



Development of Heutogogy Model as a Framework to Prepare Self-Determined Educator: A Case Study in Indonesia

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Abstract: This study aims to develop a heutogogy learning model which determines indigenous resources to improve numeracy literacy for high school educator to prepare their educator against disruptive education. This type of research is development research by using the ADDIE method according to two stages, namely (a) exploratory research to identify educator characteristics and needs, and (b) development research to develop a heutogogy model based on educators' needs. Heutogogy model succeeded in increasing educator numeracy literacy in high school as a preparation to create competent educators in a disruptive education era. This model has also succeeded in improving the literacy-numerical skills of teachers as primary agents of the information literacy movement in schools. By improving the educators' numerical skills, the model contributes to their overall information literacy, empowering them to better guide students in the rapidly evolving educational landscape characterized by disruptive changes. Need further research to implement this model on the different competencies with more deep user validation. This research can boost educators' literacy-numerical abilities, which are needed by the world of education in the next 10 years.

Keywords: ADDIE Method, Educators Competency, Heutogogy Model, Numeracy Literacy Skill, Self-Determined Educator

1. Introduction

Numeracy literacy is one of the highest contributors to the growth of MSMEs in Indonesia. It was recorded that in 2021, MSMEs contributed more than 62% of Indonesia's GDP. Along with the development of the needs of today's business environment, there are more challenges in learning numeracy literacy to fulfil these needs. Various parties have contributed to increasing the success of numeracy literacy learning (Berndt et al., 2021; Foulger et al., 2017; González Bravo et al., 2022; Li et al., 2021; Svensson, 2024) who have conducted various studies to improve the effectiveness of numeracy literacy learning. On the other hand, numeracy literacy cannot be separated from educator behaviour according to the characteristics of their age. The suitability of behavioural characteristics has been shown to have a positive impact on the success of numeracy literacy learning (Campbell et al., 2020; Falloon, 2020; Zhao et al., 2024). This is something that has been overlooked in numeracy literacy learning in schools. Numeracy literacy learning currently only focuses on the material taught according to the handbook. This is what makes educators' interest in numeracy literacy learning low (Donleavy et al., 2018; Foulger et al., 2017; Leung et al., 2024). The low interest of educators in numeracy literacy learning affects the failure of learning in transferring knowledge.

Educators play a crucial role in fostering numeracy literacy learning, encompassing various responsibilities such as providing clear instruction, creating a positive learning environment, and linking mathematical concepts to real-world applications (Meeks et al., 2014). Challenges include addressing diverse learning needs, overcoming math anxiety, and tailoring instruction for individual students within a classroom setting. Additionally, educators must stay abreast of technological advancements, manage time constraints in assessment and feedback, engage in continuous professional development, and foster parental involvement. Successfully navigating these challenges requires dedication, adaptability, and a commitment to creating an inclusive and effective learning environment for all students.

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Various efforts have been made by previous researchers to meet the needs of today's numeracy literacy learning, such as research from Li et al. (2021) which tries to develop a start-up-based numeracy literacy learning model that can encourage educators with current ideas in the future. However, in this learning model, there is no mentor involvement, even though the mentor's role is still very important in being a facilitator in numeracy literacy learning. The low involvement of mentors affected educators' misconceptions about numeracy literacy material. This misconception was refined by (Donleavy et al., 2018) who developed approaches that has increased mentor involvement to become educator facilitators during learning. However, the approach developed was not relevant to the current character of educators and was not interactive to meet the needs of educators who have a high curiosity. This is the main reason that every model developed must follow the shifting characteristics of current educators.

On the other hand, there are heutagogy learning models which can help to solve the research gap. Putting students at the centre of their educational journey, heutagogy is a pedagogical framework based on self-determined learning that emphasizes reflection, active involvement, and autonomy (Blaschke, 2012). This method, which comes from the Greek terms "heauto" (self) and "agogos" (leading), emphasizes how important it is for students to set their own objectives, select their own teaching strategies, and assess their own development. Kenyon & Hase (2001) research offers fundamental insights into heutagogy by emphasizing the value of self-directedness and the departure from conventional pedagogical methods. In a heutagogical paradigm, students actively investigate and experiment through practical exercises that foster in-depth comprehension and memory. Essential elements include reflection and metacognition, which promote an ongoing cycle of self-evaluation and correction. Additionally, the heutagogical paradigm allows for flexibility and adaptability by acknowledging the diversity of learning styles.

