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Andragogy, Peeragogy, Heutagogy and Cybergogy Contribution on Self-Regulated Learning: A Structural Equation Model Approach

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The covid-19 pandemic has disrupted the way teachers and students interact in the classroom. The pedagogy approach has been pushed to transform into Andragogy. Current research aims to investigate the student experiences with the andragogy approach and its potential impact on students' self-regulated learning. Andragogy, heutagogy, peeragogy, and cybergogy principles used by the teacher as part of distance learning during the pandemic will be modelled to check their effect on the student's self-regulated learning. The results show that andragogy, heutagogy, cybergogy, and peeragogy have significant effects on self-regulated learning. Andragogy is proven to be based on heutagogy, peeragogy, and cybergogy since it has a strong effect on these 3 approaches. The least path coefficient among them is shown by the path between andragogy and cybergogy. Andragogy also has a significant indirect effect on self-regulated learning through the approaches. The results may lead to a conclusion that andragogy, heutagogy, cybergogy, and peeragogy can be used as an effective way to improve the student self-regulated learning.

Keywords: andragogy, peeragogy, heutagogy, cybergogy, self-regulated learning

INTRODUCTION

The coronavirus (Covid-19) pandemic has caused a crisis in the field of education which has led to the massive closure of face-to-face activities in schools and universities in

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almost all countries (+1.2 billion students) to prevent the spread and reduce the impact (UNESCO, 2020). As a result, there is a transition in schools and universities from face-to-face learning to online learning (Hodges et al., 2020; Meckler et al., 2020)This transition has had many impacts on students. Students experienced a significant decrease in the number of study days and the average number of hours of learning that were left behind (learning loss), learning gap (learning gap), and loss of competence (Y Anggraena et al., 2022).

To maintain the quality of learning during the recovery period due to the COVID-19 pandemic, education stakeholders must collaborate to intervene and provide appropriate solutions. The application of *Kurikulum Merdeka* adheres to the learning process from the face-to-face method to distance learning (online). In 2022, all SMKs in Indonesia will implement *Kurikulum Merdeka* (Prototype) based on Project Based Learning which strengthens hard skills and technical skills (Jojor & Sihotang, 2022; Nugrohadi & Anwar, 2022; Pertiwi et al., 2022). *Kurikulum Merdeka* is a learning recovery curriculum for 2022-2024 and will be evaluated in 2024. *Kurikulum Merdeka*'s policy is characterized by innovation and transformation of the pedagogic approach to a more heterogeneous approach (Hasanah, 2022).

Forms of education that are in high demand during a pandemic such as distance education and e-learning have pushed the pedagogical approach into andragogic, peeragogy, cybergogy, and heutagogy approach. These three approaches are used to streamline learning to develop a modern methodological approach to learning with digital technology systems (Bykasova et al., 2021). Cybergogic and heutagogic approaches based on e-learning systems will always depend on the willingness, acceptance, and cognitive abilities of students. The educational institutions must ensure the readiness of teachers and students to accept these approaches together with the required digital literacy skills, effective learning approaches, and collaboration in supporting peer learning (Chan et al., 2019; Kaguhangire-Barifaijo et al., 2021).

Using andragogic, peeragogic, heutagogic and cybergogic approaches encourages changes from teacher-centered learning to student-centered learning (Chan et al., 2019; Hase, 2016; Muresan, 2014). Student-centered learning has positive impacts on learning outcomes and the way learning is delivered to develop students' capacities by fostering self-regulated learning (Azevedo et al., 2012; Matsuyama et al., 2019; Wangid, 2014). Self-regulated learning uses higher technology in capacity building and expands opportunities for active and meaningful learning compared to peer learning (Lysenko et al., 2021). However, the sudden pandemic condition made the readiness for the implementation of online learning cannot be optimal. There are some researches discuss the possible relationship between andragogy, peeragogy, heutagogy and cybergogy (Amanina et al., 2022; Blaschke, 2012, 2019; Blaschke & Hase, 2019), but there is no empirical data supporting the conceptual relationship. This study will provide empirical relationships between these approaches and investigate how these approaches during the pandemic and their contribution to self-regulated learning of students.

Research Question

Based on the background of the problem above, the research question is as follows:

1. How does andragogy praxis affect peeragogy praxis?
2. How does andragogy praxis affect heutagogy praxis?
3. How does andragogy praxis affect cybergogy praxis?
4. How does andragogy praxis affect the self-regulated learning of the students?
5. How does peeragogy praxis affect the self-regulated learning of the students?
6. How does heutagogy praxis affect the self-regulated learning of the students?
7. How does cybergogy praxis affect the self-regulated learning of the students?
8. How does andragogy praxis indirectly affect the self-regulated learning of the students via other innovative pedagogies?

Literature Review and Hypothesis Development

Andragogy

Andragogy is a holistic model that has the principles of knowing the needs of the student (what, when, and how to learn), developing self-concept (determining and planning what to learn), understanding and applying previous experiences to be studied, learning readiness, learning orientation and motivation (Knowles et al., 2014). Andragogy sees learners as self-directed students in learning and has autonomy (Greene & Larsen, 2018; Reischmann, 2004). Basic aspects of andragogic approaches are learner's maturity, self-awareness, motivation, orientation to learning, and domain knowledge (Muduli et al., 2018).

One of views about andragogy is that andragogy is pedagogy discipline (Savićević, 1991). While the student autonomy in pedagogy increases and teacher has less instruction, pedagogy will progress to andragogy (Blaschke, 2019). In andragogy approaches, students are dependent and independent from teacher, the learning process is single-loop with linear design, students learn by themselves and in groups, and depend on endogenous factors (Malek, 2017; Wozniak, 2020).

Peeragogy

The peeragogy approach is a peer-based learning pattern by learning together and teaching each other using digital tools to gain shared knowledge and connection. Peeragogy is believed to be an approach that opens the way for students to learn together by helping and motivating each other in learning to absorb 21st-century knowledge, skills, and competencies by utilizing ICT (Alexander et al., 2012; Antipuesto & Tan, 2020; Chan et al., 2019; Corneli et al., 2015).

The peeragogy approach is based on the learning theory of behaviorism, cognitivism, constructivism, and connectivism, which emphasizes student-centered learning and provides self-regulated learning. (Zhang, Z., & Bayley, J. G. (2019). The principles of the peeragogy approach are (1) meta learning as a font of knowledge, (2) peers providing feedback, (3) learning is linear and distributed, and (4) realizing the dream (Corneli & Danoff, 2011).

Heutagogy

Today's students are Generation Z who tend to be self-regulated learners and want the freedom to choose what they want to study (Iftode, 2019). This desire is one of the

characteristics of heutagogy. Heutagogy was initiated by (Hase & Kenyon, 2000). Constructivism, humanism, connectivism, and neuroscience of the learning process are the theory that build Heutagogy approach (Blaschke, 2012; Blaschke & Hase, 2016; Hase & Kenyon, 2007).

