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The Development and Validation of an Instrument to Measure the Learning of Context University Skills and Workplace-recognized Skills Test among Students WIE in Rural College Thailand

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Abstract

A questionnaire for measuring Context University Skills and Workplace-Recognized Skills (LCUS-WRS) requires a validated and reliable instrument. The purpose of this study was to develop and validate a questionnaire to measure learning of context university skills and workplace-recognized skills, in order to carry out an advanced psychometric properties analysis of Work-Integrated Education (WIE) students and the skills of LCUS-WRS, including internal and external reliability. Methods: We conducted multi-stage random sampling, with a sample consisting of 728 students WIE from 20 rural colleges in Thailand. Exploratory Factor Analysis (EFA) was performed on a subset of the sample (n = 279), and Confirmatory Factor Analysis (CFA) was conducted on another subset (n = 449), both in different subgroups. Additionally, the researcher analyzed the internal consistency and temporal reliability of the scale in the instrument.

Results: Using exploratory factor analysis with 39 items 6 factors and accounted for 55.881% of variance was identified of the variance for the CFA model. The model achieved a goodness-of-fit of chi-square (χ^2) = 582.907, df = 308, p = .000, χ^2/df = 1.90, GFI = .979, AGFI = .985, RMSEA = .030, SRMR = .030

Conclusion: LCUS-WRS scale has solid construct of validity and excellent internal consistency which to analyze psychometric properties It has optimum temporal reliability. Therefore, the indicated that the dimensions of measuring of LCUS-WRS guaranteed its use in higher education institutions.

Keywords: learning of context university skills, workplace-recognized skills, rural college students, Psychometrics of students

1. Introduction

The health crisis that occurred during the period of 2020-2021 was a consequence of the COVID-19 pandemic, and it had a profound impact on the field of education. This situation led to a rapid and dramatic transformation of the educational system, shifting from traditional in-person classroom instruction to online teaching (Sultana et al., 2021). This transition brought about both challenges and opportunities, with a particular emphasis on the emotional effects of the pandemic on students (Romeo, Yepes-Baldó, Soria, & Jayme, 2021). These events also had implications for the difficulty of managing the learning process, emotional well-being, including heightened levels of anxiety, alertness, anger, and disappointment in society at large (Wang et al., 2020).

Nevertheless, even in the midst of the pandemic, educational institutions worldwide responded to the challenges posed by COVID-19 in diverse ways. Some institutions continued with face-to-face teaching while implementing social distancing measures, while others transitioned entirely to online education (Messner et al., 2020). These responses underscored the necessity for the development of technological infrastructure, virtual activities, and a steadfast commitment to sustaining teaching activities within Higher Education Institutions (HEIs) (Treve, 2021).

For graduates in the fields of engineering, information technology, and logistics and supply chain management, the ability to practice their professions remained paramount for career advancement (Akkermans, Brenninkmeijer, Huibers, & Blonk, 2013). The evolving dynamics of the COVID-19 pandemic and the healthcare environment expanded their roles (Nayal, Pandey, & Paul, 2022), necessitating the acquisition of

advanced knowledge to further develop their professions (Blokker, Akkermans, Tims, Jansen, & Khapova, 2019). Over the past two decades, key programs in science and technology, including engineering, information technology, and logistics and supply chain management, have progressed and become more specialized (Schoenherr & Speier Pero, 2015). These professional career paths continue to evolve, emphasizing the critical importance of diversifying knowledge and skills for individuals to take control of their careers (Balakrishnan & Low, 2016). Consequently, the ability to achieve success and career development remains crucial for professions that are constantly changing (Patterson et al., 2019). The labor market places a strong emphasis on professional capabilities, including knowledge, skills, and abilities, as the core of career development that can impact and facilitate growth (Cerezo-Narváez, Bastante Ceca, & Yagüe Blanco, 2018). This concept is centered on behaviors that enable individuals to take responsibility for their own careers and to engage in continuous self-directed learning and long-term goal achievement (Hall & Chandler, 2005). Furthermore, it aids individuals in creating their own professions and enhancing their specialized work abilities in dynamic work environments (Bakker, Schaufeli, Leiter, & Taris, 2008).

Furthermore, the professional capabilities of individuals extend to the context of organizations and industries, as well as the competencies of both organizations and professions (Hogan & Coote, 2014). Therefore, career development and capabilities can be considered essential resources for employees to achieve success in navigating their careers while functioning within the organizational and professional contexts (Hirschi, Nagy, Baumeler, Johnston, & Spurk, 2018).

However, this research will examine and analyze the psychological aspects that can indicate attitudes, skills, and learning behaviors in higher education institutions and the essential skills for acceptance by employers, which are somewhat limited. This study focuses on students enrolled in work-integrated education (WIE) programs, who are required to work in organizations during periods of social distancing measures and when the country is still implementing social distancing policies. The objective of this article is to investigate the structural aspects of the tools used to measure the psychology of learning skills in higher education institutions and the essential skills for acceptance by students who are studying and undergoing WIE. It involves predicting psychology using exploratory factor analysis and confirming factor analysis of these skills.

2. Literature Review

2.1 Challenges of Work-integrated Education (WIE) Curriculum

Therefore, the government has formulated policies and initiatives, particularly in the education sector, to accelerate the development of students work skills before graduation (Saleem & Amin, 2013) to ensure their knowledge, abilities, and confidence are highly valued by employers (Kuijpers & Meijers, 2012). In collaboration with businesses and higher education institutions, the government has designed courses that are reflected upon by various employers by incorporating experiential learning activities with work (WIE) or blended learning into the curriculum (Smith, 2012). This maximizes student learning opportunities for the highest benefit, and if students have work-related skills, it reduces costs for the organization (Bridgstock, 2009). Meanwhile, the efficient outputs from educational institutions are well-received by employers in all sectors, adding value to the learning outcomes of the curriculum, teaching activities, and learning within work-integrated education (WIE) programs in all formats (Martin & Rees, 2019).

Thus, the design of blended learning courses involves activities that integrate clear learning with real-world work experience (Work-based learning), where participants in such courses can ensure that the activities and content in the course align with creative learning outcomes (Abeysekera, 2006). It provides students with opportunities to review and iterate work processes and improve work, enabling students to develop skills that are relevant and suitable for work and achieve the outcomes of the blended learning curriculum with work (WIE) (Dean, 2023), or blended learning that emphasizes and affects the key skills needed for work in an organization. This poses a challenge for the design of this course to reduce the concerns of organizations and continually establish guidelines, standards, and conditions for organizations. This is a trend driven by organizations to make students fully skilled (McRae & Johnston, 2016).

2.2 Transfer of Skills and Knowledge across Academic to Workplace Contexts

In the context of planning and preparing students who are currently engaged in their educational journey toward the future (Ramsden, 2008), higher education institutions emphasize the interpretation of what remains unresponsive to context and untapped in terms of students' abilities and potential (Okolie, Nwosu, & Mlanga, 2019). This emphasis is made with the intention of integrating these aspects into the creation of new knowledge for themselves. However, this continues to raise concerns among organizations regarding the career development of students in the context of new learning within the world of work (Liferov & Kostikova, 2017).

