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Development and Validation of the Learning Leader Competency Test for University Students in South Korea

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Research Article

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Abstract

Background/purpose. The purpose of this study was to develop and validate the Learning Leader Competency Test in South Korean university students. Based on the analysis of previous studies, this study defined the concept of learning leader competencies, consisting of cognitive, motivational, and behavioral domains.

Materials/methods. A total of 638 university students participated in the study and data were collected via online survey. Exploratory factor analysis was conducted using principal axis factoring and Oblimin rotation. Confirmatory factor analysis was performed using maximum likelihood and goodness indices such as IFI, TLI, CFI and RMSEA. Construct, convergent, discriminant, and cross-validities were tested.

Results. The Learning Leader Competency Test consists of 23 items and three factors; knowledge, thinking, and problem solving; learning goal orientation and self-determination; and constructive self-expectation and caring for the community. The test's reliability (Cronbach's α = .856) and validity were confirmed.

Conclusion. This study defines the concept of learning leader competency and identifies the subcomponents of learning leader competency into the cognitive, motivational, and behavioral domains. This test may be applied in order to determine the extent to which university students possess the competency of becoming a leader in learning.

1. Introduction

In today's fast-paced global society, the ideal talent is someone who is proactive and responsive to change, and who develops their skills through continuous learning. The Organisation for Economic Co-operation and Development (2018) emphasized the core competencies of learners, suggesting that educational perspectives should shift from the acquisition of knowledge to the goal of improving skills and competencies. Therefore, current education should focus on developing competencies and talents in order to meet the needs of society and situations, so that individuals can quickly adapt to today's society and perform their roles effectively (Lee et al., 2022).

In the present-day world, continuous learning is the only way to ensure survival. Learning takes place at both individual and organizational levels. Learning at the personal level requires individuals to take control of their own learning by creating a vision, setting specific goals, and planning and reviewing their learning (Choi, 2021). Lee (2009) argued that self-directed learners with higher-order thinking skills such as creative problem solving and critical thinking, as well as personal characteristics such as cognition, creativity, and leadership, are needed as individual competencies. Whereas, when learning extends beyond the individual to organizations and communities, individuals need to become learning leaders. A learning leader is an individual who has the power to set and achieve learning goals for themselves and their constituents, who is interested in the learning process, has empathy, vision, and the ability to manage and execute the learning process (Choi & Lee, 2023). To become a learning leader, students require basic skills in the cognitive, motivational, and behavioral domains, as well as the ability to design their own learning, collaborate within learning communities, and implement what they have learned (Choi, 2021). At the individual and community level, learning competency refers to a person's learning style, which includes cognition, motivation, and behaviors related to learning (Lee et al., 2011).

Learning is a cognitive restructuring in which learners feel the need to learn and seek knowledge and meaning from their learning (Sung, 2015). Essentially, learners need to have cognitive abilities such as knowledge, thinking skills and the ability to perceive and identify things or problems, process information, and respond to it (Choi, 2021). Cognitive ability refers to the acquisition and use of knowledge, including mental skills such as knowledge, understanding, reasoning, problem solving, critical thinking, and creativity (The Korean Society of Educational Psychology, 2000). Mumford et al. (2017) identified nine cognitive skills that are essential for determining leader performance; problem definition, cause/goal analysis, constraint analysis, planning, forecasting, creative thinking, idea evaluation, wisdom, and sensemaking/visioning. Connelly et al. (2000) also identified intelligence, general reasoning skills, embodied skills, and creative or divergent thinking skills as cognitive qualities of effective leaders. Carmeli et al. (2013) found that leaders can enhance employees' creative performance by encouraging both internal and external knowledge sharing, as well as improving employees' creative problem-solving abilities.