Heutagogy is different from andragogy. Heutagogy requires greater maturity and autonomy from the learner than andragogy which at the same time reduces the control of the teacher (Blaschke, 2012; Canning, 2010). The principles of heutagogy include human agency, self-reflection, double loop learning, capability, and non-linear learning (Blaschke, 2012; Hase, 2016).

Cybergogy

The cybergogy approach is vocational learning paradigm 5.0 for the Industrial Revolution 4.0 era of globalization which empowered information and communication technology (ICT) as their main core (Daud et al., 2019). In cybergogy, teachers instruct and motivate students to learn online through computer or smartphone programs and have references made by thousands of internet providers (Yusuf & Yusuf, 2019). The ost pandemic era of covid19 and rapid development of the cyber world have given Cybergogy momentum. The cybergogy approach encourages student engagement and collaboration in online environments and virtual learning environments. (Hanafi, 2021).

Students as gen Z tend to choose online or blended learning as a learning method (Schwieger & Ladwig, 2018). This tendency makes the cybergogy approach a suitable approach for students, including vocational students. The cybergogic approach accommodates cognitive learning that prepares students to adapt to difficult times by instilling skills (Belt, 2014; Iszatt-White et al., 2017; Ontong & Waghid, 2022; Scopes, 2011). The application of cybergogy pays attention to cognitive, emotive, and social factors (Corneli & Danoff, 2011).

Self-Regulated Learning

The implementation of the *Kurikulum Merdeka* reflects the spirit of self-regulated learning which has flexibility in determining learning methods and motivations in which teachers play a role in encouraging and developing self-regulated learning to gain competence and harmonize knowledge and skills in rapidly changing work environments to become lifelong learners. (Yogi Anggraena et al., 2022; Dignath-van Ewijk, 2016; Yan, 2018). The challenge of implementing self-regulated learning in the classroom or workplace is that teachers must give full responsibility for determining how to learn and learning outcomes to students (Coggin, 2020). Student-centered learning, characterized by the utilization of self-regulated learning, affect the increasing confidence in exploring, identifying, and practicing using various student learning styles (Garner, 2009; Harding et al., 2018).

Self-regulated learning is individual ability to manage and control himself in order to condition his learning situation to get his own learning goals (Solichin et al., 2021). Self-regulated learning encourages students to be motivated, active, and responsible to achieve learning objectives. Self-regulated learning is related to autonomy of students in learning process (Lysenko et al., 2022). Student learning mission is the main key to

applying self-regulated learning to achieve personal goals and learning objectives. The context of interactive learning in independent learning produces knowledge as the result of joint construction and collaboration (Hadwin et al., 2017; Zimmerman, 2000; Zimmerman & Schunk, 2011). The factors that make up SRL are goal setting, help-seeking, self-learning, managing the physical environment, and effort regulation.

METHOD

Structural equation model with partial least squares (PLS-SEM) estimation method was conducted in this current research. PLS-SEM is a model that is widely used to analyse complex relationships between many variables in various fields (Cheah et al., 2021; Sarstedt et al., 2020). This model is used because this study seeks to investigate the relationship between 5 variables with 3 of them acting as moderating variables. In addition, PLS-SEM has advantages in modelling non-normal data and small samples (Chin et al., 2008; Hair Jr et al., 2021).

Sample

The determination of the sample in the PLS-SEM model is still being debated. One of the most frequently used methods is the 10 times method. This method states that the minimum number of samples is equal to 10 times the number of variables used in the model (Joe F. Hair et al., 2011). However, this method is not effective because it produces less power (Kock & Hadaya, 2018; Rigdon, 2016). A more precise minimum sample determination method can be given through the inverse square root method (Kock & Hadaya, 2018). The inverse square root method run in WARPls shows that with $\alpha = 5\%$and power of 85% the minimum sample is equal to 432. The sample used in this study was 450 students from 2 provinces in Indonesia, so this sample already met the minimum required sample.

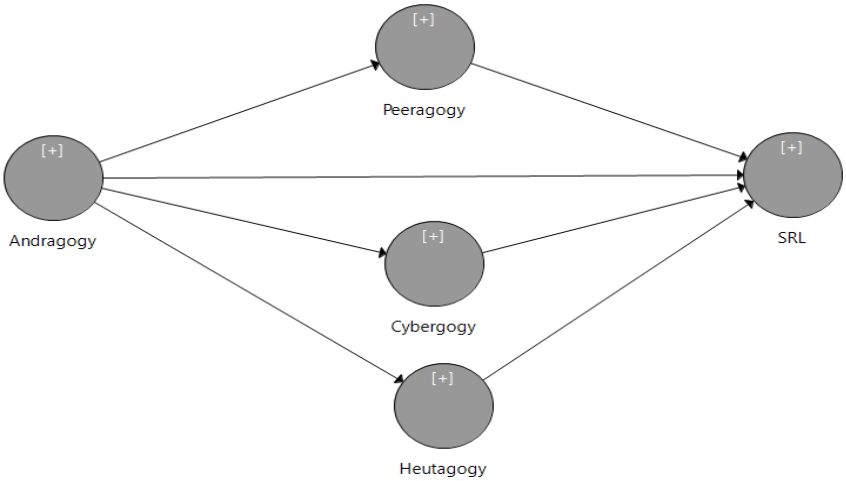

Figure 1
The structural model framework between variables

Instruments

This study aims to identify the relationship between several variables, namely andragogy, heutagogy, peeragogy, cybergogy, and independent learning. The measurement of these 5 variables is done by constructing a questionnaire based on the literature review that has been done. The initial stage in the preparation of the instrument is through expert judgment to validate the contents of the instrument. Responses to statements in the questionnaire were made using a 5-choice Likert scale whose levels were adjusted to the context of each statement. The results of the literature study and validity test results are presented in Appendix A.

FINDINGS

Based on the analysis done in SmartPLS using the research framework elaborate methods, the results of the analysis were as follows

Evaluation of Measurement Model (Outer Model)

The vocational model was developed to investigate the relationship between the implementation of Andragogy, Peeragogy, Cybergogy, and Heutagogy in Vocational Schools during the Pandemic. This model also includes learning independence (SRL) as an endogenous variable. Measurement of these variables is done by developing a construct based on a literature study which then produces indicators. The indicators used are reflective. This indicator is a reflection of latent variables that cannot be measured directly. Reflective indicators obtained from the study of the literature are used to construct constructs that will be linked through paths in the structural equation model (Hanafiah, 2020). The quality of the constructs in the model is evaluated using their validity and reliability (do Valle & Assaker, 2016).

Instrument reliability assessment can be measured using the consistency of internal reliability through composite reliability, Cronbach's alpha, and Rho A (Cepeda-Carrion et al., 2019; Joe F. Hair et al., 2020). Cronbach Alpha and Rho A are reliability measures that are often used, although Cronbach Alpha is slightly less precise than composite reliability (Joseph F. Hair et al., 2019). In addition, Rho A is also a usable reliability measure whose value is between Cronbach Alpha and composite reliability (Dijkstra & Henseler, 2015). To measure the validity of the instrument used indicator reliability and AVE (Hair Jr et al., 2021). Convergent validity, which is a type of validity that is also used to measure instrument quality, can be measured through Fornell-Larcker criteria and cross-loadings. The value of internal consistency ranges from a value between 0 and 1. The closer it is to 1, the more reliable the instrument.