Furthermore, organizations place significant importance on the development of skills and work potential while students are still in higher education institutions. Students are also capable of transferring skills and work potential that emphasize professional comprehension (Panagiotakopoulos, 2012). They can adapt to new learning environments that differ from traditional classrooms, enabling them to connect and successfully apply skills and knowledge to novel situations (Rana, Verma, Haque, & Ahmed, 2022). Simultaneously, the concept of skill and work potential transfer for practical application remains a paramount concern in the current work landscape (Udeogalanya, 2022). This also includes an emphasis on accessing content and creating new knowledge to align with novel learning situations.

Conversely, the pre-learning process does not impact the transfer of knowledge during the study phase to future career development (Jackson, Fleming, & Rowe, 2019). It corresponds to the transfer of skills and knowledge across diverse contexts, a complex area of theoretical learning widely recognized but lacking in critical analysis (Morine-Dershimer & Kent, 1999). Consequently, the importance outlined above affects the transfer of skills and work potential within the framework of experiential learning through work-integrated education (WIE). The learning and teaching processes, as mentioned earlier, necessitate reliance on the transfer of student skills and potential, which can be separated from the educational context (Jackson, 2015). Additionally, the traditional learning environment and the endpoint where students draw upon their previous learning have no bearing on the transfer of knowledge during the study phase to future career development (Berndtsson, Dahlborg, & Pennbrant, 2020). It is widely accepted that the transfer of skills and potential should be influenced by three key factors: learner characteristics, learning program characteristics, and workplace characteristics, underscoring this concept (Hyun et al., 2020). This concept asserts that knowledge derived from classroom experimentation, whether through trial and error, becomes a model for learning and subsequently impacts the roles and responsibilities that students will assume in their workplace (Aksela & Haatainen, 2019).

Furthermore, students can willingly accept conditions and experiment with new methods to adapt and solve problems in various situations that affect learning in both familiar and new contexts. This aligns with the principles of (Scheer, Noweski, & Meinel, 2012). It is evident that the evolving landscape of work features diverse and dynamic professional roles throughout individuals' lives. Consequently, successful graduates must possess the capability to transfer skills and knowledge across a broader spectrum. However, as emphasized by (Li, 2013), it is crucial to note that this WIE learning format promotes and supports the development of more specialized teaching and learning programs (Barak, 2017).

2.3 Research Framework

In this research, the researcher has reviewed the literature and conceptual framework as follows: (1) Learning skills within educational institutions consisting of four factors, and (2) Acceptance skills from organizations comprising two factors. Both sets of factors, totaling six, have an impact on the management and assessment system of skills for students in work-integrated education (WIE) programs, leading to the effectiveness of these programs and the acceptability of student skills by future organizations. (as show in Figure 1).

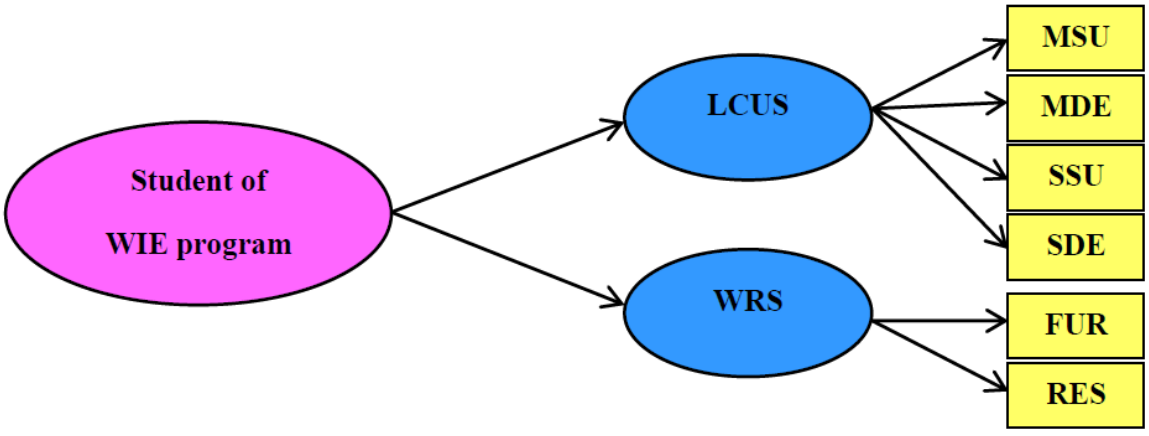

Figure 1. Research Framework

Note: LCUS = Learning of Context University Skills (MSU = Motive Surface, MDE = Motive Deep, SSU = Strategy Surface, SDE = Strategy Deep) and WRS = Workplace-Recognized Skills (FUR = Future Orientation, RES = Resilience)

3. Research Method

3.1 Population and Sample

The sample group comprised a total of 728 participants, including 298 students majoring in engineering, 235 in information technology, and 195 in logistics and supply chain management, all enrolled in WIE (work-integrated education) undergraduate programs. The reference population consisted of 3,509 WIE students from 20 rural colleges in Thailand. The sample size was determined following the method proposed by Carretero-Dios and Pérez (2005), which involved dividing the population into subgroups based on specific criteria and then conducting the study within those subgroups. Two subgroups were created: (1) third-year students who had completed at least 16 weeks of temporary employment with a business organization, and (2) fourth-year students who had also completed at least 16 weeks of temporary employment with a business organization.

3.2 Research Instruments

Research instruments used to measure learning skills in the university context included the Learning of Context University Skills (LCUS) questionnaire, which consisted of four factors with a total of 20 items: (1) Surface Motivation, (2) Deep Motivation, (3) Surface Strategy, and (4) Deep Strategy. Responses were recorded on a Likert scale ranging from 1 (Not True) to 5 (Very True). This questionnaire was adapted from the work of Biggs, Kember, and Leung (2001).

To assess workplace-recognized skills, the Workplace-Recognized Skills (WRS) questionnaire was employed, comprising two factors with a total of 19 items: (1) Future Orientation and (2) Resilience. Responses were also recorded on a Likert scale with scores ranging from 1 (Strongly Disagree: 0 - 25%) to 5 (Strongly Agree: 90 - 100%). This questionnaire was adapted from the research by Di Maggio, Zappulla, and Pace (2016).

Three experts reviewed the questionnaires for content validity, and an Index of Objective Congruence (IOC) was calculated based on their feedback, indicating a congruence index ranging from .67 to 1.00. The questionnaires were then pilot-tested with a group of 45 students, not part of the sample, to assess the research instrument's quality, resulting in a Cronbach's alpha coefficient (α) of .863 for the questionnaire's internal consistency.

3.3 Data Collection

The design and procedures of this research were exploratory and involved a probability-based sampling technique employing a stratified sampling approach. This approach aimed to examine accuracy and explore the characteristics of the psychometric matrix. The data collection period for this research spanned from August 2021 to July 2022 and was conducted among students enrolled in work-integrated education (WIE) programs at colleges in the northern and central regions of Thailand, totaling 20 institutions. The researcher obtained approval for the online questionnaire and permission from the educational institution authorities. All gathered data were treated as confidential and were protected under current regulations governing data protection. This research was carried out in accordance with the Helsinki Declaration, where voluntary informed consent was sought from participants before their involvement. Furthermore, participants had the freedom to withdraw from the study at any time without facing any penalties. It should be noted that the data collected was exclusively used for statistical purposes related to this research.