Several studies have been conducted to evaluate the use of the heutagogy model in the context of education. One relevant study is conducted by Blaschke (2012), which discusses heutagogical practices and self-determined learning. This research indicates that the heutagogy model has a positive impact on student motivation and engagement in the learning process. These findings align with the principles of heutagogy, which emphasize intrinsic motivation and active student participation in determining how they learn. Another study that can be referenced is the research by Kenyon & Hase (2001) which delves deeper into the implementation of heutagogy in higher education. The research highlights the crucial role of reflection and metacognition in the heutagogy model. The results show that students consistently applying reflective practices experience higher development of metacognitive skills, thereby enhancing their ability to self-regulate their learning.

Taken together, these studies provide empirical support for the success of the heutagogy model in enhancing intrinsic motivation, developing metacognitive skills, and stimulating active participation in the learning process. However, further research is needed to explore the application of heutagogy at various educational levels and different learning contexts and to evaluate its long-term impact on lifelong learning abilities including numeracy literacy which has a significant contribution to the educational paradigm.

Numeracy literacy learning can be carried out optimally if educators have an interest in the material being taught. There is some empirical evidence from previous research that explains the positive relationship between character and educator behaviour on numeracy literacy learning interest (Arquero et al., 2024; Campbell et al., 2020; Jayadi et al., 2022; Kirk et al., 2023; Svensson, 2024; Warsono1 & Riduwan, 2008). Furthermore, previous research has proven that behaviour-based learning has a positive impact on building educator interest in numeracy literacy learning (Blaschke, 2012; Boeren & Íñiguez-Berrozpe, 2022; Chiswick et al., 2003; Meeks et al., 2014). This is following the ultimate goal of numeracy literacy, which is to grow educators' intentions to have high numeracy literacy skills. Based on this study, this article will explore the characteristics of educators in numeracy literacy learning that refer to the Theory of Planned Behavior (TPB), which will then be used as a basis for formulating a numeracy literacy learning model to increase the self-determined of learner educators.

2. Literature Review

The concept of literacy *skills* and numeracy *skills literacy skills*) are understood in various ways. Some understand *literacy skills* as a person's dynamic ability to read, interpret and analyze information and knowledge obtained to improve capabilities in life. Some interpret literacy skills as the ability to identify, understand, interpret, and create various information obtained from various sources (written and unwritten) and use it to solve problems encountered (Bruce, 2002). *Literacy skills* can be obtained through a continuous learning process, and with literacy skills a person can achieve the desired goals, develop his knowledge and potential and be able to participate fully in life (Boudard & Jones, 2003).

Numeracy *skills* are also understood in various ways. In short, numeracy skills can be understood as a person's ability to use mathematics to solve problems, to meet the needs of life (Chiswick et al., 2003). Numerical abilities include abilities ranging from basic arithmetic and logical reasoning to advanced mathematical abilities and communication skills. Interpretive (Sticht, 2001).

One of the learning theories that is more relevant to adult learning in today's era and can be used to reveal the literacy-numerical skills of teachers is the Connectivism Learning Theory (Siemens, 2005). This theory was born against the background of the fact that the development of life in a *knowledge-based society* is always connected with *the existing knowledge*. Learning is a way of being (*a way of being*), done by constantly following and

finding out new situations, information or events (Herlo, 2017), to improve performance, so that a person can live in harmony with the times. This learning understanding is the embodiment of literacy-numerical abilities.

In the conception of the theory of connectivism, two important modalities become the spirit of the learning process, namely (a) learning on one's ability and awareness, and (b) resilience in learning. In "Learning on their own", gave birth to two key concepts, namely *self-directed learning* and *indigenous resources*. *Self-directed learning* is understood as every adult is believed to have the initiative to carry out learning activities, either with or without the help of other parties. This concept is at the core of the andragogy approach. The learning activity starts from the process of diagnosing learning needs, determining learning objectives, identifying learning resources and materials, selecting and implementing learning strategies, to evaluating learning outcomes.

Indigenous resources are understood as a very pro-active learning process where adults act as determinants and even owners of all their affairs and learning needs. This concept is at the core of the heutagogical approach and is an extension of the andragogy approach. *Heutagogy* comes from the Latin *self*. Kenyon & Hase (2001) define it as *the study of indigenous resources* (the study of learning as a process that is determined by one's self). Adults who learn determine what will be learned and how it will be learned. Tutors carry out the learning facilitation process by providing guidance and providing the learning resources needed but still trying optimally so that the determination of learning processes and strategies is entirely on the part of the educators (Blaschke, 2012).