A reliable construct has a minimum reliability value of 0.70 both with composite reliability, Cronbach alpha, and Rho A (Joe F. Hair et al., 2011, 2020). Convergent validity is a measure that shows the correlation between indicators in the same construct. One of the most popular measures of convergent validity used is average variance extracted (AVE). A good AVE value is a minimum value of 0.5(Joe F. Hair et al., 2020).

Another important measure of validity is discriminant validity. This measure indicate to what extent a construct differs from other constructs (Hair Jr et al., 2021). Each

indicator and construct have discriminant validity. Discriminant validity at the indicator level is measured by cross-loadings. An indicator is considered valid if its outer loading shows the highest outer loading on its construct when compared to other indicators on other constructs. The measurement of construct validity with Fornell Larcker criteria is done by contrasting the square root of average variance extracted in each construct with the correlation between constructs. Both of these validity measures are popularly used. However, there is a more effective measure for measuring discriminant validity, namely Heterotrait Monotrait (HTMT) (Franke & Sarstedt, 2019; Henseler et al., 2015). All three can be used to measure discriminant validity (Hair Jr et al., 2021).

Table 1
Result of outer model evaluation

Construct/Factors	Item	Outer Loadings	Rho A	Composite Reliability (CR)	Average Variance Extracted (AVE)
Andragogy	AND1	0.732	0.849	0.884	0.561
	AND2	0.679			
	AND3	0.803			
	AND4	0.733			
	AND5	0.808			
	AND6	0.731			
Cybergogy	CYB1	0.68	0.891	0.91	0.591
	CYB2	0.77			
	CYB3	0.788			
	CYB4	0.808			
	CYB5	0.774			
	CYB6	0.798			
	CYB7	0.755			
Heutagogy	HEU1	0.8103	0.871	0.904	0.653
	HEU2	0.7652			
	HEU3	0.8184			
	HEU4	Out			
	HEU5	0.8227			
	HEU6	0.8235			
Peeragogy	PEER1	0.782	0.833	0.878	0.591
	PEER2	0.803			
	PEER3	0.717			
	PEER4	0.794			
	PEER5	0.745			
Self-Regulated	SRL 1	Out	0.842	0.875	0.502
Learning	SRL 2	0.694			
	SRL 3	Out			
	SRL 4	0.578			
	SRL 5	Out			
	SRL 6	Out			
	SRL 7	0.767			
	SRL 8	0.789			
	SRL 9	0.712			
	SRL 10	Out			
	SRL 11	0.663			
	SRL 12	0.736			

Note. The value of loading items marked "out" are those that are eliminated because they do not meet the criteria >0.6.

The table above shows that most items meet the minimum requirement of 0.7 on their outer loading. However, some items still show the value of outer loading which is in the range of 0.4 – 0.6 which is still maintained as a construct indicator. Apart from that items with a loading of 0.6 – 0.7 are still considered quite good (Joseph F. Hair et al., 2019), deleting this item also does not increase the composite reliability of the construct (Ghasemy et al., 2020; Hair Jr et al., 2021).

The results of the analysis of the model tells that the factor loading value for each item is above the minimum value of 0.50. However, as a new instrument that has never been tested, the internal consistency value of 0.50 is considered acceptable (Nunally & Bernstein, 1994). Based on this, the remaining indicators prove to be reliable.

However, some items/indicators were issued as marked "out" (See Table 2 column outer loadings of lecturers and students). These items do not meet the loading value which is the criteria, or the value is less than 0.4.

The composite reliability and rho A of all constructs in the model are more than 0.7 which is the lower limit of the reliable constructs. Convergent validity using AVE also shows good results. The AVE of all constructs is more than 0.5. An AVE value greater than 0.50 means the item can demonstrate more than 50% of the indicator variance(Joseph F. Hair et al., 2019).

Table 2
Cross loadings of Indicators of Variables

	Andragogy	Cybergogy	Heutagogy	Peeragogy	SRL
AND1	0.7322	0.4806	0.5269	0.4973	0.3955
AND2	0.6791	0.4597	0.4939	0.4829	0.3785
AND3	0.8031	0.5078	0.5742	0.5567	0.5198
AND4	0.7332	0.427	0.4981	0.5015	0.5285
AND5	0.8075	0.55	0.628	0.6284	0.5592
AND6	0.7305	0.4689	0.5556	0.494	0.4615
CYB1	0.3711	0.6799	0.4022	0.3436	0.379
CYB2	0.5855	0.7696	0.6389	0.5887	0.5867
CYB3	0.4951	0.7879	0.5518	0.4817	0.4417
CYB4	0.5423	0.8075	0.663	0.5754	0.516
CYB5	0.5028	0.7743	0.6044	0.5066	0.4699
CYB6	0.4915	0.7983	0.6128	0.5151	0.4473
CYB7	0.4409	0.7551	0.543	0.4506	0.446
HEU1	0.6412	0.5759	0.8103	0.6215	0.5787
HEU2	0.5492	0.6394	0.7652	0.5261	0.4646
HEU3	0.5485	0.6466	0.8184	0.576	0.5407
HEU5	0.595	0.6359	0.8227	0.5931	0.587
HEU6	0.6159	0.5715	0.8235	0.6486	0.6371
PEER1	0.5312	0.4962	0.5803	0.7824	0.497
PEER2	0.5351	0.5558	0.5766	0.8029	0.4863
PEER3	0.4515	0.4888	0.5096	0.7173	0.3911
PEER4	0.5464	0.4749	0.5761	0.794	0.5341
PEER5	0.6254	0.4991	0.5786	0.7447	0.581
SRL2	0.5133	0.4887	0.5196	0.4648	0.6935
SRL4	0.3416	0.3568	0.3904	0.4519	0.5784
SRL7	0.4562	0.4017	0.5037	0.4473	0.7674
SRL8	0.5379	0.5836	0.6342	0.5741	0.7892
SRL9	0.4018	0.3592	0.4191	0.3984	0.7123
SRL11	0.4163	0.44	0.5019	0.4436	0.6633
SRL12	0.4537	0.3815	0.4424	0.4448	0.7356

Discriminant validities at the indicator level (table 3) and construct (table 4) show good results. All indicators show the largest outer loading on the constructs formed in the model. The outer loading of the model is greater than all possible pairs of these indicators with other constructs.