The online questionnaire was distributed by sending email invitations along with links to the online survey to participants who were currently enrolled in WIE programs. Participants received certification letters confirming that all data collected would be kept confidential and protected under personal data protection regulations and digital rights assurance controls, as outlined in general data protection rules.

The researcher conducted an analysis of the psychometric properties of the Learning of Context University Skills (LCUS) and Workplace-Recognized Skills (WRS) measures using advanced statistical techniques. These analyses included both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) within various subgroups of the study sample. Additionally, the researcher compared the following hypotheses: (1) Fourth-year students who had completed WIE internships place higher importance on university-based learning skills and workplace-recognized skills than third-year students who had also completed WIE internships, (2) There are differences between students in the central region and those in the northern region of Thailand concerning the level of linkage between university-based learning skills and workplace-recognized skills, and (3) Students from all three disciplines, namely engineering, information technology, and logistics and supply chain management, have different opinions regarding the importance of university-based learning skills and workplace-recognized skills. It is important to note that the stability of observers among themselves was not analyzed, as the data collection was primarily self-administered through the online questionnaire, and the researcher conducted an internal congruence analysis across all study samples.

3.4 Data Analysis

Quantitative variables were presented using means and standard deviations (*SD*.). The Kaiser-Meyer-Olkin (KMO) test was employed to assess the adequacy of the sample for the measures, to indicate sufficiency, and to test the sphericity of the Bartlett's test for assessing the matrix's interrelatedness (Correa-Rojas, 2021). We calculated intraclass correlations, T-tests, and ANOVA for participants to compare means between the independent groups and analyzed variance. The statistical tests used were for independent numerical methods starting from two methods or more (Weir, 2005).

Additionally, frequency and percentage variables were subjected to exploratory factor analysis (EFA) using the least squares method with no weighting to extract factors and oblique rotation methods to obtain a rotated and efficient matrix (Ferrando & Lorenzo-Seva, 2018). confirmatory factor analysis (CFA) was carried out using the minimum least squares weighted estimation criteria. The goodness-of-fit criteria for model fit assessment were as follows: the root mean square error of approximation (RMSEA) ≤ .08, the comparative fit index (CFI) ≥ .90, and the Tucker-Lewis index (TLI) ≥ .90. Internal consistency or reliability was assessed using Cronbach's alpha coefficient (Bland & Altman, 1997), and values exceeding .70 were considered satisfactory (Unfried, Faber, Stanhope, & Wiebe, 2015). For statistical analysis, the researcher used specialized software for social science data analysis. Statistical significance was set at a level where the alpha error was less than 5% for all statistical differences, and a 95% confidence level was considered.

4. Results

4.1 Characteristics of the Study Sample

The participants in this study comprised a total of 728 students enrolled in the LCUS-WRS program. The data collection was conducted using an online questionnaire. Of the total 728 participants, 66.30% were male, while 33.70% were female. The majority of the participants were in their fourth-year of study (82.80%), with the remaining 17.20% in their third-year. They completed their secondary education at the local level (97.90%), with a small proportion (2.10%) graduating from schools in the capital city, Bangkok. Regarding their academic majors, 40.90% were engineering students, 32.30% were information technology students, and 26.80% were logistics and supply chain management students. Furthermore, 67.00% of the participants were enrolled in the WIE programs at the Central College, while the remaining 33.00% were enrolled in the WIE programs at the Northern College.

These demographic details characterize the study sample, and it's important to note that there were no statistically significant differences observed between the samples used for EFA (n = 279) and CFA (n = 449), as shown in Table 1.

Table 1. Characteristics of the Study Sample

Variable	Total N = 728	EFA[1] n = 279	CFA[2] n = 449	p
Sex				
Male	483 (66.30%)	204 (73.10%)	279 (62.10%)	*.031***
Female	245 (33.70%)	75 (26.90%)	170 (37.90%)	
Level				
Third-year	125 (17.20%)	95 (17.20%)	30 (17.20%)	*.020***
Fourth-year	603 (82.80%)	184 (82.80%)	419 (82.80%)	
Affiliation of High school Local	713 (97.90%)	271 (97.10%)	442 (98.40%)	*.095*
Capital	15 (2.10%)	8 (2.90%)	7 (1.60%)	
Major Engineering	298 (40.90%)	117 (41.90%)	181 (40.30%)	*.010***
Information Technology	235 (32.30%)	122 (43.70%)	113 (25.20%)	
Logistics and Supply Chain	195 (26.80%)	40 (14.40%)	155 (34.50%)	
Rural college				
The central region	488 (67.00%)	195 (69.90%)	293 (65.30%)	
The northern region	240 (33.00%)	84 (30.10%)	156 (34.70%)	*.000***

Note1: *Indicates statistically significant difference level .05 (bilateral), **Indicates statistically significant difference at level .01 (bilateral) and EFA1: exploratory factor analysis; CFA2: confirmatory factor analysis.

4.2 Descriptive statistic of the proposed scale of (LCUS-WRS)

Descriptive statistic of the proposed scale of (LCUS-WRS) (Table 2) provide insights into the details of each item, which represent components of learning skills within the educational institution. Notably, item SSU4 exhibits the highest mean score (M = 4.400), while MDE1 has the lowest mean score (M = 4.035). Concerning the skills related to acceptance from the industry, item FUR9 has the highest mean score (M = 4.030), whereas RES4 has the lowest mean score (M = 3.700). However, it is worth mentioning that certain variables demonstrate a lack of balance within a certain range. Generally, most items exhibit a balanced distribution except for item MSU4, reflecting learning skills within the educational institution, and items FUR2, FUR6, FUR10, RES3, RES5, indicating acceptance skills from the industry. These findings suggest that preferences tend to follow a certain pattern. As for skewness, a normal distribution is not observed in all cases, except for items FUR2, FUR6, FUR8, FUR10, RES3, RES5, and RES7, which are positively skewed. Components reflecting significant correlations with substantial skewness are characterized by (FUR8 = 0.545). It is advisable to present these results with coefficients of non-normality and skewness within the range (-1 to 1) or lower than the multicollinearity of the variables observed (Mardia, 1974). Consequently, a polychoric correlation matrix was constructed. In return, the results of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO = .882) and Bartlett's Test of Sphericity (χ^2 = 13570.938, df = 741, p = .000) indicate the suitability and data adequacy for conducting exploratory factor analysis (Asparouhov & Muthén, 2009).

