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A Measure of Pre-teachers' Self-regulated Learning Strategies on Industry 4.0 & 107 Curriculum Reform

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ABSTRACT

This study describes the development and validation of self-regulated learning strategies scale, a 30-item scale that measures pre-teachers self-regulated learning strategies toward Industry 4.0 & 107 Curriculum Reform. A total of 476 pre-teachers completed the questionnaire. A pilot study (n= 120) was examined factorial validity and reliability of questionnaire and study objects (n= 356) used confirmatory factor analysis. The Self-regulated learning strategies Measure (SLSM) has three-factor model (Environmental Orientation, Behavioral Orientation and Process Orientation Self-regulation) was fit using maximum likelihood estimation (MLE). The self-regulated learning strategies scale could be useful for understanding the ways in which teachers think about self-regulation learning issues and could be used to investigate the relationship between other variables. The applications of the SLSM were discussed.

Keywords:
Industry 4.0; 107 Curriculum Reform; Self-regulated learning strategies

1. Introduction

In the global economic landscape, the manufacturing industry is understood to be the engine of growth. Germany proposed the concept of "Industry 4.0"; the USA proclaimed "making the Renaissance"; and China changed the slogan "Made in China" to "Created in China". Taiwan strongly advocates the need to emphasize its large manufacturing scale, while also enhancing its manufacturing strength In the face of future or on-going challenges and competition, companies must capitalize on tools such as the Internet of Things (IoT) and Big Data to further enhance productivity and decrease the time taken to reach markets. Business also needs to enhance resilience through digitalization in order to increase its competitiveness. The German government's proposed Industry 4.0 in 2012 offered the important concept of a smart factory to the world. In the leading German automation industry, Industry 4.0 is regarded as the development axis of Germany's future products, providing corresponding solutions for all walks of life (Fear & Sandmann, 2016; Geeraerts, Vanhoof, & Bossche, 2016).

In response to the rapidly growing global industry environment many call for changes in how individuals should deal with the industry 4.0 & 107 Curriculum Reform. An important aspect of moving towards an industry sustainable development is to promote self-regulated learning strategies adjust Industry 4.0 & 107 Curriculum Reform. Pre-teachers strengthen the self-regulated learning strategies is important who teaching profession and industry practice ability of the vocation practice course (Hoffman, Wetzel, Maloch, Greeter, Taylor, DeJulio, & Vlach,

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2016; Ingen & Ariew, 2015; Macià & García, 2016). In view of the practical needs and 107 Curriculum Reform, the vocation education curriculum content of the professional subjects is influenced by the industrial development trend (Janssen, Grossman, & Westbroek, 2015; Kilday, Lenser, & Miller, 2016). Pre-teachers' industry professional competence and specialized learning mechanism of self-regulation learning adjust Industry 4.0 & 107 Curriculum Reform will be emphasized of environmental orientation, behavioral orientation and process orientation self-regulation (Brockner& Wiesenfeld, 2016; Donnell & Gettinger, 2015; Facker & Malmberg, 2016).

Pre-teachers face two challenges of self-regulated learning strategies in Industry 4.0 & 107 Curriculum Reform, there are: 1. To understand the impact of the self-regulated learning strategies on teaching professionalization abilities, as well as to the industry practice abilities and preparation of 107 Curriculum Reform industry practice, is very important. 2. The digitalization of work is not just something that lies ahead; it has already changed work more and more over the last few years, e.g. making it more mobile. In view of the industry practical needs of the vocation education contents of Industry 4.0 & 107 Curriculum Reform, the content of professional subjects is influenced by the industrial development trend, and the industry practice competence of pre-teachers (Bryant, Maarouf, Burcham, & Greer, 2016; Geldenhuys & Oosthuizen, 2015). In the face of the industry change, the industry teaching ability of pre-teachers is challenged (Head, Schapmire, Earnshaw, Faul, Hermann, Jones, Martin, Shaw, Woggon, Ziegler, & Pfeiffer, 2016; Helgevold, Næsheim-Bjørkvik & Østrem, 2015).

