Education transformation in Indonesia requires the implementation of differentiated learning

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Article Info	ABSTRACT
	This study describes teachers' perceptions of implementing education transformation after the Corona Virus Disease 2019 (COVID-19) pandemic. The research method uses a mixed-method approach: quantitative and qualitative. Quantitative data collection using questionnaires. Analysis of quantitative data using the Rasch model. Qualitative data analysis through the collection, reduction, and presentation. The respondents of this research are 389 teachers in Indonesia. The questionnaire instrument contains 21 items of statements. Before being sent to teachers via the Google form, the questionnaire had met the readability test by 10 teachers. This research found that the most effortless education transformation is related to the education ecosystem. However, implementations still challenging to implement are related to pedagogy, especially the implementation of differentiated learning. Therefore, this study implies that the educational ecosystem needs to be maintained. Meanwhile, pedagogics, especially those related to differentiated learning, must be improved with various training to recognize student learning styles, multiple intelligences, learning readiness, teacher socio-emotional, and student socio-cultural.

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1. INTRODUCTION

Education in Indonesia before and after Corona Virus Disease 2019 (COVID-19) pandemic faces significant challenges [1]. Before the COVID-19 pandemic, the quality of education in Indonesia was progressing, although it still lags behind other ASEAN countries, especially Singapore and Malaysia [2]. Student literacy and numeracy in Indonesia need improvement [3], [4]. COVID-19 is starting to subside, but education challenges are not getting more accessible but more complicated. Lost generation due to prolonged learning from home requires an effective and efficient solution. All education stakeholders, especially the government, are not silent. In 2020, the government initiated educational transformations, including an independent learning policy (*Kebijakan Merdeka Belajar*) [5]. Independent learning is an approach that is taken so that students can choose lessons according to their interests [1]. This is to optimize their talents and contribute best to working for the Indonesian nation [5]. Furthermore, the independent learning policy is a step in transforming education to realize education that frees traditional educational practices, provides space for regulation-based independence, and frees education from social pressure and restraint [6], [7]. Therefore, until the end of April 2021, 10 episodes of Merdeka Learning have been launched.

The independent learning policy is expected to transform education [5]. Hopefully, this new policy will unravel the significant schooling challenges [6]. As a result, Indonesian education can advance in line

with other countries. The independent learning policy has become the central policy in the second half of President Joko Widodo's leadership [8]. The Indonesian people hope that this policy will be successful. The emphasis on creating a Pancasila student profile is the primary goal of Indonesian national education. Pancasila student profile is an Indonesian human figure who can learn throughout life with the essential characteristics of purity, cooperation, global diversity, critical, and creativity [9]–[11]. The role of teachers in realizing educational transformation is crucial [12], [13]. The teacher's role in implementing independent learning is the mover of independent learning. Teachers who drive independent learning must effectively teach and manage classroom activities and build effective relationships with students and the school community. Also, teachers need the ability to integrate information and communication technology (ICT) into the learning process [14]. ICT skills can help teachers become more flexible in being facilitators, collaborators, mentors, coaches, directors, and, at the same time, learning partners [15]. In learning, teachers need to have various basic teaching skills, namely: opening and closing lessons, explaining skills, questioning skills, strengthening skills, variation skills, and discussion guiding skills. [16], [17].

No research has described the extent to which teachers appreciate the transformation of education in Indonesia after COVID-19. Referring to the transformation of society through the structuration theory of Giddens [18], this study tries to explain the extent of teachers' perception of agents or subjects of educational change towards the structure or various government policies. As described earlier, the Indonesian government has implemented different new approaches to improve the quality of education. Education structures in the form of policies, regulations, and resources challenge teachers to transform autonomously. These challenges include the school ecosystem [19], the teacher himself [20], pedagogic mastery [21], [22], curriculum [23], [24], and assessment system [25], [26]. Information and conditions regarding teachers' opinions or perceptions in realizing the education transformation in Indonesia so far are incomplete and still lacking. Based on this information and situations, policymakers, including teachers as the primary implementers of education, can take advantage of the information from this survey.