Table 2. Descriptive statistic of the proposed scale of (LCUS-WRS)

Factors Item/Abbreviation	Mean	Standard deviation (*SD.*)	Skewness	Kurtosis
Learning of Context University Skills: LCUS				
Motive Surface (MSU) (*M* = 4.378, *SD.* = .437)				
MSU1	4.081	.584	-0.012	-0.112
MSU2	4.100	.648	-0.102	-0.639
MSU3	4.075	.621	-0.046	-0.421
MSU4	4.140	.560	0.034	-0.008
MSU5	4.135	.680	-0.168	-0.849
Motive Deep (MDE) (*M* = 4.201, *SD.* = .538)				
MDE1	4.035	.671	-0.038	-0.774
MDE2	4.195	.665	-0.228	-0.779
MDE3	4.230	.675	-0.322	-0.826
MDE4	4.221	.622	-0.185	-0.576
MDE5	4.229	.578	-0.576	-0.367
Strategy Surface (SSU) (*M* = 4.177, *SD.* = .503)				
SSU1	4.370	.585	-0.291	-0.698
SSU2	4.320	.651	-0.427	-0.722
SSU3	4.383	.677	-0.626	-0.695
SSU4	4.400	.555	-0.190	-0.879
SSU5	4.330	.667	-0.495	-0.749
Strategy Deep (SDE) (*M* = 4.357, *SD.* = .437)				
SDE1	4.180	.687	-0.246	-0.885
SDE2	4.200	.696	-0.261	-0.930
SDE3	4.210	.684	-0.298	-0.869
SDE4	4.295	.699	-0.313	-0.936
SDE5	4.250	.635	-0.262	-0.665
Workplace-Recognized Skills: WRS				
Future Orientation (FUR) (*M* = 4.209, *SD.* = .538)				
FUR1	3.890	.771	-0.276	-0.342
FUR2	3.840	.754	-0.369	0.275
FUR3	3.980	.791	-0.382	-0.295
FUR4	3.970	.828	-0.490	-0.142
FUR5	3.833	.852	-0.588	-0.396
FUR6	3.940	.858	-0.679	0.374
FUR7	3.600	.842	-0.184	-0.070
FUR8	4.000	.798	-0.621	0.545
FUR9	4.030	.833	-0.579	-0.005
FUR10	4.024	.888	-0.175	0.182
FUR11	3.980	.855	0.182	-0.063
Resilience (RES) (*M* = 4.412, *SD.* = .309)				
RES1	3.790	.861	-0.287	-0.383
RES2	3.895	.802	-0.334	-0.216
RES3	3.730	.833	-0.364	0.066
RES4	3.700	.868	-0.315	-0.230
RES5	3.950	.846	-0.525	0.114
RES6	3.913	.784	-0.305	-0.295
RES7	3.845	.814	-0.429	0.027
RES8	3.910	.861	-0.483	-0.066

Note 1: Correlations between Learning of Context University Skills: LCUS and Workplace - Recognized Skills: WRS.

The skills of learning within educational institutions and those associated with industry acceptance mutually exhibit a correlation at a moderate to sub-level. The highest correlation value observed is for Future Orientation (r = .931), followed by Motive Deep (r = .592), Strategy Deep (r = .544), and Strategy Surface (r = .415), in that

order (see Table 3). When compared to the moderate to high correlation values, the following relationships are evident: Future Orientation to Resilience (r = .931), Motive Deep to Strategy Surface (r = .592), Strategy Deep to Future Orientation (r = .544), Strategy Surface to Strategy Deep (r = .415), Motive Surface to Strategy Surface (r = .075), and Motive Deep to Strategy Deep (r = .418). Importantly, these data do not result in multicollinearity, as the correlation coefficients (r) for each pair of variables differ significantly from zero, and nearly all T-tests are not statistically significant, except for the F-test, which is statistically significant (Daoud, 2017). Consequently, the online questionnaire demonstrates a statistically significant and robust relationship between learning skills within educational institutions and skills associated with industry acceptance.

Table 3. Spearman correlations among the factors of the proposed scale. Learning of Context University Skills: LCUS (Biggs et al., 2001) and Workplace - Recognized Skills: WRS (Di Maggio et al., 2016)

Factors	*M*	*SD.*	MSU[1]	MDE[2]	SSU[3]	SDE[4]	FUR[5]	RES[6]
Motive Surface (MSU[1])	4.178	.437	1.000	.101**	.075*	.085*	.050	.042
Motive Deep (MDE[2])	4.198	.504		1.000	.592**	.418**	.045	.021
Strategy Surface (SSU[3])	4.357	.437			1.000	.415**	.040	.036
Strategy Deep (SDE[4])	4.206	.539				1.000	.544**	.026
Future Orientation (FUR[5])	3.855	.556					1.000	.931**
Resilience (RES[6])	3.801	.521						1.000
Cronbach's alpha (α)		.898	.842	.733	.851	.863	.893	.887

Note1: (*SD.*) Standard Deviation. * Indicates statistically significant difference level .05 (bilateral). **. Indicates statistically significant difference at level .01 (bilateral).

4.3 Construct Validity: Hypothesis Testing, Exploratory and Confirmatory Factor Analysis

For the first hypothesis, which posits that third-year students in the WIE programs who have completed internships (n = 125) have a mean value for learning skills and behaviors within the educational institution and the skills necessary for industry acceptance (M = 4.195, *SD.* = .388), it was found that fourth-year students in the WIE programs who have completed internships (n = 603) have a mean value for these variables (M = 4.357, *SD.* = .437), T = .020; p < .01.

The second hypothesis proposes that WIE students in the central region of the country (n = 488) have a mean value for learning skills and behaviors within the educational institution and the skills necessary for industry acceptance (M = 4.529, *SD.* = .271), while WIE students in the northern region (n = 240) have a mean value for these variables (M = 4.012, *SD.* = .308), T = .000; p < .01.

The final hypothesis is that WIE students majoring in engineering (n = 298) have a mean value for learning skills and behaviors within the educational institution and the skills necessary for industry acceptance (M = 4.405, *SD.* = .557) greater than that of WIE students majoring in information technology (n = 235) (M = 4.230, *SD.* = .478) and WIE students majoring in logistics and supply chain management (n = 195) (M = 4.117, *SD.* = .503), T = .010; p < .01.

The EFA analysis was conducted with a subset of 279 participants, selected from the total sample (N = 728). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) yielded a result of .882, and Bartlett's Test of Sphericity demonstrated that the researcher could accept the hypothesis of the correlation matrix being non-identity (p < .001). The rotated factor matrix revealed an underlying structure with 6 factors (see Table 4) that explain 55.881% of the variance (LCUS-WRS) with 39 items comprising the questionnaire. All items loaded onto the 6 factors, indicating moderate to high factor loadings for the MSU factors ranging from .619 to .832, MDE factors ranging from .535 to .692, SSU factors ranging from .599 to .891, SDE factors ranging from .531 to .749, FUR factors ranging from .558 to .736, and RES factors ranging from .585 to .768. The three items with the highest factor loadings for LCUS are SSU3 = .891, SSU4 = .854, and MSU2 = .832, while for WRS, the two items with the highest factor loadings are RES5 = .768 and FUR1 = .736, which serve as reference points (Kallio, 1995).