Table 3
Descriptive statistics, the correlations between factors, and the square root of AVE

	Mean	SD	Andragogy	Cybergogy	Heutagogy	Peeragogy	SRL
Andragogy	4.12	0.7	0.749				
Cybergogy	3.87	0.8	0.6459	0.7685			
Heutagogy	3.97	0.7	0.7321	0.756	0.8083		
Peeragogy	3.94	0.82	0.7071	0.6537	0.7366	0.7689	
SRL	4.2	0.65	0.6373	0.619	0.6991	0.6562	0.7087

In the construct level, the discriminant validity using the square root of AVE indicates that each construct is a valid construct. All square roots of AVE show higher values than correlations among other constructs. Although these two validity measures meet the

requirements of a valid instrument, the HTMT as a more effective measure will also be examined.

Table 4
Construct validity using Hetero Trait Mono Trait (HTMT)

	Andragogy	Cybergogy	Heutagogy	Peeragogy
Cybergogy	0.7374			
Heutagogy	0.8512*	0.8566*		
Peeragogy	0.8338	0.7527	0.8623*	
SRL	0.7485	0.7004	0.806	0.7741

*) Crosses the 0.85 limit which is the rule of thumb for HTMT

The HTMT ratio is a measure of validity that states the average of the pairwise correlations of each indicator on one latent variable with each indicator on another latent variable (Hair Jr et al., 2021). A valid instrument is an instrument whose relationship between 2 latent variables results in an HTMT ratio that is less than 0.85(Henseler et al., 2015). Table 6 shows that Heutagogy had an HTMT ratio of more than 0.85 when paired with Andragogy and Cybergogy and Peeragogy. However, this HTMT ratio is still considered to meet the maximum limit of 0.9 for the HTMT ratio in relatively similar latent variables (Hair Jr et al., 2021; Sarstedt et al., 2022). Heutagogy, Cybergogy dan Peeragogy is considered similar latent variables since they are the development of andragogic approaches.

Structural Model (Inner Model)

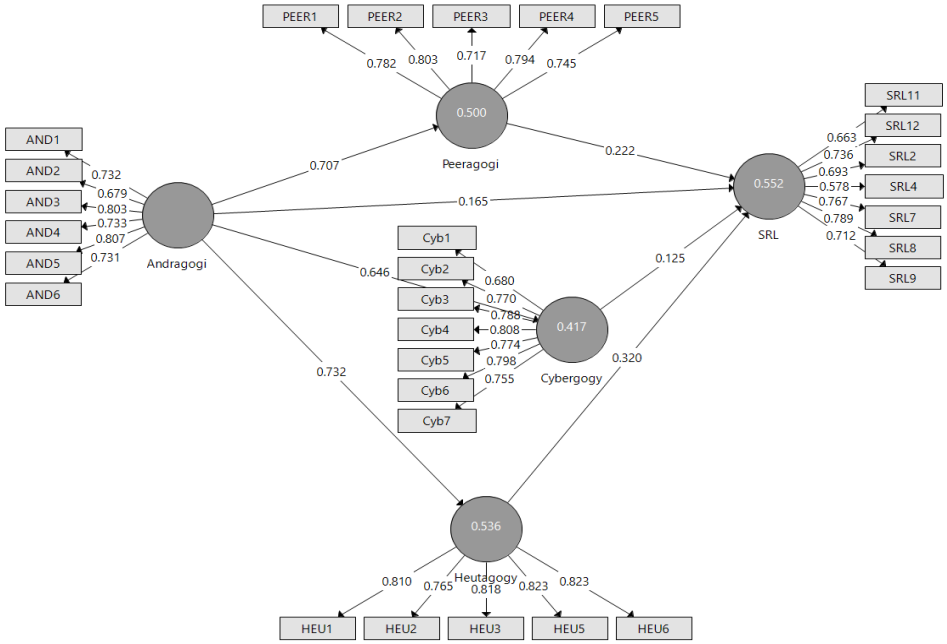

Figure 2
Result of SEM on constructs

H1: ***Andragogy (AND) has positive significant effect on Peeragogy***

The developed model shows that Andragogy (AND) has a significant direct effect on Peeragogy (PEER) $(\beta = 0.707, p < .001)$. Thus it can be concluded that the proposed hypothesis is proven.

H2: ***Andragogy (AND) significantly affects Cybergogy***

The developed model shows that Andragogy (AND) has a significant direct effect on Cybergogy (CYB) $(\beta = 0.646, p < .001)$. Thus it can be concluded that the proposed hypothesis is proven.

H3: ***Andragogy (AND) has significant and positive effect on Heutagogy***

The developed model shows that Andragogy (AND) has a significant direct effect on Heutagogy (HEU) $(\beta = 0.732, p < .001)$. Thus it can be concluded that the proposed hypothesis is proven.

H4: ***Andragogy (AND) shows a significant and positive effect on Self-Regulated Learning***

The developed model shows that Andragogy (AND) has a significant direct effect on Self-Regulated Learning (SRL) $(\beta = 0.165, p = 0.006)$. Thus it can be concluded that the proposed hypothesis is proven.

H5: ***Peeragogy (PEER) significantly affects Self-Regulated Learning***

The developed model shows that Peeragogy (PEER) has a significant direct effect on Self-Regulated Learning (SRL) $(\beta = 0.222, p < .001)$. Thus it can be concluded that the proposed hypothesis is proven.

H6: ***Cybergogy (CYB) has positively significant effect on Self-Regulated Learning***

The developed model shows that Cybergogy (CYB) has a significant direct effect on Self-Regulated Learning (SRL) $(\beta = 0.125, p = 0.026)$. Thus it can be concluded that the proposed hypothesis is proven.

H7: ***Heutagogy (HEU) has positive and significant effect on Self-Regulated Learning***

The developed model shows that Heutagogy (HEU) has a significant direct effect on Self-Regulated Learning (SRL) $(\beta = 0.320, p < .001)$. Thus it can be concluded that the proposed hypothesis is proven.

H8: ***Andragogy (AND) has positive and significant effect on Self-Regulated Learning***

In the structural model, Andragogy (AND) has an indirect path to Self-Regulated Learning (SRL). This route passes through Peeragogy (PEER), Cybergogy (CYB), and Heutagogy (HEU). Bootstrapping results on path coefficients show that Andragogy (AND) has a significant indirect effect on Self-Regulated Learning (SRL) $(\beta = 0.116, p < .001)$. Thus it can be concluded that the proposed hypothesis is proven.

Table 5
Hypothesis test results

Hypothesis	Path	Path Coef.	T Values	P Values	Conclusion
H1	AND -> PEER	0.7071	28.8177	0.000	Accepted
H2	AND -> CYB	0.6459	21.9143	0.000	Accepted
H3	AND -> HEU	0.7321	33.6273	0.000	Accepted
H4	AND -> SRL	0.1653	2.7679	0.006	Accepted
H5	PEER -> SRL	0.2216	3.8132	0.000	Accepted
H6	CYB -> SRL	0.1254	2.239	0.026	Accepted
H7	HEU -> SRL	0.3201	4.6703	0.000	Accepted
H8	AND -> SRL (ind)	0.116	4.265	0.000	Accepted

DISCUSSION

New developments in the world of education are developed with a new approach by integrating advances in computer and information technology in learning. Learning technology makes learning more innovative, effective, and independent learning. Teachers and education stakeholders need to improve and equip themselves with the latest technology and knowledge by combining heutagogy, cybergogy, and peeragogy into aspects of learning (Noor, 2018). These three approaches are part of the andragogy used in Education 4.0 (Miranda et al., 2021).