Motivation is an important factor that influences learners' behavior (Jooste & Hamani, 2017) and is essential for learners in the pursuit and achievement of their goals (Fisher & Ford, 2006). According to Kim (2004), motivated learners can direct their own learning. Joo et al. (2013) defined goal orientation as the desire to develop new skills and abilities to adapt to different situations. The behavior and learning process of individuals in different organizational situations can be predicted by goal orientation (Brown, 2001). Furthermore, it can affect the emotional, cognitive, and behavioral aspects of organizational members (Butler, 1992). It is therefore necessary for learning leaders to set learning goals for themselves and their members and to have the power to achieve them. Regarding learners' motivation, it is important to emphasize the desire for control over their learning. Self-determination, which measures the extent to which this desire manifests and whether the reason for learning is self-chosen, should be highlighted throughout the learning process (Lee, 2001). This is one of the core competencies of a learning leader.

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In behavioral terms, a leader forecasts the future through innovative and fresh ideas, communicates effectively with team members, and develops the potential of others (Lee & Park, 2014). According to Neck and Manz (2010), leadership is defined as an individual's internal characteristics, with an emphasis on the need for self-leadership, where all members become leaders and lead themselves to influence others. Kim (2013) suggested that a leader should first lead themselves in order to achieve their own goals since "myself" has the most significant influence in the process of interacting with others. Seo (2003) emphasized the significance of leadership as a crucial competency for learners in the learning process; a competency which is also essential for learning leaders. Leaders should value and consider the unique and potential ideas of their team members as part of the learning process (Lee & Park, 2014). A learning leader is an individual who can establish and accomplish learning goals for both themselves and their team members. In short, a learning leader has interest, empathy, and vision for their own learning process as well as for others, and possess the ability to manage and execute the whole learning process (Choi, 2021).

The current study defines learning leader competency as the ability of a learning leader to design and implement learning initiatives in collaboration with learning members, with a focus on cognition, motivation, and leader behavior. The individual characteristics of learners, such as cognition, motivation, and behavior, must interact appropriately with the environment and learning content in various learning situations (Lee et al., 2011). Within this interaction process, learning leaders should take the lead in both their own and members' learning.

In recent years, several studies (Kim & Kim, 2021; Lee et al., 2023; Son & Choi, 2019) have been conducted to develop tools to measure the learning competencies of university students in South Korea. However, a scale of learning leader competencies has not previously been developed that aims to measure the learning leader competencies of university students. Therefore, the purpose of the current study was to develop a test that measures learning leader competency. For the development of the test, the concept of learning leader competency was defined as "a person who has learning competency in the areas of cognition, motivation, and behavior related to learning, who designs learning on their own initiative, cooperates with the learning community, and implements learning." The factors of learning leader competency consist of knowledge, thinking, and problem solving in the cognitive aspect, learning goal orientation and self-determination in the motivational aspect, and constructive self-expectation and caring for the community in the leader behavior aspect (Lee et al., 2011). Accordingly, the current study defined the concept of learning leader competency, its derived factors, and developed a test appropriate for the measurement of learning leader competency to confirm its reliability and validity. The research questions of the study are as follows:

RQ 1: What is the concept of the learning leader competency?

RQ 2: Is the Learning Leader Competency Test a valid instrument?

2. Methodology

2.1. Samples

The samples of this study were 638 freshmen to seniors enrolled at "S" University in Seoul, South Korea, who took an online course entitled "Self-Directed Learning" during the first semester of 2021. Data were collected through an online survey at the end of the semester. The participants were randomly divided into two groups, with exploratory factor analysis was conducted with one group (318 students) and confirmatory factor analysis with the other group (320 students) to develop and validate the test.

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2.2. Data Analysis

The data collected in this study were analyzed using IBM's SPSS 25 and AMOS 22 statistical software. The detailed methods of statistical data analysis conducted were as follows:

First, descriptive statistics, correlations, and internal consistency between items (Cronbach's α) were analyzed for the measurement variables. Second, exploratory factor analysis and confirmatory factor analysis were conducted to confirm the validity of the Learning Leader Competency Test (LLCT). Principal axis factoring with Oblimin (direct Oblimin = 0) rotation was used for exploratory factor analysis. Kaiser-Meyer-Olkin (KMO) sample adequacy values and Barrett's sphericity test were used to test the suitability of the sample for factor analysis. Maximum Likelihood was used for confirmatory factor analysis, and the goodness of fit of Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Incremental Fit Index (IFI), and Root Mean Square Error Approximation (RMSEA) was confirmed. Finally, construct reliability (CR), convergent validity, and discriminant validities were confirmed, and cross-validity was confirmed by applying identity constraints between groups.