Table 4. Exploratory factor analysis (n = 279) Rotated factor matrix

Item	Factors						
	MSU	MDE	SSU	SDE	FUR	RES	h^2
MSU1	.737						.554
MSU2	.832						.696
MSU3	.766						.660
MSU4	.742						.703
MSU5	.619						.578
MDE1		.626					.498
MDE2		.535					.578
MDE3		.690					.566
MDE4		.685					.531
MDE5		.692					.596
SSU1			.599				.603
SSU2			.755				.647
SSU3			.891				.810
SSU4			.854				.767
SSU5			.661				.587
SDE1				.531			.372
SDE2				.572			.411
SDE3				.664			.513
SDE4				.718			.549
SDE5				.749			.568
FUR1					.736		.575
FUR2					.558		.333
FUR3					.719		.590
FUR4					.644		.504
FUR5					.674		.557
FUR6					.650		.553
FUR7					.580		.466
FUR8					.592		.541
FUR9					.726		.593
FUR10					.717		.624
FUR11					.594		.537
RES1						.688	.619
RES2						.716	.620
RES3						.659	.552
RES4						.676	.489
RES5						.768	.602
RES6						.585	.372
RES7						.617	.434
RES8						.652	.450
Eigenvalues	5.682	4.217	3.758	3.266	2.450	2.420	-
% of Variance	14.570	10.813	9.636	8.375	6.281	6.206	-
Cumulative %	14.570	25.383	35.019	43.395	49.675	55.881	-

Note : Extraction method: unweighted least squares (ULSs), Rotation method: direct oblimin with Kaiser normalization.

Next, confirmatory factor analysis (CFA) was conducted with a different subset of the sample (n = 449), distinct from the sample used for exploratory factor analysis (n = 279). This subset was randomly selected from the entire sample to examine the accuracy and effectiveness of the questionnaire in demonstrating the properties of the psychometric matrix efficiently. The structure of the 6 factors specified by the EFA was maintained, and the goodness- of-fit was excellent and consistent with the observed data. The model's goodness-of-fit was assessed based on statistical values, with a chi-square statistic (χ^2) of 582.907, degrees of freedom (df) = 308, and statistically significant at p = .000. The χ^2/df ratio was 1.90, indicating a good fit. The goodness-of-fit index

(GFI) was .979, the adjusted goodness-of-fit index (AGFI) was .985, the root mean square error of approximation (RMSEA) was .030, and the standardized root mean square residual (SRMR) was .030. Additionally, Table 5 presents the goodness-of-fit indices for both Model 1 and Model 2 in the CFA.

Table 5. Indicators of goodness-of-fit for the models obtained by confirmatory factor analysis (n = 449)

Model	Chi-square	*df*	*p*	χ^2/df	CFI	TLI	RMSEA	SRMR
Model 1	611.962	265	< .05	2.30	.969	.958	.036	.034
Model 2	582.907	308	< .05	1.90	.975	.967	.030	.030

5. Discussion

The study confirmed that the psychometric properties of students in WIE programs through a questionnaire assessing learning skills in higher education institutions and skills essential for employer acceptance. This tool, consisting of 39 items, employs both exploratory and confirmatory factor analysis techniques (Fathema, Shannon, & Ross, 2015). Its development is grounded in contemporary theories, and it involves collaboration to consolidate various proposals, indicating the potential to develop skill measures. These measures can effectively respond to students' future learning needs (McManus & Rook, 2021) and align with organizational culture-based employer requirements (Mustaffa & Ilias, 2013).

Furthermore, participants demonstrate their commitment to showcasing knowledge, abilities, and adaptability (Alajmi, Ahmad, Al-Ansi, & Gorondutse, 2017). This link from learning skills in higher education institutions to the effective acquisition of skills necessary for employer acceptance (Williams & Jacobs, 2004) suggests that students in WIE programs expand their current working roles and responsibilities (Lee, Lee, & Dopson, 2019). Graduates from WIE programs tend to possess suitable and comprehensive working skills and capabilities, meeting the needs of employers (Lee, Yoon, & Lee, 2022). These reasons underscore the necessity of successful cross-contextual transfer of skills and knowledge from educational settings to workplaces (Kersh, 2015). Blended learning and working, as in work-integrated education (WIE), effectively address contextual work-related demands (Andrews & Ramji, 2020). They provide opportunities for tertiary-level students to apply learned knowledge, abilities, comprehension, and confidence from classrooms to workplaces (Fleming, Rowe, & Jackson, 2021). Simultaneously, students in WIE programs can leverage existing resources and apply blended learning to advance their careers and create a positive organizational image (Jackson, 2017). These outcomes feed back into factors promoting and designing comprehensive blended learning and teaching course structures. Such courses are strategic, adaptable to contexts, activity-rich, process-oriented, and analytical. They are valuable (Henderson & Trede, 2017) and enhance the organizational structure and effectiveness in increasingly demanding work environments (Young et al., 2015).

6. Conclusion

The evolution of the WIE curriculum from its inception to the present has confronted significant challenges, especially considering the survival of higher education institutions amidst the adversities presented by the COVID-19 pandemic. The curriculum's adaptation has served as a motivating force, refining both students' and businesses' perspectives on the capabilities of WIE students, particularly during their academic tenure. While Thailand grapples with a shortage of skilled labor, third and fourth-year students undergoing practical training in businesses as temporary employees offer a substantial solution to this deficit.

This article aims to enlighten stakeholders on the competencies and potential of students from regional areas who are enrolled in WIE programs, specializing in engineering, information technology, and logistics and supply chain management. These students, given their educational investment, are well-equipped to discern and establish definitive career objectives. This topic garnered attention following feedback from the corporate sector to the Thai government concerning the apparent skill and potential gap in recent graduates, a concern that has broader implications.

In 2002, the Thai government delineated policies and strategic directions to foster the WIE curriculum, ensuring that new graduates possess the requisite skills and proficiencies that are in demand and recognized by the corporate world. The initial phase of WIE's learning system development was pivotal in driving educational reforms. However, creating mutual understanding between educational institutions and businesses was constrained. These reforms had profound implications on the educational structures, necessitating significant adjustments by higher education institutions and businesses. Yet, numerous institutions remain committed to producing efficient human capital for the job market. Predominantly, institutions that offer the WIE curriculum are situated in regional areas, exceeding those in the capital. This has led to enhanced collaborative networks

between regional educational establishments and a diverse array of businesses. Over time, as corporate demands have escalated, institutions with a WIE curriculum have expanded their programs, sending WIE students for practical training as temporary employees for more than 16 continuous weeks per academic semester, surpassing the previous minimum of 16 weeks.

Although certain findings from this study may not be revolutionary, it emphasizes the importance of addressing the skills and capabilities deficit among WIE students, which is advantageous for all parties involved. This article could potentially provide deeper insights for future discussions on career development and policy frameworks for lifelong learning.

7. Research Recommendation

Based on the study results, this research provides the following recommendation for the executives of college and representatives of establishments:

Firstly, The research findings indicate that the learning skills in higher education institutions consist of four components: Motive Surface, Motive Deep, Strategy Surface, and Strategy Deep. Meanwhile, the skills necessary for employment comprise two main components: Future Orientation and Resilience. Therefore, in the development of student skills, both WIE and non-WIE students should focus on all six components.