Heutagogy is an approach formed by various learner-centred theories including andragogy (Blaschke, 2019; Gaol, 2020). Heutagogy is a further development of andragogy that increases students' autonomy and maturity in learning (Blaschke, 2012). This andragogy-heutagogy progression provides an explanation of andragogy and heutagogy praxis relationship in the classroom. Both approaches require the student to be mature and autonomous in the learning process (Blaschke, 2019). The difference between these two approaches is only on the level of the student maturity and autonomy needed.

Like heutagogy, cybergogy is also a development of andragogy. Cybergogy is a form of andragogy and pedagogy by adding a web paradigm to it (Muresan, 2014). This causes the implementation of ideal andragogy in schools will also facilitate the implementation of the learning process with a good cybergogy, heutagogy, and peeragogy approach. The effect is shown by the result where interplaying the approaches in the classroom is

supported by andragogy. Andragogy praxis has positively affected other innovative pedagogies in learning process.

The use of the Andragogy approach is also able to increase self-regulated learning of the students. Self-regulated learning produces competencies that are in line with the three principles of andragogy, namely; 1) learning must focus on the needs and interests of students who prioritize learning rather than teaching, 2) learning that can encourage motivation and self-direction of students internally, 3) teachers as facilitators, inspirations and motivators for students to acquire new knowledge and skills (Harding et al., 2018; Yan, 2018). The theoretical connections between andragogy and self-regulated learning may explain the reasons why Andragogy praxis affects the self-regulated learning of the students.

In addition, self-regulated learning is also influenced by the application of heutagogy, pedagogy, and cybergogy approaches. In self-regulated learning, the teacher acts as a source of facilitator and students play the role of content/material seekers. This causes students to need a new set of soft skills and hard skills so that they focus on technological constructivism or a connectivism approach that uses collaborative processes such as heutagogy, cybergogy, and peeragogy to enhance, facilitate and offer learning experiences for all participants (Beukman, 2021).

In heutagogy, learning independence can also be increased due to the non-linear nature of heutagogy. This trait allows students to determine their own frequency, duration, and response to the information they get in the learning process (Agonács & Matos, 2019; Nadelson et al., 2015). In addition, the human agency aspect of heutagogy also gives students autonomy to determine what they want to learn and how they learn it. The nature of this autonomy is also found in the cybergogy approach (Amanina et al., 2022). The nature of autonomy in the learning approach provides freedom and independence for students to determine what they will learn (Hase, 2016). This causes students to be able to independently find a learning community that can provide additional understanding without the need to depend on the teacher (Gregory & Bannister-Tyrrell, 2017).

Peeragogy praxis has positively affected the self-regulated learning of the students. The peer learning approach (peeragogy) is based on the learning theory of behaviourism, cognitivism, constructivism, and connectivism, which emphasizes student-centred learning to provide independent learning and learning experiences for students (Zhang & Bayley, 2019). One aspect of peeragogy is that each student contributes to the collaborative process (Amanina et al., 2022). This individual contribution requires self-regulation in extracting information to be shared with peers.

Cybergogy also has significant effect on self-regulated learning of the students. Using technology and internet on learning process has affected the student regulation on their learning (Hanif, 2020). Using technology on learning process may make student enjoy the process and evaluate their learning achievement (Bovermann et al., 2018). Of these three approaches, cybergogy shows the smallest path coefficient. Indonesian students are not used to using various online learning platforms (Hasudungan & Ningsih, 2021).

This can happen because the internet infrastructure is not sufficient to support learning (Sardjuningsih & MF, 2022) such as internet connection and large internet quota usage (Qhoimah & Apridayanti, 2022). Students in Indonesia also tend to use the internet to play online games which may lead to addiction and the student learning quality (Nadeak, 2021). This information may give explanation on the weak effect of cybergogy on self-regulated learning of the students.

CONCLUSION

The structural equation model employed shows that the exogenous variable has a significant effect on the intervening variables and endogenous variables. The data analysis result gives 8 findings. Andragogic approach in the class has a significant effect on the heutagogic, peeragogic, and cybergogic approaches. This effect comes from the fact that heutagogic, peeragogic, and cybergogic approaches used in the classroom is developed from andragogic approaches. Andragogic approaches also show a significant impact on the self-regulated learning of the students. The significant impact was produced by the andragogy principle of autonomy which may lead students to promote their self-regulation in their learning process. Using Peeragogic, Heutagogic, and Cybergogic approaches also significantly affects the self-regulated learning of the students. Peeragogy, heutagogy and cybergogy approaches also let the students to develop their self-regulated learning by providing the space for student's autonomy in the classroom. This approach praxis also gives a significant effect on improving the student self-regulated learning. However, the current research was limited by the number of samples which were only students in South and West Sulawesi. Hence, the results can only be generalized in Sulawesi but cannot be in Indonesia. Future research can be conducted using a larger sample representing the student characteristics in Indonesia. The next research is suggested to use demographic variables to investigate the different effects of the model praxis in a different demographic variable.

REFERENCES

Agonács, N., & Matos, J. F. (2019). Heutagogy and self-determined learning: a review of the published literature on the application and implementation of the theory. *Open Learning*, *34*(3), 223–240. https://doi.org/10.1080/02680513.2018.1562329

Alexander, B., Allison, P., Barondeau, R., Breitbart, D., Burroughs, S., Corneli, J., & Walker, G. (2012). The Peeragogy Handbook. *August-2012 (Version 0.98) All Content Here Is Public Domain (CC0) Http://Metameso. Org/Peeragogy-2.01-Ebook. Pdf (Retrieved 08.11. 2013)*.

Amanina, N., Zaidatun, B., Kew, T., & Na, S. (2022). Innovative pedagogical principles and technological tools capabilities for immersive blended learning : a systematic literature review. In *Education and Information Technologies* (Issue 0123456789). Springer US. https://doi.org/10.1007/s10639-022-11243-w

Anggraena, Y, Felicia, N., Eprijum, D., Pratiwi, I., Utama, B., Alhapip, L., & Widiaswati, D. (2022). *Kajian akademik kurikulum untuk pemulihan pembelajaran [Monograph]*. Pusat Kurikulum dan Pembelajaran.

Anggraena, Yogi, Felicia, N., Eprijum, D., Pratiwi, I., Utama, B., Alhapip, L., & Widiaswati, D. (2022). *Kajian akademik kurikulum untuk pemulihan pembelajaran [Monograph]*.

Antipuesto, J. L., & Tan, D. A. (2020). Enhancing Student Performance and Engagement in Mathematics Via Peeragogy. *Science International (Lahore)*, *32*(2), 159–164.