Furthermore, teachers can map their problems based on accurate information and determine the right solution. In other words, studying teachers' opinions or perceptions is part of an effort to find the best key to realizing quality education in Indonesia. Therefore, this research is novel. In addition, this study has a novelty in data analysis, using the Rasch model [27], [28]. Using the Rasch model in Indonesia is still limited, and this model has advantages over classical models. The benefits of Rasch's modeling include generalizing across samples and items, calculating response options without psychological distance, allowing unidimensionality testing, and identifying harmful items and unexpected responses [29], [30].

Based on the structuration theory of Giddens [18], the position of teachers is an agent of change, so their perceptions provide clues to the level of implementation of educational transformation. As an autonomous subject in responding to the educational environment's structure in Indonesia, teachers' response or action to carry out various transformations is very important. Based on the structuration or environment, teachers should be able to provide appropriate measures on educational indicators such as the school ecosystem, the teacher himself, pedagogic mastery, curriculum, and assessment system. Information on which parts have been done optimally and which have not optimally can help policymakers and teachers continuously improve. The challenges and some indicators of education transformation can be seen in the following points. Education transformation indicators are successful if teachers change the education ecosystem [31]. The educational ecosystem should be a place of fun activities [32]. Leadership in schools that are part of the ecosystem must be able to change from being served to serving [33]. School administrators must collaborate with partners within and outside the school [34]. Managers must have the required competencies. As part of the ecosystem, parents must be able to harmonize the implementation of education at home and school [35]. Education transformation indicators are successful if the teacher's treatment of students has changed [36], [37]. The indications are that teachers have become more independent in planning and implementing learning. Teachers have become facilitators of various sources of knowledge [38].

Teacher training is based on practice. Teacher competence has been seen in its academic and socio-emotional aspects. Learning is already in student-centered learning [39]. Teachers have implemented differentiated learning in content, process, and product [40]. Education has been carried out by utilizing technology [41]. Teachers have implemented many approaches to play to learn [42]. In addition, the Teacher, in carrying out teaching, pays attention to the student's ability level [43]. Educational transformation indicators are successful if the curriculum and assessment system have improved. Curriculum refers to implementation concerning student competence [23], focusing on soft skills and student character [44], [45]. They implement the curriculum through collaboration between subject teachers [34], [46]. The Teacher conducts diagnostic, formative, and summative assessments in a differentiated manner [47]–[49].

Through a survey of teachers, a picture of the teacher's perception in answering the education challenges can be obtained. If the teacher approves the statement about the transformation of education, we can see whether the transformation of education has been carried out optimally. On the other hand, which of

the teacher's perceptions do they think is the most difficult and the easiest to implement? How do informants (practitioners) view the significant findings through interview excavation? [50]. Therefore, this research is critical and helpful in photographing the implementation of education transformation in Indonesia.

2.   RESEARCH METHOD

This study aims to describe teachers' perception of facing the challenges of education in educational transformation after the COVID-19 pandemic. The challenge intended in this study is how teachers change the challenges in the form of the school ecosystem, the teacher himself, pedagogic mastery, curriculum, and assessment systems that are not yet good into better. Are teachers able to change these challenges so that transformation occurs? Which of these challenges is the most difficult to transform? How did the informants respond to the findings of this study?

The research uses a mixed-method approach [51]. This research started with quantitative, followed by qualitative [52]. First, the quantitative process is carried out by data analysis using the Rasch model [53], [54]. The Rasch model works based on the item-response theory. Unlike classical test theory, the Rasch model can separate enforceability from agreeability. Researchers can quickly identify items with their respondents and sort statements that are easy to agree with and difficult for respondents to agree with several studies [55]–[57]. Next, the qualitative approach with interviews [58], the informants selected by the researcher to respond to the quantitative findings. The stages of qualitative data analysis include data collection, reduction, and presentation [50], [52]. While collecting data, researchers also conduct participant observation, recording, and accessing documents and other material artifacts. In data reduction or interpretation, researchers strive with creative writing, namely understanding the dynamics of subjects under study continuously in depth. In the presentation of data, researchers do this by creating narratives, namely communicating data by telling stories [59].

The sample criteria use the purposive sampling technique [60]. Namely, the researcher subjectively determines the number of samples and the sample criteria used [61]. In this study, researchers chose teachers in Indonesia as respondents to fill out a questionnaire consisting of eight aspects of respondents' demographics and 21 statement items. First, data was entered from as many as 412 respondents through a Google form; then, researchers used 389 respondents. The selection process for respondents who participated in this study went through three stages: i) respondents who filled out the Google form consisted of teachers, principals, lecturers, and other education practitioners; ii) the researcher removed all respondents from the list except the teacher; and iii) the researcher discarded teacher respondents who did not fill in the complete instrument [62], [63]. The percentage of respondents' demographic data is listed in Table 1.