3. Results

3.1. Descriptive Statistics

To analyze the LLCT's items using the collected data, the average and standard deviation of the data were calculated for each item, and skewness and kurtosis checked to verify the normality of the distribution. Where the absolute value of skewness was less than three and less than 10 for kurtosis, it was judged to be close to a normal distribution (Kline, 2015), and the analysis revealed that all variables satisfied the assumption of normality. Knowledge, thinking, and problem solving consists of items 1 to 12, learning goal orientation and self-determination consists of items 13 to 20, and constructive self-expectation and caring for the community consists of items 21 to 29. The descriptive statistics of the learning leader competency test were as shown in Table 1.

Table 1. Descriptive statistics of LLCT

Item No.		*M*	*SD*	Skewness	Kurtosis
1.	I know a lot and tend to remember things for a long time.	3.47	0.90	-0.283	-0.243
2.	I am always looking for new information because I am interested in it.	3.72	0.95	-0.391	-0.545
3.	I can classify and determine the importance and priority of information.	4.05	0.72	-0.683	0.825
4.	I like to use logical/scientific evidence in the process of understanding and research.	3.79	1.04	-0.644	-0.419
5.	I obtain new ideas and specific results by integrating key contents or information necessary for problem solving and research.	3.53	0.83	-0.353	0.009
6.	I can apply experiments, investigations, and learning outcomes to new situations (daily life) well.	3.53	0.82	-0.489	0.203
7.	I tend to structure (organize) data to understand it.	3.70	0.90	-0.437	-0.400
8.	I am good at finding what's inconvenient in things I use all the time.	3.31	1.01	-0.150	-0.666
9.	I can come up with a variety of ideas for solving inconvenient problems.	3.34	0.91	-0.300	-0.408

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Item No.		*M*	*SD*	Skewness	Kurtosis
10.	I accept that there may be multiple solutions to a problem and look for alternatives.	4.04	0.81	-0.811	0.732
11.	Once I start something, I tend to work on it until the problem is solved.	4.00	0.86	-0.731	0.225
12.	I feel that I can successfully solve the tasks assigned to me.	4.11	0.71	-0.597	0.543
13.	I want to learn as much as possible.	4.14	0.90	-0.906	0.459
14.	I want to fully understand what I've learned.	4.50	0.65	-1.227	1.474
15.	It is important to improve my skills in class.	4.45	0.61	-0.710	-0.022
16.	Failures makes me try harder.	3.67	0.98	-0.382	-0.571
17.	I consider it important when studying to double check what I have learned.	4.17	0.70	-0.581	0.359
18.	I believe that studying is worthwhile.	4.35	0.73	-0.902	0.260
19.	I enjoy studying.	3.02	1.01	-0.207	-0.451
20.	I study because I get pleasure from challenging tasks.	3.11	1.05	0.020	-0.600
21.	I make my own plans for assignments or lessons, and I stick to them most of the time.	3.56	1.03	-0.507	-0.363
22.	When I plan work (task), I forecast the results, and tend to make an overall plan.	3.42	1.10	-0.433	-0.656
23.	I prioritize things before I starting working on them.	4.17	0.79	-0.984	1.211
24.	I believe that I can do well on my own even in challenging and difficult situations.	4.06	0.78	-0.741	0.922
25.	I respect myself.	4.20	0.86	-1.076	1.012
26.	I am positive about myself.	3.98	0.97	-0.663	-0.362
27.	I try to solve problems collaboratively with colleagues rather than alone.	3.34	1.15	-0.259	-0.825
28.	I understand and cover for the mistakes of other friends and colleagues.	4.06	0.74	-0.565	0.269
29.	I put myself in the other person's shoes.	4.20	0.80	-0.787	0.347

3.2. Correlation Matrix

There was a positive correlation ($r = .526$, $p < .001$) revealed between "knowledge, thinking, and problem solving" and "learning goal orientation and self-determination," and a positive correlation ($r = .372$, $p < .001$) between "knowledge, thinking, and problem solving" and "constructive self-expectation and caring for the community." A positive correlation was also found between "learning goal orientation and self-determination" and "constructive self-expectation and caring for the community" ($r = .377$, $p < .001$). The correlation between factors is shown in Table 2.

