The Modeling Pedagogy Competency Using Structural Equation Modeling

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ABSTRACT

The role of universities to create the human resources that high competitiveness very great influence over the progress of the nation. For that qualified lecturers is needed to convey knowledge and skills so that the students have competencies in accordance with the demands of the work world is growing at a rapid rate. Thus the required evaluation of educators in this case are the competencies that have been on duty in the lecturer learning process. The research done on students at Hangtuah Stikes Prodi DIII Nursing Surabaya. The latent variables used is four competencies lecturers (pedagogy, professional, social and personality). The purpose of this penlitian is examine the relationship pattern four competencies lecturer is pedagogy, professional, social and personality. The analysis method used is the Structural Equation Modeling (SEM). The results of the study showed that the competencies pedogogik influenced by social competence, professional competencies and competency personality. Lecturer in teaching does not just give information orally to students, but in teaching lecturers should be able to create the situation learning environment that allows students active in learn to have a sense of humor, know with good students who follow her study, relation with professional competencies namely lecturers have the ability to provide the motivation to the student the ability to explain the material in a timely manner and the ability to provide relevant examples of the concepts that are being taught.

KEY WORDS: SEM, Competency, Pedagogy, Professional, Social, Personality

1. INTRODUCTION

Human resource competence of late many debated. One of the areas that have the issue of competency that is interesting to be seen is the field of education. The problems is *booming* these days is the problem of the competence of the educators, as an essential component in education. As an important part in the quality of human resources through education process, educators need to have competency that can support in the teaching and learning process. Constitution of The Repulic of Indonesia No. 14 The year 2005 about Teachers and Lecturers who stated that an educators need to have competency [1]. Competency is a set of knowledge, skills and behavior that must be owned, at first found, and controlled by the teacher or lecturer in carrying out the tasks professionalism [2].

Thus [3] provide beacon the beacon about the meaning of the competencies as the ownership of the knowledge (the basic concept of scientific), skills needed in completing a work in the field and the values and attitudes. Thus the competencies have three-dimensional, namely: (1) mastering the concept, (2) the skills to implement the concept, and (3) of ownership of the values and attitudes of the concept of controlled and implemented. Law No. 14 the year 2005 [1], about Teachers and Lecturers loading also aspects of the competencies which need to be owned by a lecturer namely pedagogy competency, competency professional, competency personality and social competence [1]. Through the dimensions can be conducted an assessment or evaluation that can be used to improve competency in support performance in the activities of the teaching and learning process. Grade lecture has purpose to know how big the lecturer can provide a good teaching methods according to the student where a lecturer is expected to become a professional in kind. Lecturers Indonesian teachers that is professional required to have a strong science base as a solution to the community of technology and knowledge society. With the requirement of professionalism lecturers or teachers, then required to give birth to a new paradigm lecturer profile Indonesian teachers that professional has a mature personality and growing, where the longer the lecturer teaching will be able to develop the potential on himself because of experience gained more and more.

Competency is the ability, expertise, authority and power. The Government through the[1], about Teachers and Lecturers Chapter I Article 1 paragraph 10 defines competency as a set of knowledge, skills and behavior that must be owned, at first found, and controlled by the teacher or lecturer in carrying out the tasks the latter hailed. Constitution of The goverment of the Repubic of Indonesia Number 19 Year 2005 on National Education Standards Article 28 stated that: Educators must have the academic qualification and competence as

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agents of learning, healthy physical and spiritual, and have the ability to realize the purpose of national education while according to the provisions of Constitution No. 14 of 2005 on Teachers and Lecturers teachers professional competencies have been separated into four, (1) pedagogy competency, (2) competencies personality, (3) professional competencies and (4) Social competence. Pedagogy competency summarises results to the ability to (a) understand learners, (b) planning capability, implement and assess learning, and (c) the ability to develop learners. The competencies personality summarises results become berpribadi steady and stable, arif, authority, and high moral standards. Then the professional competencies summarises results to dominate the scholarly fields of study and critical studies a deepening of the contents of the fields of study. Social competence further broken down into the ability to communicate with learners, colleagues and the community [3].