3. Method

This study employs the ADDIE method, as described by Branch (2009), to address the two main objectives: first, to explore the characteristics of educators in numeracy literacy learning based on the Theory of Planned Behavior (TPB); and second, to develop a numeracy literacy learning model that enhances educators' interest in numeracy literacy learning. The research consists of several stages. Firstly, the Analysis stage involved in-depth interviews with 10 high school educators who were teaching numeracy literacy, along with observations, to gather primary data on educators' characteristics in numeracy literacy learning based on the TPB. The data validity was ensured through source triangulation with two additional respondents, as well as triangulation by comparing interview transcripts with field observation results. The collected data were analyzed using an interaction model based on Branch (2009) to identify the educators' characteristics in numeracy literacy learning.

The results of the analysis served as the foundation for the Design stage (Stage 2), which focused on planning a Monopoly Gamification-based numeracy literacy learning model. This involved setting learning objectives, designing teaching scenarios and learning activities, creating learning tools, developing learning materials, and evaluating learning outcomes. The design of the Monopoly Gamification model was conceptual at this stage and would be further developed in subsequent stages. The subsequent stage, Development (Stage 3), aimed to translate the conceptual framework into a ready-to-implement product. Trials were conducted with material experts and models, following inter-rater agreement principles (R. J. Gregory, 2014).

Overall, this study adopts the ADDIE method to investigate educators' characteristics in numeracy literacy learning, based on the TPB, and to create a Monopoly Gamification-based learning model. The developed model underwent rigorous analysis, design, and development stages, ensuring its validity and readiness for implementation.

Expert Opinion 1

	Low relevance (item rated 1-2)	High relevance (item rated 3-4)
Expert Opinion 2 Low relevance (item rated 1-2)	A	B
High relevance (item rated 3-4)	C	D

The basis for making decisions using the expert test index based on the inter-rater-agreement model (Robert J Gregory, 2014) is as follows:

$$\text{Expert test index} = \frac{D}{A + B + C + D}$$

Information:

A: low relevance of Expert 1 and Expert 2

B: low relevance of Expert 1 and high relevance of Expert 2

C: low relevance of expert 1 and high relevance of expert 2

D: high relevance of expert 1 and expert 2

The subject of material expert testing was carried out by; 1) M. Nuruddin Zangky, S.Pd., M.Pd as a lecturer in the management department who focuses on numeracy literacy learning, and M. Asbihani, S.Pd as a Numeracy literacy teacher at Al-Rifaie Modern High School. In the learning model expert testing was carried out by; 1) Dr. Chau Kien Tsong an expert on learning models at the University Sains Malaysia, and 2) Dr. Karkono, S.S., M.A as an expert on learning models.

Stage 4) *Implementation*, was carried out by implementing the Monopoly Gamification model which was developed in small groups to measure the success of the numeracy literacy learning model which was realized in the form of the Monopoly Gamification model in increasing educator interest in numeracy literacy learning. This implementation was carried out on 20 educators of various senior high schools in East Java Province. The last stage is 5) *Evaluation*, which was carried out at each stage of the previous ADDIE method.

4. Result

4.1. Exploration of Educator Characteristics in Numeracy Literacy Learning

The findings of this study, which investigated the characteristics of educators in numeracy literacy learning, have effectively identified three key elements within the Theory of Planned Behavior (TPB). These elements include 1) attitudes toward behaviour, 2) subjective norms, and 3) behavioural control. The results of the analysis are illustrated in the following table;

Table 1: Results of Exploration of Educator Characteristics in Numeracy Literacy Learning refers to TPB

No	TPB Element	Educator Characteristic
1	Attitude Towards Behavior	Educators didn't know the ideal opportunities they could do in the future Educators feel that there were no opportunities for them to have numeracy literacy Educators didn't know how to start the study of numeracy literacy Educators feel numeracy literacy learning is a boring and unimportant lesson
2	Subjective Norms	Educators didn't have the support to learn numeracy literacy Educators are influenced by peers who say that numeracy literacy learning is not interesting Educators have a difficult way to understand the numeracy literacy skill
3	Behavioural Control	Educators followed peers who didn't pay attention when learning numeracy literacy Educators had irrational thinking that was influenced by the social environment Educators had a low interest in numeracy literacy learning

Source: processed by researchers, 2024

The condition of the cognitive aspects and affective aspects of educators makes them easily influenced by external stimuli so they still give negative responses to the stimulus (not listening to learning seriously). There are even educators who claim to have left the class many times in numeracy literacy subjects. The consequences that educators received for their behaviour were 1) not understanding the numeracy literacy material being taught; 2) increasingly assume that numeracy literacy lessons were not interesting because they didn't follow the entrepreneurial simulations carried out in class; 3) got a warning from the teacher and got a bad grade; 4) did not pass the numeracy literacy subject exam.