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Table 2. Correlation between factors of LLCT

	Knowledge, thinking, and problem solving	Learning goal orientation and self-determination	Constructive self-expectation and caring for the community
Knowledge, thinking, and problem solving	1		
Learning goal orientation and self-determination	.526***	1	
Constructive self-expectation and caring for the community	.372***	.377***	1

***$p < .001$

3.3. Exploratory Factor Analysis

Exploratory factor analysis was conducted to confirm the construct validity of the LLCT. In order to determine the suitability of the inter-item correlation matrix for factor analysis, the KMO adequacy value was calculated and confirmed, and then Barlett's sphericity test was performed. The method of factor extraction was principal axis factoring and for factor rotation it was oblimin rotation (delta = 0). If the factor coefficient was revealed as being .4 or more and the cross-loading value .2 or more, then the factor item would be considered as valid. When factors with an eigenvalue of 1 or more were extracted for the three domains, the number of factors was calculated as eight, which was inconsistent with the three-factor structure; therefore, unidimensionality was confirmed for each domain.

Exploratory factor analysis on knowledge, thinking, and problem solving

The exploratory factor analysis results for "knowledge, thinking, and problem solving" are presented in Table 3. The KMO value was found to be greater than .7, and the Bartlett test was significant; therefore, the item matrix was considered suitable for factor analysis. The factor analysis results for items 1-12 showed that the factor coefficient for items 7, 8, and 10 was less than .4, which was not valid. The remaining items had a factor coefficient that ranged from .403 to .547, were therefore all .4 or higher, and appeared within a single dimension. The total explanation was revealed as 19.350%.

Table 3. Exploratory factor analysis on knowledge, thinking, and problem solving

Item	Factor coefficient
1	.456
2	.417
3	.431
4	.424
5	.547
6	.507
7	.315
8	.383
9	.525
10	.392
11	.403

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Item	Factor coefficient
12	.425
Eigen value	2.322
% of variance	19.350
Accumulation rate (%)	19.350
Kaiser-Meyer-Olkin scale	.750
Barlett	χ^2 = 573.914, p < .001

Exploratory factor analysis on learning goal orientation and self-determination

The results of the exploratory factor analysis on "learning goal orientation and self-determination" are presented in Table 4. As the KMO value was shown to be greater than .7 and the Bartlett test significant, the item matrix was considered suitable for factor analysis. When the factors of items 13 to 20 were analyzed, all items appeared within a single dimension with a value range of .461 to .644; therefore, all were round to be greater than .4, with the total explanation revealed as being 31.079%.

Table 4. Exploratory factor analysis on learning goal orientation and self-determination

Item	Factor coefficient
13	.628
14	.461
15	.640
16	.464
17	.531
18	.644
19	.569
20	.484
Eigen value	2.486
% of variance	31.079
Accumulation rate (%)	31.079
Kaiser-Meyer-Olkin scale	.784
Barlett	χ^2 = 598.488, p < .001

Exploratory factor analysis on constructive self-expectation and caring for the community

Table 5 shows the results of the exploratory factor analysis on "constructive self-expectation and caring for the community." As the KMO value was greater than .7 and the Bartlett test result was significant, the item matrix was considered suitable for factor analysis. When factor analysis was performed on items 21 to 29, the results showed that items 21-23 had a factor coefficient that was less than .4. The remaining items ranged from .400 to .798, were therefore all .4 or higher and within a single dimension. The total explanation was revealed as being 26.972%.