According to [4] stated that the influence of social competence competency and personality professional competencies influence pedagogy competency. According to [5] about the performance of lecturers using path analysis method (*path analysis* concluded (1) professional competencies contributes directly and significantly to the performance of the lecturers, (2) work motivation contributes directly and significantly to the performance of the lecturers, (3) simultaneously professional competencies and work motivation contributed significantly to the performance of lecturers. So that needs to be done the research to develop models of teaching simultaneously based on four (4) competencies lecturer, after with listed in the Constitution of The Repulic of IndonesiaNo. 14 The year 2005 about Teachers and Lecturers. The method used will be used in research that is *Structural Equation Modeling* (SEM) [7][8][9]. The purpose of this research is the cost for a hipotesa built in this research are as follows: (1) the higher level of professional competence and social competence that is owned by the lecturer of the higher the competencies taught them (pedagogy), (2) the higher the level of match between the lecturers and professional competencies competencies personality (personality), the higher the competencies taught them (pedagogy), (3) the higher the level of match between the lecturer and social competencies competencies personality (personality), the higher pedagogy competency [10] .

2. LITERATURE STUDY

The validity of the associated with whether a exchangeable measuring what should be measured. The validity of the testing done by testing the significance of the parameters of the measurement model. Lambda (λ) parameters are related to the measurement of the latent exchangeable by exchangeable manifest. The test statistics used is t-test with the criteria reject H0 when p-value < α and the hypothesis that is tested is [7][8][9]:

H0 : $\lambda = 0 \approx$ not valid indicator as a latent variable

H1 : $\lambda \neq 0 \approx$ valid indicator as a latent variable

Reliability is the consistency of a measurement. High Reliability showed that the indicators have a high consistency in measuring the exchangeable latennya. To measure the reliability of the can be used the formula *costruct reliability* (C-R) as follows [10][11]

$$C - R = \frac{\left(\sum_{i=1}^{n} \lambda_i\right)^2}{\left(\sum_{i=1}^{n} \lambda_i\right)^2 + \left(\sum_{i=1}^{n} \delta_i\right)} \tag{1}$$

With λ_i is the factor loading for each change or latent variable and δ_i is error variance for each change/latent. The value of the minimum used to assess C-R or is said to have good reliability for a latent exchangeable was 0.70.

According to [9], in the measurement model or Confimatory Factor Analysis (CFA), the relationship between the latent variables can be estimated based on the kovariannya. The measurement model can be written as follows:

$$x_1 = \Lambda_1 \eta + \epsilon_1 \tag{2}$$
$$x_2 = \Lambda_2 \xi + \epsilon_2 \tag{3}$$

With x_1(r x 1) and x_2(s x 1) is a random vector variables manifest/indicators which is an indicator of η and ξ, Λ_1 (r x q1) and Λ_2 (s x q2) is based the loading, ϵ_1(r x 1) and ϵ_2(s x 1) is a random vector measurement error. The assumption that must be met that measurement error is normal distribution, ϵ_1 and ϵ_2 (not correlates with η, ξ and δ). So the structural equation model as follows [9]

$$\eta = \Gamma \xi + \delta \tag{4}$$

With η(q1 x 1) is a random vector endogenous latent variable, and ξ(q2 x 1) random vectors of exogenous latent variables, Γ (q1 xq2) is coeficient from the influence of the relationship between η and ξ, δ (q1 x 1) is a random vector from measurement error.

The estimation of structural model parameters or SEM one only using the Maximum Likelihood Method can be formulated as follows [9].

$$F_{ML} = \log|\Sigma(\theta)| + tr\left(S\Sigma^{-1}(\theta)\right) - \log|S| - (p+q) \tag{5}$$

3. METHODOLOGY

The technique of data collection is done by using questionnaires and supported by observation. Research respondents is a student of Hangtuah Stikes Prodi DIII nursing had taken the first semester period gasal 2013/2014 [12].The latent variables used is four competencies lecturers (pedagogy,professional,social and personality) [13]. This research uses probabilistic sampling method, where each element in the population has the opportunity or the possibility for selected as samples. Probabilistic Sampling used is simple random sampling [14] . CFA used test the validity of a theoretical change. The primary concept that is used in this case is the measurement validity and reliability. Estimation parameters and testing the hypothesis in SEM with the framework of the concept as follows [15].
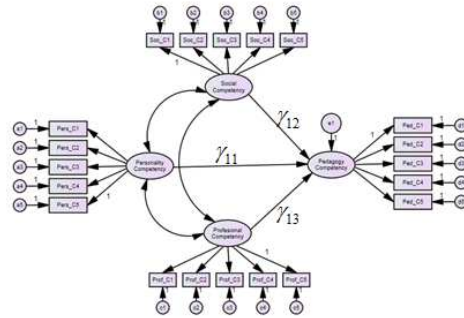

Figure 1. Path Model Competency Pedegogy

Pathdiagram on the figure1. above can be converted into structural model as follows :

$$\text{Pedagogy} = \gamma_{11} \text{ Professional} + \gamma_{12} \text{ Social} + \gamma_{13} \text{ Personality} + e_1$$

4. RESULTS AND DISCUSSION

The measurement of the model consists of a validity test and reliability test. The results are presented in detail in the following table.