Azevedo, R., Behnagh, R. F., Duffy, M., Harley, J. M., & Trevors, G. (2012). Metacognition and self-regulated learning in student-centered learning environments. In *Theoretical foundations of learning environments* (pp. 171–197). Routledge.

Belt, E. (2014). Applying heutagogy in online learning: the side model. *Experiences in Self-Determined Learning*, 195–204.

Beukman, P. C. (2021). *A pedagogical framework for the adoption of Technology Enhanced Active Learning (TEAL) with the consideration of learning spaces in a Higher Education context*. University of Portsmouth.

Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. *The International Review of Research in Open and Distributed Learning*, *13*(1), 56–71.

Blaschke, L. M. (2019). The Pedagogy–Andragogy–Heutagogy Continuum and Technology-Supported Personal Learning Environments. In *SpringerBriefs in Open and Distance Education* (pp. 75–84). Springer Singapore. https://doi.org/10.1007/978-981-13-7740-2_9

Blaschke, L. M., & Hase, S. (2016). Heutagogy: A holistic framework for creating twenty-first-century self-determined learners. In *The future of ubiquitous learning* (pp. 25–40). Springer.

Blaschke, L. M., & Hase, S. (2019). Heutagogy and digital media networks. *Pacific Journal of Technology Enhanced Learning*, *1*(1), 1–14.

Bovermann, K., Weidlich, J., & Bastiaens, T. (2018). Online learning readiness and attitudes towards gaming in gamified online learning–a mixed methods case study. *International Journal of Educational Technology in Higher Education*, *15*(1), 1–17.

Bykasova, L., Kamenskaya, E., Krevsoun, M., & Podbereznyj, V. (2021). Heutagogy as a Concept of Online Education in Higher School. *E3S Web of Conferences*, *258*, 7073.

Canning, N. (2010). Playing with heutagogy: Exploring strategies to empower mature learners in higher education. *Journal of Further and Higher Education*, *34*(1), 59–71.

Cepeda-Carrion, G., Cegarra-Navarro, J. G., & Cillo, V. (2019). Tips to use partial least squares structural equation modelling (PLS-SEM) in knowledge management. *Journal of Knowledge Management*, *23*(1), 67–89. https://doi.org/10.1108/JKM-05-2018-0322

Chan, C. G., Embi, M. A. Bin, & Hashim, H. (2019). Primary school teachers' readiness towards heutagogy and peeragogy. *Asian Education Studies*, *4*(1), 11.

Cheah, J. H., Roldán, J. L., Ciavolino, E., Ting, H., & Ramayah, T. (2021). Sampling weight adjustments in partial least squares structural equation modeling: guidelines and illustrations. *Total Quality Management and Business Excellence*, *32*(13–14), 1594–1613. https://doi.org/10.1080/14783363.2020.1754125

Chin, W. W., Peterson, R. A., & Brown, S. P. (2008). Structural equation modeling in marketing: Some practical reminders. *Journal of Marketing Theory and Practice*, *16*(4), 287–298.

Coggin, J. (2020). *Self-Regulated Learning Instruction's Relationships with Teacher Subject Area, Teacher Beliefs, and Teacher Efficacy*.

Corneli, J., & Danoff, C. J. (2011). Paragogy. *Proceedings of the 6th Open Knowledge Conference, OKCon 2011, Berlin, Germany, June 30 July 1, 2011.*

Corneli, J., Danoff, C. J., Pierce, C., Ricaurte, P., & MacDonald, L. S. (2015). Patterns of peeragogy. *Proceedings of the 22nd Conference on Pattern Languages of Programs*, 1–23.

Daud, W. W. A. A. W., Teck, W. K., Ghani, M. T. A., & Ramli, S. (2019). The needs analysis of developing mobile learning application for cybergogical teaching and learning of Arabic language proficiency. *International Journal of Academic Research in Business and Social Sciences*, *9*(8), 33–46. https://doi.org/10.6007/IJARBSS/v9-i8/6206

Dignath-van Ewijk, C. (2016). Which components of teacher competence determine whether teachers enhance self-regulated learning? Predicting teachers' self-reported promotion of self-regulated learning by means of teacher beliefs, knowledge, and self-efficacy. *Frontline Learning Research*, *4*(5), 83–105.

Dijkstra, T. K., & Henseler, J. (2015). Consistent partial least squares path modeling. *MIS Quarterly*, *39*(2), 297–316. https://www.jstor.org/stable/26628355

do Valle, P. O., & Assaker, G. (2016). Using Partial Least Squares Structural Equation Modeling in Tourism Research: A Review of Past Research and Recommendations for Future Applications. *Journal of Travel Research*, *55*(6), 695–708. https://doi.org/10.1177/0047287515569779

Franke, G., & Sarstedt, M. (2019). Heuristics versus statistics in discriminant validity testing: a comparison of four procedures. *Internet Research*, *29*(3), 430–447. https://doi.org/10.1108/IntR-12-2017-0515

Gaol, P. L. (2020). Literature Study: The Transformation of Post-Pandemic Learning Methods from Pedagogy, Andragogy to Heutagogy. *Konferensi Nasional Ilmu Administrasi*, *4*(1), 187–192.

Garner, J. K. (2009). Conceptualizing the relations between executive functions and self-regulated learning. *The Journal of Psychology*, *143*(4), 405–426.

Ghasemy, M., Teeroovengadum, V., Becker, J. M., & Ringle, C. M. (2020). This fast

car can move faster: a review of PLS-SEM application in higher education research. *Higher Education*, *80*(6), 1121–1152. https://doi.org/10.1007/s10734-020-00534-1

Greene, K., & Larsen, L. (2018). Virtual andragogy: A new paradigm for serving adult online learners. *International Journal of Digital Society*, *9*(2), 1376–1381.

Gregory, S., & Bannister-Tyrrell, M. (2017). Digital learner presence and online teaching tools: higher cognitive requirements of online learners for effective learning. *Research and Practice in Technology Enhanced Learning*, *12*(1), 1–17.

Hadwin, A., Järvelä, S., & Miller, M. (2017). Self-regulation, co-regulation, and shared regulation in collaborative learning environments. In *Handbook of self-regulation of learning and performance* (pp. 83–106). Routledge.

Hair, Joe F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, *109*(August 2019), 101–110. https://doi.org/10.1016/j.jbusres.2019.11.069

Hair, Joe F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hair, Joseph F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage publications.

Hanafi, M. H. (2021). Vision of Teaching in Ensuring Continuity of Clinical Teaching in Medical Training post COVID-19 and Beyond. *Education in Medicine Journal*, *13*(1), 93–96.

Hanafiah, M. H. (2020). Formative Vs. Reflective Measurement Model: Guidelines for Structural Equation Modeling Research. *International Journal of Analysis and Applications*, *18*(5), 876–889. https://doi.org/10.28924/2291-8639-18-2020-876

Hanif, M. (2020). Students ' Self -Regulated Learning in Iconic Mobile Learning System in English Cross- Disciplined Program. *Anatolian Journal of Education*, *5*(2), 121–130.

