at deeper levels, recognise their roles, and set their life goals to prepare for entering the workforce. Both Vago (2014) and Rothbaum et al. (2012) provide empirical evidence that the influence of Buddhist culture, where people are encouraged to develop mindfulness, leads to improved self-awareness. However, this may not be in the case in Western or other cultures.

This study had certain limitations, as it examined undergraduate meta-skills development in an urban setting in Thailand, a predominantly Buddhist culture, and these results need to be replicated in different cultures, as cultural and different educational practices may influence skill development because distinct cultures and educational guidelines affect the development of Meta-skills. This was in line with the Bioecological Model of Human Development by Bronfenbrenner and Morris (2006) which stated the expression of humans was determined by the multi-level factors from individual, interpersonal, social and cultural level to the public policy level. All factors were interrelated.

While the sample size was sufficient for statistical purposes, larger scale studies are desirable. Additionally, because of the limitation of duration and budget, a further study should increase the sample group size to gain further inclusive results and more accurately reflect the population. Consistent with Taberdoost (2017) and Adam (2020) who proposed that the sample group of survey research was the significant quality to refer to the population from the sample group and to avoid error of sampling or prejudice. For this reason, the size of the sample group should be sufficient. Moreover, this study only explored meta-skills development needs. Also, it is recommended that future studies investigate and compare the meta-skills development needs of undergraduate students in different regions of the country and increase the sample size so that the results are more extensive and reflect the population more accurately. Furthermore, it is also suggested that future studies should explore approaches to meta-skills development among undergraduate students and use the data obtained to help equip undergraduate students with the skills needed for Thailand 4.0’s workforce.

5. Conclusion

This study yielded new insights into meta-skills development needs among undergraduate students. The findings showed that the greatest meta-skills deficit in undergraduates was creative problem-solving, which is arguably a high priority meta-skill. Therefore, it is recommended that those who are involved in enhancing students' development use these results to develop a policy for their institutions to foster undergraduate students’ meta-skills that are necessary for the future workforce.

Declarations

Author contribution statement

Pitchada Praiittichok: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Kamolwan Karomprach Klaykaew: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data.

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Data availability statement

Data will be made available on request.
Declarations of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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