The research findings emphasize the utmost importance of developing learning skills in higher education institutions and skills essential for employment. Thus, it is crucial to prioritize skill development to enhance students positive attitudes toward education, enable them to connect knowledge gained from educational institutions to their work-related thinking, and make them attractive candidates for employers.

Secondly, Future research should aim to create and test skill training and development programs that encompass excellence and promote students identities. These programs may include technology and digital skills, self-development principles, and collaboration with others, along with adaptability.

Research should explore ways to design blended learning and teaching programs in collaboration with employers to align with educational institutions.

8. Limitations and Future Research Directions

In the past, students from regional areas were perceived to possess inferior workplace skills compared to their counterparts. Cao, X., Ji, S., & Liu, X. (2023) Numerous research efforts have reported on the issue of skill recognition and the employability potential of students across various regions. This influences stakeholders involved in curriculum development, compelling them to incorporate diverse teaching methodologies, necessitating the integration of learning networks, and other supportive services related to holistic learning and employment experiences. (Ren, S., Zhu, Y., & Warner, M. 2013) This results in a pressing need to incorporate diverse pedagogical approaches, integrate learning networks, and offer ancillary support services that facilitate the harmonization of learning and professional experiences. (Helyer, R., & Lee, D. 2014) The competition among students, particularly those enrolled in the WIE (work-integrated education) program, between metropolitan and regional areas has intensified due to a self-acknowledged deficiency in employability skills. (Hesse, N. 2015) Many students harbor aspirations that align with the ideal characteristics of their chosen professions. This alignment, however, is often challenged by a lack of understanding or misconceptions about expected professional behaviors, standards, regional values, employer expectations, operational processes, and hierarchical structures. (Ng, P. M., Wut, T. M., & Chan, J. K. 2022) Furthermore, it has been observed that students from humanities and social sciences disciplines are particularly unfamiliar with the integrated learning context, especially when applied within local educational environments. Activities and various promotional initiatives are often perceived as constraints or are misunderstood, leading to curriculum-related confusions and concerns among students. (Ha, N. T. N., & Duong, N. V. 2022) Additionally, students from the fields of science and technology seem to lack local contextual knowledge, prompting concerns about their future employability prospects. (Zeldin, A. L., Britner, S. L., & Pajares, F. 2008) Also, an existing bias among employers, possibly rooted in prior experiences or attitudes, further exacerbates the perceived shortfall of information concerning WIE program students. (McDonald, P. 2019) Preliminary findings, perhaps presented in Table 1, suggest that a diverse sample of students across different disciplines may hold varying opinions regarding the skills acquired from higher education institutions and the recognition of these skills by potential employers. (Leontyeva, I. A. 2018) The research supports the notion that students who adapt effectively to their work environments during their academic journey tend to set more realistic and achievable career goals. This adaptability becomes especially critical as students transition from academia to the workforce, a phase known to present numerous challenges. (Tomlinson, M. 2017) The study highlights the necessity of preparing students for the workforce and

suggests that effectively linking classroom knowledge can enhance other skills, aligning with career expectations, leading to further professional development opportunities in the future. (Kuh, G. D. 1995)

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Obtained.

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The Publication Ethics Committee of the Canadian Center of Science and Education.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Reference

Abeysekera, I. (2006). Issues relating to designing a Work-Integrated Learning (WIL) program in an undergraduate accounting degree program and its implications for the curriculum. *Asia-Pacific Journal of Cooperative Education, 7*(1).

Akkermans, J., Brenninkmeijer, V., Huibers, M., & Blonk, R. W. (2013). Competencies for the contemporary career: Development and preliminary validation of the career competencies questionnaire. *Journal of career Development, 40*(3), 245-267. https://doi.org/10.1177/0894845312467501

Aksela, M., & Haatainen, O. (2019). *Project-based learning (PBL) in practise: Active teachers' views of its' advantages and challenges.* Integrated Education for the Real World, International STEM in Education Conference, 9-16, http://hdl.handle.net/10138/304045

Alajmi, R. H., Ahmad, F. B., Al-Ansi, A. A., & Gorondutse, A. H. (2017). The moderating effect of government support between gender egalitarianism, assertiveness, future orientation, and female leadership effectiveness: Empirical study of public universities in Saudi Arabia. *International Review of Management and Marketing, 7*(2), 390-402. Retrieved from https://dergipark.org.tr/en/pub/irmm/issue/32104/355840

Andrews, J., & Ramji, K. (2020). Connecting Work-Integrated Learning and Career Development in Virtual Environments: An Analysis of the UVic Leading Edge. *International Journal of Work-Integrated Learning, 21*(5), 643-656.

Asparouhov, T., & Muthén, B. (2009). Exploratory structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal, 16*(3), 397-438. https://doi.org/ 10.1080/10705510903008204

Bakker, A. B., Schaufeli, W. B., Leiter, M. P., & Taris, T. W. (2008). Work engagement: An emerging concept in occupational health psychology. *Work & stress, 22*(3), 187-200. https://doi.org/10.1080/02678370802393649

Balakrishnan, B., & Low, F. S. (2016). Learning experience and socio-cultural influences on female engineering students' perspectives on engineering courses and careers. *Minerva, 54*, 219-239. https://doi.org/10.007/s11024-016-9295-8

Barak, M. (2017). Science teacher education in the twenty-first century: A pedagogical framework for technology-integrated social constructivism. *Research in Science Education, 47*, 283-303. https://doi.org/10.1007/s11165-015-9501-y

Berndtsson, I., Dahlborg, E., & Pennbrant, S. (2020). Work-integrated learning as a pedagogical tool to integrate theory and practice in nursing education–An integrative literature review. *Nurse education in practice, 42*, 102685. https://doi.org/ 10.1016/j.nepr.2019.102685

Biggs, J., Kember, D., & Leung, D. Y. (2001). The revised two-factor study process questionnaire: R-SPQ-2F. *British journal of educational psychology, 71*(1), 133-149. https://doi.org/ 10.1348/000709901158433

Bland, J. M., & Altman, D. G. (1997). Statistics notes: Cronbach's alpha. *Bmj, 314*(7080), 572. https://doi.org/10.1136/bmj.314.7080.572

Blokker, R., Akkermans, J., Tims, M., Jansen, P., & Khapova, S. (2019). Building a sustainable start: The role of career competencies, career success, and career shocks in young professionals' employability. *Journal of Vocational behavior, 112*, 172-184. https://doi.org/10.1016/j.jvb.2019.02.013

Bridgstock, R. (2009). The graduate attributes we've overlooked: Enhancing graduate employability through career management skills. *Higher Education Research & Development, 28*(1), 31-44. https://doi.org/10.1080/07294360802444347

Cao, X., Ji, S., & Liu, X. (2023). Educational inequity and skill formation differences experienced by floating rural students in the process of urbanization: a case study from a school perspective. *Education Sciences, 13*(2), 131. https://doi.org/10.3390/educsci13020131

Carretero-Dios, H., & Pérez, C. (2005). Normas para el desarrollo y revisión de estudios instrumentales. *International Journal of clinical and health psychology, 5*(3), 521-551.