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Table 5. Exploratory factor analysis on constructive self-expectation and caring for the community

Item	Factor coefficient
21	.283
22	.253
23	.276
24	.653
25	.798
26	.749
27	.507
28	.408
29	.400
Eigen value	2.427
% of variance	26.972
Accumulation rate (%)	26.972
Kaiser-Meyer-Olkin scale	.702
Barlett	χ^2 = 939.151, p < .001

3.4. Confirmatory Factor Analysis

Based on the exploratory factor analysis, some items were removed in order to conduct confirmatory factor analysis. Items 7, 8, and 10 on "knowledge, thinking, and problem solving" and items 21-23 on "constructive self-expectation and caring for the community" were removed. Table 6 shows the goodness of fit from the confirmatory factor analysis of the Learning Leader Competency Test. The χ^2 of the original model was 1071.507, and the χ^2/df was 4.720. The overall goodness of fit (IFI = .828, TLI = .808, CFI = .827) was below the recommended standard of .9, and the RMSEA was .108, which was above the recommended standard of .08. Therefore, in order to improve the goodness of fit of the model, the covariance between the errors was allowed. After modifying the model, the χ^2 of the model was 672.097 and the χ^2/df was 3.069. The overall goodness of fit indices (IFI = .908, TLI = .893, CFI = .907) were found to be close to or met the recommended standard value of .9, and the RMSEA was .081, which was lower than the recommended standard value of .08. The measurement model is shown as illustrated in Figure 1.

Table 6. Goodness of fit of the Learning Leader Competency Test model

	χ^2	*df*	χ^2/df	IFI	TLI	CFI	RMSEA
Initial model	1071.507	227	4.720	.828	.808	.827	.108
Modified model	672.097	219	3.069	.908	.893	.907	.081

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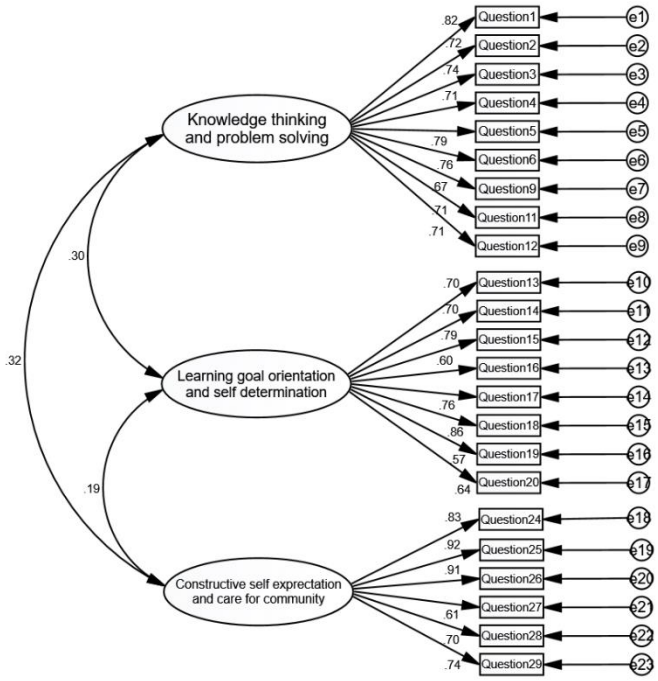

Figure 1. Competency confirmatory factor analysis (standardization coefficient)

Construct, convergent, discriminant, and cross-validity

The following procedures were used to examine the construct, convergent, discriminant, and cross-validity of the LLCT instrument developed in this study. First, to verify the construct validity, parameter estimates of the measurement model were obtained (see Table 7). As can be seen from Table 7, the construct validity of the LLCT was assured since the values for all items were revealed to be statistically significant ($p < .001$).