4.2. Heutagogy Model Development

People who learn in addition to considering their problem-solving process which systemically consists of components of problems, actions, and results, also review the beliefs or points of view that underlie the problem-solving actions they have done. Visually, the process is described as follows.

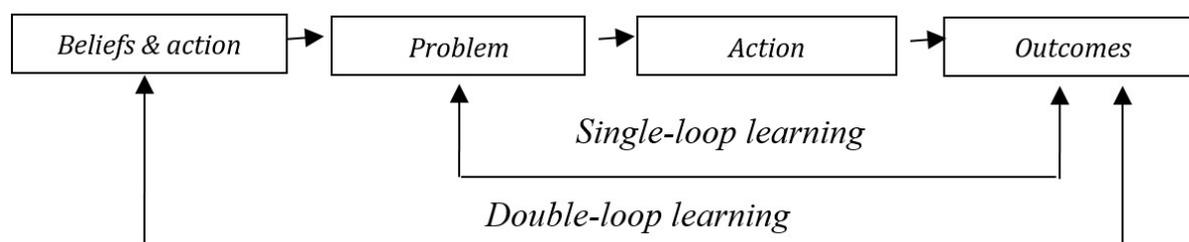


Figure 1: Heutagogy Work Flow, Source: processed by researchers, 2024

From the schematic above, it can be seen that if someone is still doing the problem-solving process, then the person concerned is still doing *single-loop*. However, if someone has questioned his own beliefs, assumptions, or point of view regarding the problem-solving process he has done, and how the process affects his beliefs, assumptions, or point of view, then the person concerned has done a *double loop*.

Furthermore, *self-reflection* or self-reflection is the ability to reflect on what has been done. In this case, a person asks himself whether what has been done has been following what it should be, why it is not appropriate,

what valuable lessons can be taken, and so on, and then uses these lessons and experiences to improve the steps of his life further. By implementing this ability, adult life continues to experience significant progress.

Indigenous resources are oriented to help someone acquire competence and problem-solving capabilities heuristically. Competence is characterized by the ability to find the knowledge or skills needed for problem-solving, while capability is characterized by self-confidence in their competence in carrying out problem-solving actions appropriately and effectively in both familiar and unknown situations. These capabilities include self-efficacy, communication, and teamwork skills, creativity, and positive values. Capabilities are the development of competence.

The double loop learning process for a person is expected to be more aware of his preferred learning style and better able to adapt his learning style to new situations. Therefore, a person's learning style also contributes to learning. Concerning the implementation of learning, in andragogy, the curriculum, questions, discussions, and assessments are designed by the instructor according to the learning needs of the learner. In heutagogy, the learner organizes the required learning materials and designs and develops learning maps. The level of learning autonomy in heutagogy, andragogy, and pedagogy, can be described as follows.

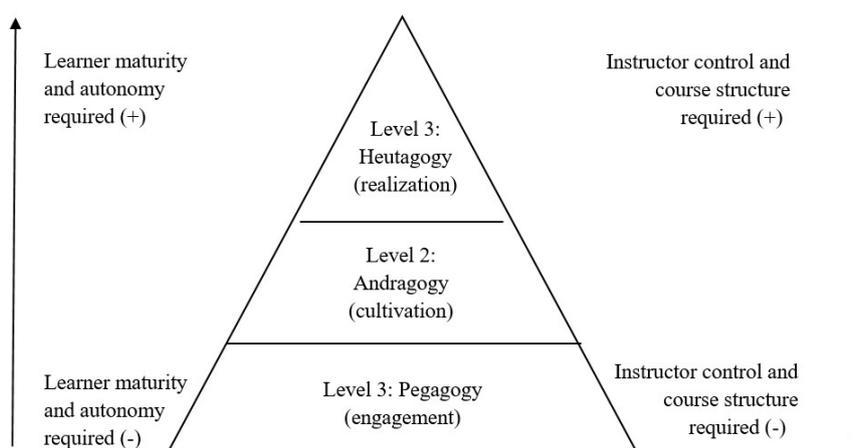


Figure 2: Heutagogy Model Modification, Source: processed by researchers, 2024.