Cerezo-Narváez, A., Bastante-Ceca, M., & Yagüe-Blanco, J. (2018). Traceability of intra-and interpersonal skills: From education to labor market. *Human capital and competences in project management*, 87-110. https://doi.org/10.5772/intechopen.71275

Correa-Rojas, J. (2021). Intraclass correlation coefficient: Applications to estimate the temporal stability of a measuring instrument. *Ciencias Psicológicas, 15*(2). https://doi.org/10.22235/cp.v15i2.2318

Daoud, J. I. (2017). *Multicollinearity and regression analysis.* Paper presented at the Journal of Physics: Conference Series. https://doi.org/10.1088/1742-6596/949/1/012009

Dean, B. A. (2023). *The value of work-integrated learning for preparing the future teaching workforce*. In Work-Integrated Learning Case Studies in Teacher Education: Epistemic Reflexivity, 11-22. https://doi.org/10.1007/978-981-19-6532-6_2

Di Maggio, R., Zappulla, C., & Pace, U. (2016). The relationship between emotion knowledge, emotion regulation and adjustment in preschoolers: A mediation model. *Journal of Child and Family Studies, 25*, 2626-2635. https://doi.org/10.1007/s10826-016-0409-6

Fathema, N., Shannon, D., & Ross, M. (2015). Expanding the Technology Acceptance Model (TAM) to examine faculty use of Learning Management Systems (LMSs) in higher education institutions. *Journal of Online Learning & Teaching, 11*(2).

Ferrando, P. J., & Lorenzo-Seva, U. (2018). Assessing the quality and appropriateness of factor solutions and factor score estimates in exploratory item factor analysis. *Educational and psychological measurement, 78*(5), 762-780. https://doi.org/10.1177/0013164417719308

Fleming, J., Rowe, A. D., & Jackson, D. (2021). Employers as educators: the role of work placement supervisors in facilitating the transfer of skills and knowledge. *Journal of Education and Work, 34*(5-6), 705-721. https://doi.org/10.1080/13639080.2021.1969343

Ha, N. T. N., & Duong, N. V. (2022). Enhancing Student Employability: A Mixed-Methods Study into

Work-Integrated Learning Curricula in Vietnamese Universities. *International Journal of Work-Integrated Learning, 23*(3), 405-425.

Hall, D. T., & Chandler, D. E. (2005). Psychological success: When the career is a calling. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 26*(2), 155-176. https://doi.org/10.1002/job.301

Helyer, R., & Lee, D. 2014). The role of work experience in the future employability of higher education graduates. *Higher Education Quarterly, 68*(3), 348-372. https://doi.org/10.1111/hequ.12055

Henderson, A., & Trede, F. (2017). Strengthening attainment of student learning outcomes during work-integrated learning: A collaborative governance framework across academia, industry and students. *Asia-Pacific Journal of Cooperative Education, 18*(1), 73-86.

Hesse, N. (2015). Career paths of academic entrepreneurs and university spin-off growth. *Entrepreneurship, Human Capital, and Regional Development: Labor Networks, Knowledge Flows, and Industry Growth, 31*, 29-57. https://doi.org/10.1007/978-3-319-12871-9_3

Hirschi, A., Nagy, N., Baumeler, F., Johnston, C. S., & Spurk, D. (2018). Assessing key predictors of career success: Development and validation of the career resources questionnaire. *Journal of Career Assessment, 26*(2), 338-358. https://doi.org/10.1177/1069072717695584

Hogan, S. J., & Coote, L. V. (2014). Organizational culture, innovation, and performance: A test of Schein's model. *Journal of Business Research, 67*(8), 1609-1621. https://doi.org/10.1016/j.jbusres.2013.09.007

Hyun, C. C., Wijayanti, L. M., Asbari, M., Purwanto, A., Santoso, P. B., Igak, W., Pramono, R. (2020). Implementation of contextual teaching and learning (CTL) to improve the concept and practice of love for faith-learning integration. *International Journal of Control and Automation, 13*(1), 365-383.

Jackson, D. (2015). Employability skill development in work-integrated learning: Barriers and best practice. *Studies in Higher Education, 40*(2), 350-367. https://doi.org/ 10.1080/03075079.2013.842221

Jackson, D. (2017). Developing pre-professional identity in undergraduates through work-integrated learning. *Higher Education, 74*, 833-853. https://doi.org/10.1007/s10734-016-0080-2

Jackson, D., Fleming, J., & Rowe, A. (2019). Enabling the transfer of skills and knowledge across classroom and work contexts. *Vocations and Learning, 12*, 459-478. https://doi.org/10.1007/s12186-019-09224-1

Kallio, R. E. (1995). Factors influencing the college choice decisions of graduate students. *Research in Higher Education, 36*, 109-124. https://doi.org/10.1007/BF02207769

Kersh, N. (2015). Rethinking the learning space at work and beyond: The achievement of agency across the boundaries of work-related spaces and environments. *International Review of Education, 61*, 835-851. https://doi.org/ 10.1007/s11159-015-9529-2

Kuh, G. D. (1995). The other curriculum: Out-of-class experiences associated with student learning and personal development. *The Journal of Higher Education, 66*(2), 123-155. https://doi.org/10.1080/00221546.1995.11774770

Kuijpers, M., & Meijers, F. (2012). Learning for now or later? Career competencies among students in higher vocational education in the Netherlands. *Studies in Higher Education, 37*(4), 449-467. https://doi.org/10.1080/03075079.2010.523144

Lee, P. C., Lee, M. J., & Dopson, L. R. (2019). Who influences college students' career choices? An empirical study of hospitality management students. *Journal of Hospitality & Tourism Education, 31*(2), 74-86. https://doi.org/10.1080/10963758.2018.1485497

Lee, P. C., Yoon, S., & Lee, M. J. (2022). Are you ready? Perceived career readiness attributes of the hospitality management students. *Journal of Hospitality & Tourism Education, 34*(3), 157-169. https://doi.org/10.1080/10963758.2021.1963740

Leontyeva, I. A. (2018). Modern distance learning technologies in higher education: Introduction problems. *Eurasia journal of mathematics, science and technology education, 14*(10), 1-8, https://doi.org/10.29333/ejmste/92284

Li, N. (2013). Seeking best practices and meeting the needs of the English language learners: Using second language theories and integrating technology in teaching. *Journal of International Education Research, 9*(3), 217-222. https://doi.org/10.19030/jier.v9i3.7878

Liferov, A., & Kostikova, L. (2017). Russian higher education meeting challenges of 21st century labour market. 4(Special), 51-58.https://doi.org/10.21071/ij21ce.v4iSpecial.10392

Mardia, K. V. (1974). Applications of Some Measures of Multivariate Skewness and Kurtosis in Testing Normality and Robustness Studies. *Sankhy: The Indian Journal of Statistics, Series B (1960-2002), 36*(2), 115–128. http://www.jstor.org/stable/25051892

Martin, A. J., & Rees, M. (2019). Student Insights: The Added Value of Work-Integrated Learning. *International Journal of Work-Integrated Learning, 20*(2), 189-199.