Table 7. Parameter estimates of the measurement model

Factor	Item No.	*B*	β	*SE*	*CR*
Knowledge, thinking, and problem solving	1	1.000	.821		
	2	0.936	.721	.065	14.298***
	3	0.838	.745	.056	14.944***
	4	1.952	.705	.069	13.899***
	5	0.955	.792	.059	16.220***
	6	0.887	.758	.058	15.227***
	9	0.887	.675	.068	13.112***
	11	0.887	.706	.063	13.892***
	12	0.804	.712	.057	13.993***
Learning goal orientation and self-determination	13	1.000	.701		
	14	0.818	.696	.071	11.438***
	15	0.925	.794	.071	12.997***
	16	1.056	.598	.106	9.951***
	17	1.020	.761	.081	12.516***
	18	1.059	.861	.076	13.94***

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Factor	Item No.	*B*	β	*SE*	*CR*
	19	1.081	.566	.115	9.415***
	20	1.196	.636	.113	10.544***
Constructive self-expectation and caring for the community	24	0.890	.826	.043	20.909***
	25	1.000	.920		
	26	1.088	.910	.041	26.475***
	27	0.780	.608	.062	12.496***
	28	0.705	.699	.046	15.372***
	29	0.780	.744	.046	17.097***

*** $p < .001$

Second, in order to test convergent and discriminant validity, the square of the correlation coefficient between sub-variables, construct reliability (CR), average variance extracted (AVE), and Cronbach's α were each calculated (see Table 8). Construct reliability was revealed to be greater than .7 for all factors and the AVE was also greater than .5. This confirmed that convergent and discriminant validity were both achieved. In addition, the internal consistency of the items was found to be stable, with Cronbach's α above .7. The overall reliability was revealed as .899.

Table 8. Construct reliability, discrimination, and convergent validity of the LLCT

	(1)	(2)	(3)
Knowledge, thinking, and problem solving (1)	.754		
Learning goal orientation and self-determination (2)	.286	.736	
Constructive self-expectation and caring for the community	.294	.197	.804
Construct reliability (3)	.922	.903	.915
AVE	.566	.542	.646
Cronbach's α	.916	.877	.916

*** $p < .001$

Note. The diagonal is the square root of AVE.

Finally, Table 9 presents the results of the analysis with equality constraints to prove cross-validity of the LLCT according to the students' field of study (IT & Computer Science/Engineering/Sciences = 153, Business & Law/Humanities/Social Sciences, Arts and Physical Education = 167).

Table 9. Cross-validity by students' field of study

	χ^2	*df*	χ^2/df	IFI	TLI	CFI	RMSEA
Configural invariance	1113.761	442	2.520	.870	.849	.868	.069
Metric invariance	1129.885	462	2.446	.870	.856	.869	.067
Metric invariance – Configural invariance	16.124	20		0	.007	.001	-.002
Scalar invariance	1199.184	485	2.473	.860	.853	.860	.068
Metric invariance – Scalar invariance	69.299	23		-.01	-.003	-.009	.001

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As shown in Table 9, the LLCT was considered valid for both student groups if the goodness-of-fit indices of each model did not change significantly by setting the configural invariance model without constraints on the two groups, the metric invariance model with constraints on the factor coefficients, and the scalar invariance model with constraints on the intercept. The goodness of fit of the configural invariance model (χ^2 = 1113.761, *df* = 442, χ^2/df = 2.520, IFI = .870, TLI = .849, CFI = .868, RMSEA = .069), the metric invariance model (χ^2 = 1129. 885, *df* = 462, χ^2/df = 2.446, IFI = .870, TLI = .856, CFI = .869, RMSEA = .067), and the scalar invariance model (χ^2 = 1199.184, *df* = 485, χ^2/df = 2.473, IFI = .860, TLI = .853, CFI = .860, RMSEA = .068) were found to be good. The chi-squared difference between the configural invariance and metric invariance models was shown as not significant. Additionally, the overall goodness-of-fit difference value was also not found to be significant ($\Delta\chi^2$ = 16.124, *df* = 20, *p* > .05, ΔIFI = .000, ΔTLI = .007, ΔCFI = .001, ΔRMSEA = -.002). The chi-squared difference between the metric and scalar invariance models was revealed to be significant, but the overall goodness-of-fit difference was not significant ($\Delta\chi^2$ = 69.299, *df* = 23, *p* < .05, ΔIFI = -.010, ΔTLI = -.003, ΔCFI = -.009, ΔRMSEA = .001). Therefore, cross-validity according to the students' field of study was demonstrated.

Table 10 presents the results of the analysis with equality constraints to prove the cross-validity according to student grade (first and second year = 151, third and fourth year = 169) for the LLCT.