Table 1. Validity test and the reliability of the indicators on the latent Variable

Variables	Indicators	Validity		Reliability	
		Loading (λ)	P-value	Error variance	P-value	Composite Reliability (C-R)
Personality Competency (Pers_C)	Authority as private lecturers (Pers_C1)	0.783	0.000	.244	0.000	
	Wisdom in taking the decision (Pers_C2)	0.840	0.000	.159	0.000	
	Become an example in attitude and behaves (Pers_C3)	0.777	0.000	.196	0.000	0.885
	Consistent in the words and actions (Pers_C4)	0.581	0.000	.461	0.000	
	Ability to control himself in many situations and conditions (Pers_C5)	0.889	0.000	.111	0.000	
Social competency(Soc_C)	Ability to convey the opinion (Soc_C1)	0.517	0.000	.351	0.000	
	Ability to accept criticism, advice and opinions (Soc_C2)	0.519	0.000	.179	0.000	
	Know with good students who follow her study (Soc_C3)	0.746	0.000	.203	0.000	0.797
	Have a sense of humor (Soc_C4)	0.783	0.000	.156	0.000	
	The tolerance of diversity of students (Soc_C5)	0.729	0.000	.189	0.000	

Professional competency (Prof_C)	Ability to explain the material in a timely manner (Prof_C1)	0.689	0.000	.161	0.000	
	Ability to provide relevant examples from the concept that taught (Prof_C2)	0.679	0.000	.251	0.000	
	Ability to explain the relevance of the material that is taught in the context of life (Prof_C3)	0.583	0.000	.246	0.000	0.831
	Ability to admonishing wisely, clear and firm (Prof_C4)	0.655	0.000	.306	0.000	
	Ability to provide the motivation to the students (Prof_C5)	0.894	0.000	.085	0.001	
Pedagogy competency (Ped_C)	Readiness of delivering lectures and/or/practice hands-on labs (Ped_C1)	0.826	0.000	.171	0.000	
	Order and order the appropriate lecture table (Ped_C2)	0.764	0.000	.190	0.000	
	Ability to turn on the classroom (Ped_C3)	0.825	0.000	.134	0.000	0.871
	Clarity of the delivery of the material and the answer to the question in the classroom (Ped_C4)	0.779	0.000	.299	0.000	
	Utilization of media and learning technology (Ped_C5)	0.573	0.000	.520	0.000	

Table 1 shows the value of loading factor worth more than 0.5 and p-value < 0.05 each indicator on the latent variable personality competency (Pers_C), social competency (Soc_C), professional competencies (Prof_C) and pedagogy competency (Ped_C). Then all said indicator is valid and significant in forming the latent variable. While for reliability Table 1 also shows that all latent variable gives the value of Composite Reliability (C-R) above the value of the cut-off his 0.7 it can be said all the latent variable reliabel.

After the validity test and reliability on each of the latent variable, some prerequisites that must be met in the structural modeling is the assumption of normal multivariate,non multicolinearity, non singular and outlier. CR multivariate value of 1.298 and this value is located between -1,96 until 1.96, so that it can be said that data is normal multivariate distribution. Singularcan be seen through determinant covariance matrix. The research results provide the value of the determinant of sample covariance matrix of 0.000732. This value is almost approaching from zeros so that it can be said that there singularity problems on the data analyzed. So not directly all the latent variable no multicolinearity. Outlier is the observation that appears with extreme values in both multivariate and univariate, Mahalanobis value greater than the Chi-square table or the value of p1 < 0.001 said the observation that outlier. In this research there are three data outlier, but still within the alpha 5 percent, thancan still was not an outlier.