McDonald, P. (2019). How factorial survey analysis improves our understanding of employer preferences. *Swiss Journal of Sociology, 45*(2), 237-260. https://doi.org/10.2478/sjs-2019-0011

McManus, L., & Rook, L. (2021). Mixed views in the academy: academic and student perspectives about the utility of developing work-ready skills through WIL. *Studies in Higher Education, 46*(2), 270-284. https://doi.org/10.1080/03075079.2019.1630809

McRae, N., & Johnston, N. (2016). The development of a proposed global work-integrated learning framework. *Asia-Pacific Journal of Cooperative Education, 17*(4), 337-348.

Messner, C. B., Demichev, V., Wendisch, D., Michalick, L., White, M., Freiwald, A., Kreidl, M. (2020). Ultra-high-throughput clinical proteomics reveals classifiers of COVID-19 infection. *Cell systems, 11*(1), 11-24. https://doi.org/10.1016/j.cels.2020.05.012

Morine-Dershimer, G., & Kent, T. (1999). The complex nature and sources of teachers' pedagogical knowledge. *In Examining pedagogical content knowledge: The construct and its implications for science education, 6*, 21-50. https://doi.org/ 10.1007/0-306-47217-1_2

Mustaffa, C. S., & Ilias, M. (2013). Relationship between Students Adjustment Factors and Cross Cultural Adjustment: A Survey at the Northern University of Malaysia. *Intercultural communication studies, 22*(1), 279-300. Retrieved from https://repo.uum.edu.my/id/eprint/9230

Nayal, P., Pandey, N., & Paul, J. (2022). Covid-19 pandemic and consumer employee organization wellbeing: A dynamic capability theory approach. *Journal of Consumer Affairs, 56*(1), 359-390. https://doi.org/10.1111/joca.12399

Ng, P. M., Wut, T. M., & Chan, J. K. (2022). Enhancing perceived employability through work-integrated learning. *Education Training, 64*(4), 559-576. https://doi.org/10.1108/ET-12-2021-0476

Okolie, U. C., Nwosu, H. E., & Mlanga, S. (2019). Graduate employability: How the higher education institutions can meet the demand of the labour market. *Higher Education, Skills and Work-Based Learning, 9*(4), 620-636. https://doi.org/10.1108/HESWBL-09-2018-0089

Panagiotakopoulos, A. (2012). Employability skills development in Greek higher education institutions (HEIs) Implications for policy makers. *Higher Education, Skills and Work-Based Learning, 2*(2), 141-150. https://doi.org/10.1108/20423891211224621

Patterson, C. A., Chang, C.-N., Lavadia, C. N., Pardo, M. L., Fowler, D. A., & Butler-Purry, K. (2019). Transforming doctoral education: preparing multidimensional and adaptive scholars. *Studies in Graduate and Postdoctoral Education, 11*(1), 17-34. https://doi.org/10.1108/SGPE-03-2019-0029

Ramsden, P. (2008). *The future of higher education: Teaching and the student experience.* York, UK: Higher Education Academy. pp. 1-21.

Rana, S., Verma, S., Haque, M. M., & Ahmed, G. (2022). Conceptualizing international positioning strategies for Indian higher education institutions. *Review of International Business and Strategy, 32*(4), 503-519. https://doi.org/10.1108/RIBS-07-2021-0105

Ren, S., Zhu, Y., & Warner, M. (2013). Human resources, higher education reform and employment opportunities for university graduates in the People's Republic of China. *In Society and HRM in China,* 207-224. https://doi.org/10.1080/23311975.2015.1060729

Romeo, M., Yepes-Baldó, M., Soria, M. Á., & Jayme, M. (2021). Impact of the COVID-19 pandemic on higher education: characterizing the psychosocial context of the positive and negative affective states using classification and regression trees. *Frontiers in Psychology, 12*, 714394. https://doi.org/10.3389/fpsyg.2021.714397

Saleem, S., & Amin, S. (2013). The impact of organizational support for career development and supervisory

support on employee performance: An empirical study from Pakistani academic sector. *European Journal of Business and Management, 5*(5), 194-207.

Scheer, A., Noweski, C., & Meinel, C. (2012). Transforming constructivist learning into action: Design thinking in education. *Design and Technology Education, 17*(3), 8-19.

Schoenherr, T., & Speier-Pero, C. (2015). Data science, predictive analytics, and big data in supply chain management: Current state and future potential. *Journal of Business Logistics, 36*(1), 120-132. https://doi.org/10.1111/jbl.12082

Smith, C. (2012). Evaluating the quality of work-integrated learning curricula: A comprehensive framework. *Higher Education Research & Development, 31*(2), 247-262. https://doi.org/10.1080/07294360.2011.558072

Sultana, M. S., Khan, A. H., Hossain, S., Ansar, A., Sikder, M. T., & Hasan, M. T. (2021). Prevalence and predictors of post-traumatic stress symptoms and depressive symptoms among Bangladeshi students during COVID-19 mandatory home confinement: a nationwide cross-sectional survey. *Children and Youth Services Review, 122*, 105880. https://doi.org/10.1016/j.childyouth.2020.105880

Tomlinson, M. (2017). Forms of graduate capital and their relationship to graduate employability. *Education Training, 59*(4), 338-352. https://doi.org/10.1108/ET-05-2016-0090

Treve, M. (2021). What COVID-19 has introduced into education: Challenges facing higher education institutions (HEIs). *Higher Education Pedagogies, 6*(1), 212-227. https://doi.org/10.1080/23752696.2021.1951616

Udeogalanya, V. (2022). Aligning digital literacy and student academic success: Lessons learned from COVID-19 pandemic. *International Journal of Higher Education Management, 8*(2). https://doi.org/10.24052/IJHEM/V08N02/ART-4

Unfried, A., Faber, M., Stanhope, D. S., & Wiebe, E. (2015). The development and validation of a measure of student attitudes toward science, technology, engineering, and math (S-STEM). *Journal of Psychoeducational Assessment, 33*(7), 622-639. https://doi.org/ 10.1177/0734282915571160

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International journal of environmental research and public health, 17*(5), 1729. https://doi.org/10.3390/ijerph17051729

Weir, J. P. (2005). Quantifying test-retest reliability using the intraclass correlation coefficient and the SEM. *The Journal of Strength & Conditioning Research, 19*(1), 231-240. https://doi.org/10.1519/15184.1

Williams, J. B., & Jacobs, J. (2004). Exploring the use of blogs as learning spaces in the higher education sector. *Australasian Journal of Educational Technology, 20*(2). https://doi.org/10.14742/ajet.1361

Young, W., Davis, M., McNeill, I. M., Malhotra, B., Russell, S., Unsworth, K., & Clegg, C. W. (2015). Changing behaviour: Successful environmental programmes in the workplace. *Business Strategy and the Environment, 24*(8), 689-703. https://doi.org/10.1002/bse.1836

Zeldin, A. L., Britner, S. L., & Pajares, F. (2008). A comparative study of the self-efficacy beliefs of successful men and women in mathematics, science, and technology careers. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching, 45*(9), 1036-1058. https://doi.org/10.1002/tea.20195