Table 10. Cross-validity by student grade

	χ^2	*df*	χ^2/df	IFI	TLI	CFI	RMSEA
Configural invariance	1145.682	442	2.592	.866	.845	.865	.071
Metric invariance	1164.743	462	2.521	.866	.852	.865	.069
Metric invariance – Configural invariance	19.061	20		0	.007	0	-002
Scalar invariance	1232.627	485	2.541	.857	.850	.856	.070
Metric invariance – Scalar invariance	67.884	23		-.009	-002	-.009	.001

Table 10 shows the results of the cross-validity by student grade. The goodness of fit of the configural invariance model (χ^2 = 1145.682, *df* = 442, χ^2/df = 2.592, IFI = .866, TLI = .845, CFI = .865, RMSEA = .071), the metric invariance model (χ^2 = 1164.743, *df* = 462, χ^2/df = 2.521, IFI = .866, TLI = .852, CFI = .865, RMSEA = .069), and the scalar invariance model (χ^2 = 1232.627, *df* = 485, χ^2/df = 2.473, IFI = .857, TLI = .850, CFI = .856, RMSEA = .070) were all found to be good. The chi-squared difference between the configural invariance and metric invariance models was not revealed as being significant, and the overall goodness-of-fit difference value was also not significant ($\Delta\chi^2$ = 19.061, *df* = 20, *p* > .05, △IFI = .000, △TLI = .007, △CFI = .000, △RMSEA = -.002). The chi-squared difference between the metric and scalar invariance models was significant, but the overall difference in goodness-of-fit was found to be insignificant ($\Delta\chi^2$ = 67.884, *df* = 23, *p* < .05, △IFI = -.009, △TLI = -.002, △CFI = -.009, △RMSEA = .001). Therefore, cross-validity according to student grade was demonstrated.

Final items

The factors of the Learning Leader Competency Test were "knowledge, thinking, and problem solving," "learning goal orientation and self-determination," and "constructive self-expectation and caring for the community." On the basis of the exploratory and confirmatory factor analyses performed, 23 items were finalized, divided into knowledge, thinking, and problem solving (items 1-9), learning goal orientation and self-determination (items 10-17), and constructive self-expectation and caring for the community (items 18-23). The structure of the final items of the LLCT is shown as presented in Table 11. All items of the LLCT are listed in Appendix I.

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Table 11. Number of items and Cronbach's α by factor

Factor	Number of items	Cronbach's α
Knowledge, thinking, and problem solving	9	.732
Learning goal orientation and self-determination	8	.766
Constructive self-expectation and caring for the community	6	.733
Total items	23	.856

4. Discussion

This study defined the concept of learning leader competencies as consisting of cognitive, motivational, and behavioral domains, represented by knowledge, thinking, and problem solving (cognitive), and goal orientation and self-determination (motivational), and constructive self-expectation and caring for the community (behavioral). A test was then developed and validated to measure college students' learning leader competencies based on these domains. From the results of the study, the Learning Leader Competency Test (LLCT), which consists of three factors and 23 items, had both reliability and validity confirmed. These results of this process are discussed as follows:

Firstly, the study defined the concept of learning leader competency as "the ability to collaborate with the learning community and execute learning while designing learning on one's own initiative with learning competency in the areas of cognition, motivation, and leader behavior related to learning." In addition, the composition of learning leader competency was divided into cognitive, motivational, and behavioral domains since we recognized that "knowledge, thinking, and problem solving," "learning goal orientation and self-determination," and "constructive self-expectation and caring for the community" were important aspects of learning leader competency. The results of the current study may be compared with those of Sung (2015), who conducted research on the core learning competencies of university students and emphasized goal setting, motivation, time management, planning, and practice as being essential to prepare them for the future. In building upon this, the current study divided the concept of learners into cognitive, motivational, and behavioral domains, consisting of "knowledge, thinking, and problem solving," "learning goal orientation and self-determination," and "constructive self-expectation and caring for the community" as the competencies that learning leaders should possess. In addition, Lee et al. (2011) developed a learning competency test for university students and organized learning competency under self-directed learning, individual cognition, learning motivation, and learning behavior areas in order to improve a person's learning competency through complementing their strengths and weaknesses. This is similar to the view that it is necessary to check and inspect the characteristics of learners in each area in terms of the cognitive, motivational, and behavioral domains of learning leader competency composition.