After the validity test and reliability on all latent variables which valid results and reliable, data not multivariat normal, not happen multicolinearity and outlier below 5 percent, then the latent variables can be continued in the analysis with the form of the path diagram as follows.
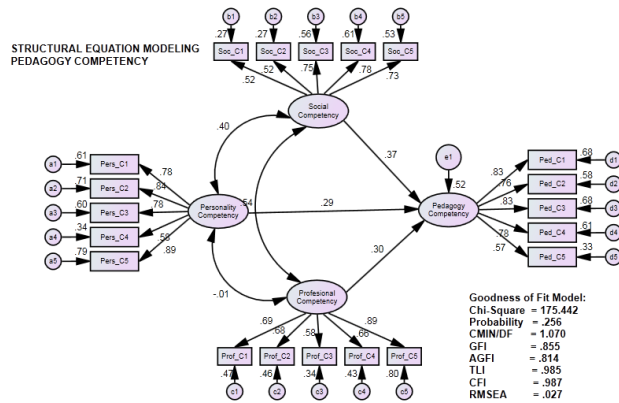

Figure 2. Competency Relationship Personality, Social, Professional with Pedagogy

The results of the complete model testing in AMOS program in detail can be seen in the following table:

Table 2. The Results Goodness of Fit the Model of Pedagogy Competency

Criterion	Cut – OffValue	Results of Calculation	Description
Chi - Square	It is expected that small	175.442	χ^2 with df 94 = 164 is 96.189 Good
Probability	≥ 0.05	0.256	Good
RMSEA	≤ 0.08	0.027	Good
GFI	≥ 0.90	0.855	Good enough
AGFI	≥ 0.90	0.814	Good enough
CMIN/DF	≤ 2.00	1.070	Good
TLI	≥ 0.95	0.985	Good
CFI	≥ 0.95	0.987	Good

Based on the table above shows that 6 (six) criterion used to assess worthy / or not a good model it states. It can be said that the model can be accepted, which means there is a similarity between the model with data.

From the appropriate model, so it can be in interprets each path coefficient. The coefficient of the path coefficient is the hypothesis in this research that can be performed in the following structural equation:

$$Ped\_C = 0.288 \, Pers\_C + 0.375 \, Soc\_C + 0.297 \, Prof\_C$$

Where:
Ped_C = Pedagogy Competency
Pers_C = Personality Competency
Soc_C = Social Competencies
Prof_C = Professional Competencies

The path coefficient testing on Figure 2. and equality above in detail is presented in the following table:

Table 3. Test Result Path Coefficient Model Pedagogy Competency

Variables	coefficient	C.R.	Prob.	Description
Personality Competency(Pers_C) → Pedagogy Competency(Ped_C)	0.288	2.696	.007	Significant
Social Competency (Soc_C)→ Pedagogy Competency(Ped_C)	0.375	2.436	.015	Significant
Professional Competency (Prof_C) →Pedagogy Competency (Ped_C)	0.297	2.417	.016	Significant

Based on the table 3, interpretation of each path coefficient is as follows:
▪ The competencies personality (Pers_C) have positive and significant impact on pedagogy competency (Ped_C). This can be seen from the path marked by the positive coefficient of 0.288 with the value C.R of 2.696. and obtained the significance probability (p) of 0.007 smaller than equal significance (α) determined by 0.05. Thus the competencies personality (Pers_C) directly impact on pedagogy competency (Ped_C) of 0.288, which means that every increase in the competencies personality (Pers_C) then will raise pedagogy competency (Ped_C) of 0.288.
▪ Social competency (Soc_C) have positive and significant impact on pedagogy competency (Ped_C). This can be seen from the path marked by the positive coefficient of 0.375 with the value C.R of 2.436. and obtained the significance probability (p) of 0.015 smaller than equal significance (α) determined by 0.05. Thus the Social Competency (Soc_C) directly impact on pedagogy competency (Ped_C) of 0.375, which means that every increase in social competencies (Soc_C) then will raise pedagogy competency (Ped_C) of 0.375.
▪ Professional competencies (Prof_C) have positive and significant impact on pedagogy competency (Ped_C). This can be seen from the path marked by the positive coefficient of 0.297 with the value C.R. of 2.417 and obtained the significance probability (p) of 0.016 smaller than equal significance (α) determined by 0.05. Thus the professional competencies (Prof_C) directly impact on pedagogy competency (Ped_C) of 0.297, which means that every increase in the professional competencies (Prof_C) then will raise pedagogy competency (Ped_C) of 0.297.