Harding, S., Nibali, N., English, N., Griffin, P., Graham, L., Alom, B. M., & Zhang, Z. (2018). Self-regulated learning in the classroom: Realising the potential for Australia's high capacity students. *Assessment Research Centre, Melbourne Graduate School of Education*.

Hasanah, U. (2022). *Mengenal Kurikulum Merdeka*. https://lpmpdki.kemdikbud.go.id/mengenal-kurikulum-merdeka/

Hase, S. (2016). Self-determined learning (heutagogy): Where have we come since 2000? *Southern Institute of Technology Journal of Applied Research*, *Special Ed*(May),

1–21. https://sit.ac.nz/Portals/0/upload/documents/sitjar/Heutagogy - One.pdf%0Ahttps://www.sit.ac.nz/Portals/0/upload/documents/sitjar/Heutagogy - One.pdf

Hase, S., & Kenyon, C. (2000). From andragogy to heutagogy. *UltiBASE In-Site*.

Hase, S., & Kenyon, C. (2007). Heutagogy: A Child of Complexity Theory. *Complicity: An International Journal of Complexity and Education*, *4*(1), 111–118. https://doi.org/10.29173/cmplct8766

Hasudungan, A. N., & Ningsih, T. Z. (2021). Learning loss: A real threat in education for underprivileged students and remote regions during the COVID-19 pandemic. *International Journal of Distance Education and E-Learning*, *7*(1), 12–23.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. Educause. *EDUCAUSE Review, Boulder*.

Iftode, D. (2019). Generation Z and learning styles. *Available at SSRN 3518722*.

Iszatt-White, M., Kempster, S., & Carroll, B. (2017). An educator's perspective on reflexive pedagogy: Identity undoing and issues of power. *Management Learning*, *48*(5), 582–596. https://doi.org/10.1177/1350507617718256

Jojor, A., & Sihotang, H. (2022). Analisis Kurikulum Merdeka dalam Mengatasi Learning Loss di Masa Pandemi Covid-19 (Analisis Studi Kasus Kebijakan Pendidikan). *Edukatif: Jurnal Ilmu Pendidikan*, *4*(4), 5150–5161.

Kaguhangire-Barifaijo, M., Namara, R. B., & Rwemisisi, J. (2021). The education manager in the covid-19 era: Dilemma to responsiveness and continuity of education. *African Journal of Educational Management, Teaching and Entrepreneurship Studies*, *4*(1), 7–18.

Knowles, M. S., Holton III, E. F., & Swanson, R. A. (2014). *The adult learner: The definitive classic in adult education and human resource development*. Routledge.

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, *28*(1), 227–261. https://doi.org/10.1111/isj.12131

Lysenko, L., Kiforo, E., Wade, C. A., Abrami, P. C., Iminza, R., & Kiforo, E. (2021). *Self-regulated learning in Kenyan classrooms: a test of a process e-portfolio*.

Lysenko, L., Wade, C. A., Abrami, P. C., Iminza, R., & Kiforo, E. (2022). Self-Regulated Learning in Kenyan Classrooms: A Test of ePEARL, a Process e-Portfolio. *International Journal of Instruction*, *15*(3), 63–82.

https://doi.org/10.29333/iji.2022.1534a

Malek, J. A. (2017). The impact of heutagogy education through telecentre in smart village (SV). *E-BANGI*, *12*(2), 112–125. https://www.proquest.com/openview/615048a5b2a8b3550ac2824593ab6d8f/1?pq-origsite=gscholar&cbl=616374

Matsuyama, Y., Nakaya, M., Okazaki, H., Lebowitz, A. J., Leppink, J., & Van Der Vleuten, C. (2019). Does changing from a teacher-centered to a learner-centered context promote self-regulated learning: a qualitative study in a Japanese undergraduate setting. *BMC Medical Education*, *19*(1), 1–12.

Meckler, L., Strauss, V., & Heim, J. (2020). Millions of public school students will suffer from school closures, education leaders have concluded. *Washington Post, April*, *13*.

Miranda, J., Navarrete, C., Noguez, J., Molina-Espinosa, J.-M. M., Ramírez-Montoya, M.-S. S., Navarro-Tuch, S. A., Bustamante-Bello, M.-R. R., Rosas-Fernández, J.-B. B., & Molina, A. (2021). The core components of education 4.0 in higher education: Three case studies in engineering education. *Computers & Electrical Engineering*, *93*(September 2020), 107278. https://doi.org/10.1016/j.compeleceng.2021.107278

Muduli, A., Kaura, V., & Quazi, A. (2018). Pedagogy or andragogy? Views of Indian postgraduate business students. *IIMB Management Review*, *30*(2), 168–178.

Muresan, M. (2014). Using Cybergogy and Andragogy Paradigms in Lifelong Learning. *Procedia - Social and Behavioral Sciences*, *116*, 4722–4726. https://doi.org/10.1016/j.sbspro.2014.01.1015

Nadeak, B. (2021). The Impact of Online Game Addiction on the Quality of Student Education During the COVID-19 Pandemic. *Jurnal Pendidikan Dan Pengajaran*, *54*(3).

Nadelson, L. S., Cain, R., Cromwell, M., Edgington, J., Furse, J. S., Hofmannova, A., Lund, E., Matyi, J., Morris, S., & Sais, C. (2015). A world of information at their fingertips: College students' motivations and practices in their self-determined information seeking. *International Journal of Higher Education*, *5*(1), 220.

Noor, M. Z. M. (2018). The Future of Architectural Education in Malaysia: Introducing a New Theory of Studiogogy using SOLE Module1. *E-PROCEEDINGS*, 81.

Nugrohadi, S., & Anwar, M. T. (2022). Pelatihan Assembler Edu untuk Meningkatkan Keterampilan Guru Merancang Project-based Learning Sesuai Kurikulum Merdeka Belajar. *Media Penelitian Pendidikan: Jurnal Penelitian Dalam Bidang Pendidikan Dan Pengajaran*, *16*(1), 77–80.

Nunally, J. C., & Bernstein, I. R. (1994). Psychometric Theory, McGraw-Hills. In *New York, NY*. McGraw-Hill.

Ontong, K., & Waghid, Z. (2022). Hybridising Cybergogy and Sense of Place: A Response to Remote Multimodal Teaching and Learning in South African Higher

Education. *Alternation African Scholarship Book Series (AASBS)*, 246. https://web.archive.org/web/20220428110235id_/http://alternation.ukzn.ac.za/Files/books/series/08/00-aa-full-volume.pdf#page=266

Pertiwi, A. D., Nurfatimah, S. A., & Hasna, S. (2022). Menerapkan Metode Pembelajaran Berorientasi Student Centered Menuju Masa Transisi Kurikulum Merdeka. *Jurnal Pendidikan Tambusai*, *6*(2), 8839–8848.

Qhoimah, N., & Apridayanti, R. (2022). Analysis of Education Infrastructure during the Covid-19 Pandemic in High School Indonesian Islamic University. *Proceeding International Conference on Religion, Science and Education*, *1*, 101–107.