Heutagogy refers to the ability of adults to engage in problem-solving processes while reflecting on their beliefs and perspectives related to their experiences. Numeracy literacy, on the other hand, is viewed as a deliberate and planned behaviour. After conducting material expert assessments and user tests focusing on usability, syntax convenience, accuracy, and attractiveness, the results indicated that: 1) the acceptance index of the first and second learning model experts was 0.83, and 2) the acceptance index of the first and second entrepreneurship material experts was 1. These findings suggest that the developed entrepreneurship learning model was highly appropriate, useful, interesting, and easy to use for improving educators' numeracy literacy skills. The validated learning model was subsequently implemented within a limited group of 20 educators in East Java high schools, as detailed below:

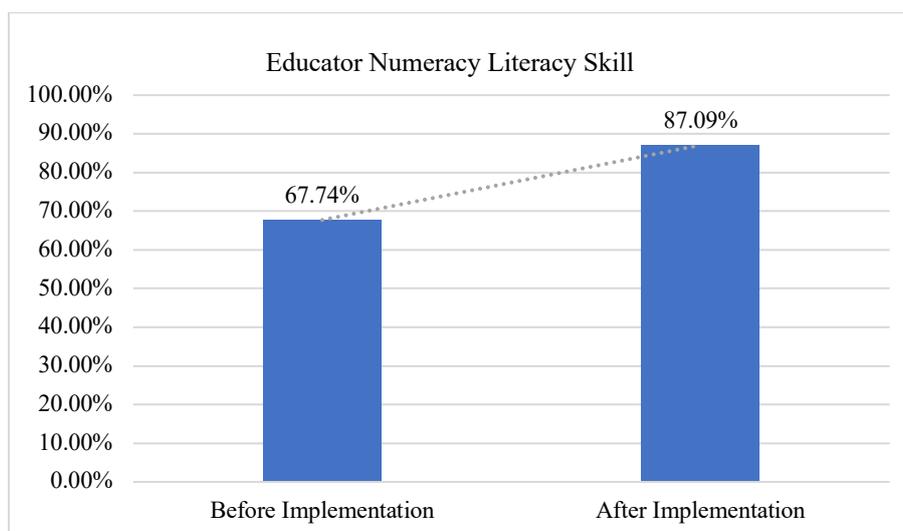


Figure 3: Heutagogy Implementation Result
Source: processed by researchers, 2024.

Based on the implementation results there are improvements in educator numeracy literacy skills in the small group user testing. It means that the heutagogy learning model development succeeds in increasing the educator competency in numeracy literacy skills which will help to improve their teaching quality.

5. Discussion

Based on the data presented in Table 1, it is evident that educators' attitude toward behavior negatively impacted their interest in numeracy literacy learning. This unfavorable attitude was identified as the primary reason for the lack of success in numeracy literacy education. These findings align with previous studies that highlight the significance of educators having a positive attitude or perception toward the subject (Akmal & Pritchett, 2021; Campbell et al., 2020; Conica et al., 2023; Donleavy et al., 2018). This cognitive aspect plays a crucial role in numeracy literacy learning, as a negative attitude hinders educators' self-regulation and their willingness to engage in social interactions related to numeracy literacy.

In the affective aspect, field facts show that subjective norms were still not well internalized. Subjective norms owned by educators tend to lead to deviant behavior which results in the inability of numeracy literacy learning to provide a stimulus to increase educator interest in numeracy literacy learning. The failure of this stimulus reduces educator interest so that numeracy literacy subjects are considered unimportant and useless for their next life.

Based on the explanation of the educator characteristics analysis that refers to the Theory of Planned Behavior (TPB) above, it shows that the stimulus that comes from external factors will be difficult to intervene with because it was an uncontrolled factor. The most possible intervention is to restructure the cognitive and affective aspects on the internal side of educators taking numeracy literacy learning (Foulger et al., 2017; Leung et al., 2024). The appropriate form of intervention to restructure cognitive and affective aspects which will further increase educators' interest in numeracy literacy learning is the gamification learning model that leads to educators' cognitive, affective to psychomotor aspects. The existence of a business implementation simulation from planning, and implementation to an evaluation in collaboration with the use of *Edukit* can be used to touch core beliefs so that it can help educators increase interest in learning numeracy literacy more deeply.