Pre-teachers' self-regulated learning strategies adjust Industry 4.0 & 107 Curriculum Reform was conducted in the industry practice specialization process of pre-teachers' cognitive process, not only to participate in the common self-regulation learning behavior, but also to practice quite personal characteristics. The self-regulated learning strategies adjust Industry 4.0 & 107 Curriculum Reform process is cognitive adjustment that to use knowledge and main contributions of this study and to set up the industry learning (Hascher & Kittinger, 2014; Ho, Lee, & Teng, 2016; Körkkö, Kyrö-Ämmälä, & Turunen, 2016; Oliver, Wehby, & Nelson, 2015). It is important to understand pre-teachers' views of self-regulated learning strategies in the vocation and technology education of human cultivation and industry connotation (Ruttan, & Nordgren, 2016). The review of the literature reveals that the research studies conducted in the context of self-regulated learning strategies and applications have measured attitudes and behavior of pre-teachers regarding environmental orientation, behavioral orientation and process orientation self-regulation (Ingen & Ariew, 2015). Scholars researchers classify self-regulation learning strategies there are environmental orientation, behavioral orientation and process orientation self-regulation. The content is: 1. Environmental orientation self-regulation learning, includes: seeking information, environmental structuring, seeking peer assistance, assistance from teachers and adults, etc. 2. Behavioral orientation self-regulation learning, includes: self-assessment (self-evaluation, organizing and transforming, goal-setting and planning, keeping records and monitoring, rehearing and memorizing, reviewing , notes and textbooks, etc.; 3. Process orientation self-regulation, includes is self-consequences (Chen, 2016; Cheng & Wu, 2016; Dal, Alper, Özdem-Yilmaz, Öztürk, & Sönmez, 2015; Facker & Malmberg, 2016; Jiménez & O'Shanahan, 2016; Marshall, Smaaaart, & Alston, 2016).

The self-regulated learning strategies is one of the majority of the research on teaching professionalization is concerned with household setting. Growing importance of self-regulated learning strategies adjust Industry 4.0 & 107 Curriculum Reform has made it imperative to study the same in vocaiton education settings. The purpose of the present article is to present a framework to explain self-regulated learning strategies adjust Industry 4.0 & 107 Curriculum Reforms in pre-teachers teaching professionalization (Hascher & Kittinger, 2014; Leavy & Hourigan, 2016). Researchers reviewed self-regulation sustainability literature in the self-management discipline and self-regulated learning strategies adjust Industry 4.0 & 107 Curriculum Reforms related literature from psychology and social psychology. Based on the conceptual framework for explaining self-regulated learning strategies of teaching professionalization was proposed. It argue that individual characteristics such as self-assessment, goal-setting and planning will influence the pre-teachers' self-regulated learning strategies in Industry 4.0 & 107 Curriculum Reforms (Claessens, et al. 2016; ; Geldenhuys & Oosthuizen, 2015; Ruttan, & Nordgren, 2016; Pfitzner-Eden, 2016).

The purpose of the study was to develop a valid and reliable instrument to be used for measuring pre-teachers' attitudes toward self-regulated learning strategies adjust Industry 4.0 & 107 Curriculum Reform and its applications. With this instrument, it is believed that the gap in the professional literature indicated above will be partially met.

2. Method

2.1. Participants

The participants in this study were 476 pre-teachers from 12 teacher programs institutes in Asian countries. A total of 476 pre-teachers completed the questionnaire and adopted both random sampling and cluster sampling for the survey. The stratified sampling was in accordance with the basic information (e.g. school, teaching professional, and gender), and a computer randomly selected the department samples. The stratified sampling was in accordance with the basic information (e.g. school attributes, teaching background, current post, seniority, and gender), and a computer randomly selected the department samples.

2.2. Measure

The purpose of this study was to evaluate the 30-SLSM factorial validity. All participants were volunteers and they were briefed on the purpose of this study and informed of their rights not to participate and withdraw from completing the questionnaire at any time during or after the data have been collected]. Participants took about 20 min to complete the questionnaire. This study aimed to test and refine the items. These items were presented using a 5-point Likert response scale with 1 = strongly disagree and 5 = strongly agree.

3.Results

The principal component analysis with varimax-rotated see Table 1, and results of confirmatory factor analysis see Table 2.

Table1. Principal component analysis with varimax-rotated

	EO	BO	PO	H2
EO 1	**.769**	.216	.356	.828
EO 2	**.749**	.329	.782	.867
EO 3	**.787**	.398	.794	.874
EO 4	**.842**	.261	.389	.845
EO 5	**.799**	.249	.243	.839
EO 6	**.812**	.324	.317	.841
EO 7	**.866**	.341	.216	.857
EO 8	**.872**	.268	.311	.832
EO 9	**.824**	.232	.342	.887
EO10	**.741**	.732	.238	.819
BO1	.235	**.789**	.276	.824
BO 2	.341	**.823**	.312	.798
BO 3	.267	**.821**	.226	.891
BO 4	.289	**.869**	.317	.832
BO 5	.311	**.742**	.238	.819
BO 6	.243	**.796**	.326	.823
BO 7	.327	**.839**	.325	.856
BO 8	.345	**.823**	.210	.844
BO 9	.354	**.793**	.297	.865