Reischmann, J. (2004). *Andragogy. History, meaning, context, function*.

Rigdon, E. E. (2016). Choosing PLS path modeling as analytical method in European management research: A realist perspective. *European Management Journal*, *34*(6), 598–605. https://doi.org/10.1016/j.emj.2016.05.006

Sardjuningsih, S., & MF, M. S. H. (2022). STRUCTURE SOCIAL PROBLEM COVID-19 THE PRACTICE OF-ONLINE LEARNING IN INDONESIAN HIGHER EDUCATION. *Fenomena*, *21*(2), 175–186.

Sarstedt, M., Hair, J. F., & Ringle, C. M. (2022). "PLS-SEM: indeed a silver bullet"–retrospective observations and recent advances. *Journal of Marketing Theory and Practice*, *00*(00), 1–15. https://doi.org/10.1080/10696679.2022.2056488

Sarstedt, M., Ringle, C. M., Cheah, J. H., Ting, H., Moisescu, O. I., & Radomir, L. (2020). Structural model robustness checks in PLS-SEM. *Tourism Economics*, *26*(4), 531–554. https://doi.org/10.1177/1354816618823921

Savićević, D. M. (1991). Modern Conceptions of Andragogy: a European Framework. *Studies in the Education of Adults*, *23*(2), 179–201. https://doi.org/10.1080/02660830.1991.11730556

Schwieger, D., & Ladwig, C. (2018). Reaching and retaining the next generation: Adapting to the expectations of Gen Z in the classroom. *Information Systems Education Journal*, *16*(3), 45.

Scopes, L. (2011). A cybergogy of learning archetypes and learning domains: practical pedagogy for 3d immersive virtual worlds. In *Transforming virtual world learning*. Emerald Group Publishing Limited.

Solichin, M. M., Muhlis, A., & Ferdiant, A. G. (2021). Learning motivation as intervening in the influence of social support and self regulated learning on learning outcome. *International Journal of Instruction*, *14*(3), 945–964. https://doi.org/10.29333/iji.2021.14355a

UNESCO. (2020). *Covid-19 Education Responses*. https://en.unesco.org/covid19/educationresponse/globalcoalition

Wangid, M. N. (2014). Student-centered learning: Self-regulated learning. *International*

Conference on Fundamentals and Implementation of Education (ICFIE), 161–165.

Wozniak, K. (2020). Personalized Learning for Adults: An Emerging Andragogy. In S. Yu, M. Ally, & A. Tsinakos (Eds.), *Emerging Technologies and Pedagogies in the Curriculum* (pp. 185–198). Springer Singapore. https://doi.org/10.1007/978-981-15-0618-5_11

Yan, Z. (2018). How teachers' beliefs and demographic variables impact on self-regulated learning instruction. *Educational Studies*, *44*(5), 564–577.

Yusuf, Q., & Yusuf, Y. Q. (2019). Digital culture and digitagogy: a life of a digital culturalist and a digitagogist. *International Conference on Early Childhood Education*, 7–13.

Zhang, Z., & Bayley, J. G. (2019). Peer Learning for University Students' Learning Enrichment: Perspectives of Undergraduate Students. *Journal of Peer Learning*, *12*(5), 61–74.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In *Handbook of self-regulation* (pp. 13–39). Elsevier.

Zimmerman, B. J., & Schunk, D. H. (2011). Self-regulated learning and performance: An introduction and an overview. *Handbook of Self-Regulation of Learning and Performance*, 15–26.

Appendix A

Research Instruments

Constructs	Indicators/items
Andragogy	I develop the competencies (knowledge, attitudes and skills) acquired at school on my own initiative for self-study (AND1)
	I gain a lot of competence by seeking and learning from my own experience by interacting with the learning environment both at school and outside of school (AND2)
	I cultivate self-study awareness (AND3)
	I determine the time, place and try myself to study and do learning tasks (AND4)
	I learn from various learning sources by interacting with the learning environment to provide maturity in knowledge and skills (AND5)
	I identify and take the initiative to study on my own to acquire vocational competence in order to meet the demands of the world of work (AND6)
Peeragogy	In every group discussion/study with my friends, I actively participate and provide feedback on my friends' answers (PEER1)
	I build a learning network and discuss with my peers or peers both offline and online to develop self-competence (PEER2)
	I am in discussions with colleagues/peers taking the role of team leader, resource person or moderator (PEER3)
	I like to invite friends to discuss and think of different solutions than usual (PEER4)
	I and/or a group in practical learning both at school and in industry prioritize teamwork by discussing steps, strategies and job/job solutions provided offline and online (PEER5)
Cybergogy	I actively access the cyber world such as accessing the internet, google classroom/whatsapp group class, youtube to receive and share learning materials (CYB1)
	I can also acquire hard skills (Knowledge and skills) and soft skills (attitudes and character) competencies through online learning both at school and in industry (CYB2)
	I take the initiative to learn on my own, receive and share learning materials by utilizing the internet (online) system available now such as google classroom/whatsapp group class, youtube etc (CYB3)

	I am actively getting used to learning and getting references online (cyber) both knowledge and skill competencies (CYB4)
	I document learning and related materials obtained offline/online on google drive, email, blog etc (CYB5)
	I access the virtual world (internet/cyber) to get the latest learning materials and support (CYB6)
	I usually use digital technology to learn skills/competencies such as zoom, Vlogs, Video podcasts, Smartphones, Google Drive, websites and other technologies (CYB7)
Heutagogy	I instill a self-concept to focus and determine my own direction, goals, and expectations as well as how to learn to gain competence (HEU1)
	I develop competency knowledge, attitudes and skills at school and study on my own with the aim of the demands of the world of work in the XXI century (HEU2)
	I can reflect on the results of the learning process that I get and give confidence to act to solve any difficult problem (HEU3)
	I receive teaching materials and study anywhere, facilitated online by the school, making it easier to learn (HEU4)
	I identify my potential and learn from new experiences that don't have to be planned and based on needs (HEU5)
	I have been developing creativity, critical thinking, communicating, and collaborating independently and in groups to acquire work skills according to the chosen area of expertise (HEU6)
Self-Regulated Learning	I set my study goal each day (SRL1)
	I learned the way I had previously planned (SRL2)
	I usually contact a friend who I think understands the subject I am studying (SRL3)
	I enjoy discussing lessons with other friends (SRL4)
	When it is difficult to understand the lesson, I always ask my friends until I can understand the lesson (SRL5)
	Drawing diagrams, tables or schematics makes it easier for me to learn (SRL6)
	To be able to understand the subject matter, I read it over and over again (SRL7)
	I review lessons and notes to get the gist of the subject matter (SRL8)
	I study in a place where I focus on studying (SRL9)
	In order to study well, I choose a place where no one bothers me (SRL10)
	I study the subject matter until the end even though the lesson is boring (SRL11)
	I always try hard to understand the subject matter (SRL12)