It is not solely a reaction to external stimuli or experiential catalysts but also involves a consciously planned process. The Theory of Planned Behavior (TPB) is a widely used framework that consistently models intentions regarding numeracy literacy, including among educators (Fernández-Pérez et al., 2019; Haddad et al., 2021; Little et al., 2022; Minty-Walker et al., 2023). In TPB, intentions to perform a behavior are influenced by the desire to engage in it and the perception of success in doing so. Specifically, intentions are shaped by attitudes towards behavior, subjective norms, and perceived behavioral control, all of which are based on individual beliefs regarding the benefits associated with these behaviors.

The first element, attitudes toward behavior, relates to the individual's perspective on the desired behavior. It reflects the personal perception of the attractiveness of the target behavior, such as becoming a sustainable educator. Attitudes toward behavior are influenced by behavioral beliefs, which encompass the perceived likelihood of positive or negative outcomes resulting from the behavior (Hong et al., 2020). The second element, subjective norms, involves how the social environment, including friends, family, or mentors, approves or disapproves of certain behaviors. Subjective norms arise from normative beliefs, which reflect an individual's willingness to comply with the opinions of close friends. It describes how the social environment's constraints and opportunities influence a person's intention to become an educator (Blaschke, 2012). The third element, perceived behavioral control, is conceptualized through perceptions of one's ability to perform a particular behavior, akin to self-efficacy. It reflects an individual's belief in their capability to carry out the behavior (Boeren & Íñiguez-Berrozpe, 2022; Donleavy et al., 2018). Perceived behavioral control combines beliefs about one's skills and the facilitators and obstacles experienced. These elements are influenced by individual background factors that are challenging to modify. Therefore, when learning numeracy literacy, it is crucial to tailor the approach to each individual's existing factors. Adapting numeracy literacy learning based on these three elements holds significant potential for enhancing educators' interest in numeracy literacy.

The achievement of successful numeracy literacy learning is highly desired by various groups, particularly educators. By leveraging the creativity and innovation of high school educators, collaborative efforts can generate innovative ideas and enhance student productivity (Hakkarainen et al., 2023). The implementation of a numeracy literacy learning model should be flexible, aligning with Indonesia's adoption of the 4.0 industrial revolution, where technology serves as a foundation for everyday life (Li et al., 2021). Consequently, numeracy literacy learning must be conducted more effectively and efficiently. Teachers should incorporate technology and tailor their approach to suit the characteristics of the students. There are various models available for teachers to utilize in the learning process, including heutagogy models

6. Conclusion

In summary, the analysis of educator characteristics in numeracy literacy learning, using the Theory of Planned Behavior (TPB), reveals that across the three elements attitudes towards behavior, subjective norms, and behavioral control - educators tend to exhibit deviant behavior. This behavior negatively impacts the effectiveness of numeracy literacy learning in stimulating the improvement of educators' numeracy literacy skills. This was because the cognitive and affective aspects of educator have not been well constructed so they were easily influenced by irrational thoughts from their social environment. This shows that educators need a learning model that follows

these characteristics so that they can construct cognitive and affective aspects and create positive stimuli while improving numeracy literacy.

From the results of the analysis, a numeracy literacy learning model was formulated using the integrated heutagogy based on an indigenous resource which includes three levels realization, cultivation, and engagement wherein each of these levels there were several activities carried out by educators to construct cognitive, affective, and psychomotor aspects that will increase numeracy literacy skill of educator. This learning model has been validated by material and learning model experts that the model was very appropriate, very useful, very interesting, and very easy to use. The results of the limited group trial showed that the learning model succeeded in increasing educator skills in numeracy literacy with a percentage increase of 19.36%.

This research implies that adopting the heutagogy model is crucial for cultivating educators capable of self-directed learning. The study suggests that integrating this model into teacher training and professional development in Indonesia could enhance educators' adaptability in the rapidly changing educational landscape. The findings also indicate the model's universal applicability across diverse contexts, emphasizing its potential to contribute to the preparation of educators globally for the challenges of the 21st century.

This research is limited to a trial of 20 educators in East Java High School, so further research is needed to measure the success of the learning model developed more comprehensively. Theoretically, the exploration of educator characteristics in numeracy literacy learning is only limited to the theory of planned behavior where there is still the possibility to do a deeper exploration that refers to different theories.

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