BO10	.279	**.741**	.789	.877
PO 1	.288	.216	**.756**	.828
PO 2	.419	.329	**.782**	.867
PO 3	.234	.289	**.808**	.882
PO 4	.278	.390	**.833**	.878
PO 5	.342	.306	**.842**	.797
PO 6	.387	.398	**.794**	.874
PO 7	.279	.411	**.789**	.877
PO 8	.824	.232	**.742**	.887
PO 9	.798	.367	**.868**	.828
PO 10	.837	.355	**.789**	.845
Eighenvalue	6.872	7.694	3.498	-
% of variance explained	32.56	39.34	17.56	-

Note. EO=Environmental orientation; BO= behavioral orientation; PO= process orientation. All factor loadings=.74 or greater are underlined. H2=communality.

Table 2. Results of confirmatory factor analysis

Item	Understandardized esitmate	Standardtized estimate	*t* value	R^2	α
Environmental Orientation					.917
EO 1	.984	.8783	65.783	.789	
EO 2	.955	.874	48.327	.765	
EO 3	.992	.891	34.461	.740	
EO 4	1.403	.987	13.209	.942	
EO 5	1.109	.993	23.093	.935	
EO 6	1.056	.992	21.434	.972	
EO 7	1.387	.978	13.478	.956	
EO 8	1.388	.996	13.024	.938	
EO 9	1.022	.973	27.389	.589	
EO10	1.052	.983	26.359	.578	
Behavioral Orientation					.912
BO1	1.022	.921	78.934	.967	
BO 2	.982	.899	78.544	.958	
BO 3	.993	.882	23.598	.542	
BO 4	1.018	.972	39.873	.923	
BO 5	1.361	.992	13.367	.962	
BO 6	1.388	.996	13.024	.938	
BO 7	.969	.895	78.256	.965	
BO 8	1.387	.978	13.478	.956	
BO 9	1.484	.993	13.459	.971	
BO10	1.403	.987	13.209	.942	
Process Orientation					.921
PO 1	1.104	.984	22.319	.925	
PO 2	1.022	.984	89.356	.978	

PO 3	1.001	.985	70.984	.958
PO 4	.992	.895	79.320	.978
PO 5	1.388	.996	13.024	.938
PO 6	1.387	.978	13.478	.956
PO 7	.965	.917	76.953	.944
PO 8	1.403	.987	13.209	.942
PO 9	1.108	.992	22.378	.943
PO 10	1.137	.992	24.043	.987

3.1. Model comparison

The CFA was conducted to test the above three models. Table 3 shows the results of the model comparison, indicating that the model has a better index and is within the SEM's recommended values. On this basis, the model is retained as the best model.

Table 3. Confirmatory factor analysis of alternative models

Mode	χ^2	χ^2/df	TLI	CFI	RMSEA	RMR	Model description
1	573.25	3.45	.937	.958	.115 (.106, .116)	-	Null model
2	29465.33	17.68	.657	.726	.217 (.278, .328)	.167	One-factor (30-item)
3	354.56	2.29	.968	.981	.081 (.067, .089)	.058	Three-factor corrlated

3.2. Compare different pre-teachers in self-regulated learning strategies

Table 4 presents the results of testing the presence of significant differences in the grade on self-regulated learning strategies ($F(356)= 36.177$, $p <.05$). Pre-teacher was higher than college pre-teacher on self-regulated learning strategies, and university pre-teacher behavior was high than college pre-teacher on pro-industry. It has reaching a significant level between environmental orientation ($F(356)=45.051$, $p <.05$), behavioral orientation ($F(356)=43.311$, $p <.05$) and process orientation ($F(356)=11.488$, $p <.05$). Master pre-teacher higher than university pre-teacher on environmental orientation and behavioral orientation, and university pre-teacher was higher than college pre-teacher. Master pre-teacher was higher than college and university pre-teacher on process orientation.

Table 4. ONE-WAY ANOVA of pre-teachers' education level for self-regulated learning strategies

Factor	Source of variation	SS	*df*	MS	*F* value	Sig.	Comparison
Environmental orientation	between	1927.997	2	963.999	45.051	.000	Master > University > College
	within	18019.192	354	20.928			
	total	19947.189	356				
Behavioral orientation	between	1793.299	2	896.649	44.421	.000	Master > University > College
	within	16955.744	354	19.693			
	total	18749.043	356				
Process orientation	between	960.790	2	480.395	15.598	.000	Master > College
	within	30414.260	354	35.324			

	total	31375.050	356				Master > University
Total	between	13581.758	2	6790.879	37.287	.000	Master >
	within	152270.300	354	176.853			University >
	total	165852.057	356				College