It states that teaching is a system that the complex and integrative from a number of skills to convey the message of a man [16]. Lecturer in teaching does not just give information orally to students, but in teaching lecturers should be able to create the situation learning environment that allows students active in learn to have a sense of humor (Soc_C4), know with good students who follow her study (Soc_C3) [17]. Relation with professional competencies namely lecturers have the ability to give motivation to the students (Prof_C5), the ability to explain the material in a timely manner (Prof_C1), and the ability to provide relevant examples from the concept that taught (Prof_C2).

5. CONCLUSION

The results of the study showed with the approach of Shem that pedagogy competency model is a model that fit, and indicator on the competencies personality, social competence, Professional Competency and pedagogy competency is valid and reliable. The competencies pedogogy influenced by social competence, professional competencies and competency personality. In its development should be an evaluation of the performance of a lecturer in the learning process is done by involving the four competencies simultaneously according to the listed in the Constitution of The Republic of Indonesia No. 14 The year 2005 about Teachers and Lecturers. This can be known from empirical studies of this research which stated that the competency of lecturers mutual influential in determining the performance of teaching/pedagogy lecturers.

REFERENCES

[1] Republik Indonesia (2005). UU No 14 tahun 2005 Tentang Guru dan Dosen.
[2] Miarso,Y. (2004). *Pengembangan profesionalisme dosen Dalam rangka peningkatan mutu Perguruan Tinggi.*
[3] Suderadjat, H. (2004). *Implementasi Kurikulum Berbasis Kompetensi (KBK): Pembaharuan Pendidikan dalam Undang-Undang Sisdiknas 2003*, Bandung: CV Cipta Cekas Grafika.
[4] Suhendar,A.(2009). *Pengaruh Budaya Belajar Organisasi, Dukungan Manajemen, Daya Dukung Sarana, dan Kualitas Pemanfaatan Internet Terhadap Kompetensi Guru.* http://asepsuhendar.wordpress.com/ resumetesis/, diakses tanggal 27 Maret 2010.
[5] Riduwan. (2007). *Kontribusi Kompetensi Profesional Dan Motivasi Kerja Terhadap Kinerja Dosen*: Studi pada Universitas Jenderal Achmad Yani Kota Cimahi.
[6] Hamalik,O.(2003). *Perencanaan Pengajaran Berdasarkan Pendekatan Sistem*. Bumi Aksara. Jakarta.
[7] Raykov, T. & Marcoulides, G. A. (2006). A First Course *in* Structural Equation Modeling. London. Lawrence Erlbaum Associates, Inc.
[8] Kline, R. B. (2005). *Principle and Practice of Structural Equation Modeling*. The Guilford Press, New York: London
[9] Lee, S.Y. (2007). *Structural Equation Modeling a Bayesian Approach Department of Statistics.*USA: John Wiley & Sons Inc.
 [10]Hair, J.F. JR., Anderson, R.E, Tatham, R.L. & Black, W.C. (2006). *Multivariate Data Analysis.* Six Edition. New Jersey: Pearson Educational, Inc.
[11] Johnson RA & Wichern DW. (2007). *Applied Multivariate Statistical Analysis*. Prentice Hall, Englewood Chiffs, New Jersey
[12] Setiawan. (2007). *Penentuan Ukuran Sampel Memakai Rumus Slovin dan Tabel Krejcie-Morgan: Telaah Konsep dan Aplikasinya.* Makalah disampaikan pada Diskusi Ilmiah Jurusan Sosial Fakultas Peternakan Unpad.
[13] Mitrani, A Palziel, M, and Fitt, D.(1992). *Competency Based Human Resources Management*: *Value – Driven Strategies For Recruitment, Development And Reward*. Kogan Page Limited, London.
[14] Sekaran, U. (2006). *Metodologi Penelitian untuk Bisnis 2* (Edisi 4). Jakarta: Salemba Empat
[15] Republik Indonesia, Peraturan Pemerintah (PP) Nomor 16 Tahun 2007 Tentang Estándar Kualifikasi Akademik dan Kompetensi Guru.
[16] Widyasari,S. (2004). *Competency – Based Education And Training (CBET)* Suatu Pendekatan Strategik Dalam Pengembangan Kompetensi Bagi Peningkatan Kinerja Organisasi.
[17] Baso, Moerad, H. M. (2003). *Pembinaan SDM Berbasis Kompetensi*, USAHAWAN/ No. 02 /Th. XXXII/ Februari.