Secondly, we discuss the appropriateness and validity of the LLCT instrument developed in the current study. Previous research (Kim & Kim, 2021; Lee et al., 2011; Lee et al., 2023) on learning competency primarily reflected on the cognitive domain of how learners use knowledge, the affective domain of learners' beliefs and values, and the behavioral domain in which learners take the lead in managing their external environment. However, the significance of the current study is that a test was developed and validated that focuses on a leader's competency to respond to social change by emphasizing the personal and motivational aspects of individual learners and to lead one's own learning, and also that of members, to cope with social change and to play a role in the future society.

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The current study does present a limitation concerning the selection of the study sample, which consisted of students from "S" University in Seoul, South Korea. As such, the sample collected and utilized in the current study cannot be said to be representative of all South Korean university students, and the results should therefore be interpreted with some caution.

5. Conclusion

The "Learning Leader Competency Test" developed and validated in this study consists of 23 questions within three constructs: "Knowledge, thinking, and problem solving," "learning goal orientation and self-determination," and "constructive self-expectation and caring for the community." Therefore, learners may use the LLCT as an instrument to identify their learning leader competencies. The test provides a specific understanding of the learner's competencies in the cognitive, motivational, and behavioral domains related to learning. Using the LLCT may also be utilized to help universities design curricula and to improve their teaching practices. In this way, universities may ultimately foster more responsible learners and build collaborative learning communities.

Declarations

Author Contributions. Choi, E. J.: Original manuscript preparation, literature review, conceptualization, and data analysis. Jun, J. S.: Data collection, writing-reviewing, and editing. All authors have read and approved the published final version of the article.

Conflicts of Interest. The authors declare no conflict of interest.

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Ethical Approval. No ethical approval was sought for this study since it was based on voluntary participation of the research subjects.

Data Availability Statement. The datasets generated during the current study are available from the corresponding author upon reasonable request.

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Appendix I. Learning Leader Competency Test items

No.	Item description	①	②	③	④	⑤
1	I know a lot and tend to remember things for a long time.					
2	I am always looking for new information because I am interested in it.					
3	I can classify and determine the importance and priority of information					
4	I like to use logical/scientific evidence in the process of understanding and research.					
5	I obtain new ideas and specific results by integrating key contents or information necessary for problem-solving and research.					
6	I can apply experiments, investigations, and learning outcomes to new situations (daily life) well.					
7	I tend to structure (organize) data to understand it.					
8	I am good at finding what's inconvenient in things I use all the time.					
9	I can come up with a variety of ideas for solving inconvenient problems.					
10	I accept that there may be multiple solutions to a problem and look for alternatives.					
11	Once I start something, I tend to work on it until the problem is solved.					
12	I feel that I can successfully solve the tasks assigned to me.					
13	I want to learn as much as possible.					
14	I want to fully understand what I've learned.					
15	It is important to improve my skills in class.					
16	Failures makes me try harder.					
17	I consider it important to study to double check what I have learned.					
18	I believe that studying is worthwhile.					
19	I enjoy studying.					
20	I study because I get pleasure from challenging tasks.					
21	I make my own plans for assignments or lessons, and I sticks to them most of the time.					
22	When I plan work (task), I forecast the results, and tend to make an overall plan.					

No.	Item description	①	②	③	④	⑤
23	I prioritize things before start working on them.					
24	I believe that I can do well on my own even in challenging and difficult situations.					
25	I respect myself.					
26	I am positive about myself.					
27	I try to solve problems collaboratively with colleagues rather than alone.					
28	I understand and cover the mistakes of other friends and colleagues.					
29	I put myself in the other person's shoes					

Note: ① = Strongly disagree, ② = Disagree, ③ = Neither agree nor disagree, ④ = Agree, ⑤ = Strongly Agree

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