3.3. Compare different teaching profession group pre-teachers in self-regulated learning strategies

Table 5 presents the testing results of significant differences teaching profession group on self-regulated learning strategies ($F(356)= 7.867$, $p <.05$). The business pre-teacher and industry pre-teacher was higher than design pre-teacher on self-regulated learning strategies. The compare analysis has reaching a significant level between environmental orientation ($F(356)= 10.399$, $p <.05$) and behavioral orientation ($F(356)= 9.264$, $p <.05$), but don't reach a significant level on process orientation ($F(356)= 2.556$, $p >.05$). Industry pre-teacher was higher than business pre-teacher of teaching profession group, and business pre-teacher was higher than design pre-teacher of teaching profession group. Business pre-teacher and Industry department pre-teacher were higher than design pre-teacher on behavioral orientation.

Table 5. ONE-WAY ANOVA of pre-teachers' department in self-regulated learning strategies

Factor	Source of variation	SS	df	MS	F value	Sig.	Comparison
environmental orientation	between	515.053	2	246.416	10.399	.000	Industry >Business >Design
	within	19432.137	354	21.469			
	total	19947.189	356				
behavioral orientation	between	399.609	2	198.795	9.264	.000	Business > Design
	within	18349.434	354	20.202			Industry > Design
	total	18749.043	356				
process orientation	between	193.204	2	95.592	2.556	.064	
	within	31181.846	354	35.106			
	total	31375.050	356				
Total	between	3017.653	2	1189.726	7.867	.000	Business > Design
	within	162834.405	354	188.212			Industry > Design
	total	165852.057	356				

4. Conclusion

The purpose of this study was to test awareness among pre-teachers using the newly developed Self-regulated learning strategies Measure (SLSM) adjust Industry 4.0 & 107 Curriculum Reform. The tool provides an alternative to existing measures where pre-teachers support self-regulation learning, with a focus on pre-teacher industry recognition, behavioral orientations and process orientations' views on self-regulated learning strategies. The consisting of three factors, the SLSM measures user perceptions of the industry, behavioral orientations, and process orientations' views on using self-regulation learning. The self-regulated learning strategies measurement (SLSM) is developed and validated through research using separate samples (Bryant, Maarouf, Burcham, & Greer, 2016; Lee, & Schallert, 2016).

In general, the validity of this study was found to support SLSM as a measure of the utility of pre-teachers in supporting self-regulation learning. The results of the CFA show that the data for the third model is the best compared to the two alternative models and that these items have good normalized loading for the hypothetical underlying factors constructs, which are less highly correlated between them. These results provide evidence of the molecular structure of SLSM and may be useful to educational researchers. A better understanding of pre-teachers' understanding of the industry will increase their awareness of self-regulation and industry-related behaviors and will make teaching more meaningful in the field of education (Marshall, Smart, & Alston, 2016; Oliver, Wehby, & Nelson, 2015).

Several researchers have demonstrated a positive relationship between pre-teacher "self-regulation learning" awareness and their teaching professionalization and industry practice ability development (Ho, Lee, & Teng, 2016; Hoffman, et al., 2016). As part of supporting industries as part of teacher education, SLSM allows researchers to measure and understand how users respond to instruction. For example, researchers investigating teaching practices to facilitate supportive industries can use SLSM to collect data on various factors that influence underlying pedagogical awareness (Jiménez, & O'Shanahan, 2016; Macià & García, 2016; Witte & Jansen, 2016)).

In addition, pre-teachers of in business have a higher professional performance than those in design. Masterpre-teachers have higher self-regulation learning than colleges. These findings can be used to identify teachers who can use the SLSM to gather information about pre-teacher reactions and then implement any course through pro-industry activities. This information will help teachers make decisions about resource allocation, practical instructional design and teaching strategies. For example, if pre-teachers in a school are found to have low Industry 4.0 & 107 Curriculum Reform, teachers can organize a series of mutual aid activities to highlight the potential and availability of industries and how pre-teachers can effectively learn through parenting teaching (Kilday, Lenser, & Miller, 2016).

Although this study reports the study, the structure of the factors in the SLSM needs further evaluation due to its limited validation. In particular, samples from universities institutions of higher learning may limit the universality of results and the utility of SLSM for more people. Therefore, future research is needed to examine other psychometric information on this measure. Moving forward, the SLSM factors can be modeled as structural relationships with other structures that are seen as influencing parental behavior.

In doing so, the usefulness of SLSM can be expanded to further inform researchers about the factors that affect user behavior. Such future research may be based on user demographics, such as the level of industry development, the level of industry experience, and attitudes toward industrial learning.

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