Table 1. Respondent's demographic percentage data

Region		Domicile		Gender		Position		Mover		School status		School level		Age	
East	10	Urban	48	LK	37	Teacher	69	Yes	13	Public	42	Kindergarten	15	<30	15
Middle	11	Rural	52	PR	63	Principal	26	No	76	Private	58	Primary	56	31-40	54
West	79					Supervisor	5					Senior	25	41-50	26
												Other	4	>50	5

Respondents' answers in the instrument used a Likert scale [64] with five rating options. The answer score of respondents who chose strongly agree is five, and strongly disagree with a score of 1 [65]—the quantitative data processing through the Rasch model analysis. The stages are as data input, testing with Winsteps: i) summary statistic; ii) item measure and variable map; ii) item (column): fit order; iv) item: dimensionality; and v) rating (partial–credit) scale [66]. The informants quantitatively confirmed the results of the findings. The criteria for the informants are education actors in schools. The main objective is to qualitatively deepen the meaning of quantitative findings [49].

The statement items in the instrument are sourced from concepts and theories to obtain content validity [67]. Several teachers received a readability test from statement items [68]. After reading the statement items from the research instrument, the researcher received input from the teachers to correct the items that were not right and less understandable to the respondents. Researchers can state that respondents understand the instrument [69]. The researcher then sets out 21 statement items that represent the dimensions of the school ecosystem [70], the teacher himself [71], pedagogic mastery [72], [73], curriculum [74], and the learning assessment system [75], [76].

The statement regarding the ecosystem (E) contains: (E1) School has become a fun activity; (E2) The leadership has provided services as expected; (E3) School management/managers have collaborated with partners in internal and external schools; (E4) School management/managers are competent; (E5) There is

harmony between the implementation of education at home and school. The statements regarding the teacher (T) contain: (T1) The teacher is independent in planning and implementing learning; (T2) Teachers have become facilitators of various sources of knowledge; (T3) Teacher training is based on practice; and (T4) Teacher competence includes pedagogic and socio-emotional. The statement regarding the pedagogic mastery (P) contains: (P1) Student-oriented learning has been implemented optimally; (P2) Differentiated learning (content, process, and product) has been implemented optimally; (P3) Learning that utilizes technology has been implemented maximally; (P4) The approach of "playing is learning, meaningful and in context" has been implemented maximally; and (P5) The implementation of teaching based on the student's ability level has been carried out maximally. The statement regarding the curriculum (C) contains: (C1) The implementation of the curriculum is flexible and contextual by the teacher; (C2) The curriculum has been implemented referring to students' learning competencies/achievements; (C3) The curriculum has focused on soft skills and student character development; and (C4) The curriculum has been implemented collaboratively by subject teachers. The statement regarding the assessment (A) contains: (A1) A diagnostic check to see the competence, strengths, and weaknesses of students have been carried out optimally; (A2) Formative assessment involving students to support an effective learning process has been carried out maximally; and (A3) A summative assessment that helps the evaluation of learning outcomes has been carried out in a differentiated manner.

3. RESULTS AND DISCUSSION

This study found i) the quality of the instrument statement items, including special; ii) the educational transformation instrument is in a suitable category; iii) the statement items with the model are appropriate. In other words, the respondents can understand the instrument's items; iv) the instrument has construct validity or can measure the range of variables or all respondents; v) the probability of each instrument rating is different for the respondent. In other words, the respondents can distinguish all the scales in the instrument on the challenges of education transformation; vi) the top three items are the most difficult to get respondents' approval. This shows that implementing pedagogics is the most difficult for teachers; and vii) the lowest item shows the most accessible item for the respondent's approval. This indicates that teachers already feel comfortable with the work environment at school. The findings of the statements that are difficult to agree with respondents and accessible are then discussed in discussions with informants.

The Winsteps on summary statistics test results get a person measure=1.33. This data shows that respondents agree more with instrument items [54]. Value for person reliability=0.97. This data shows high respondent consistency. Value for Cronbach's alpha=0.99. This data shows that the interaction between the person and the instrument items is very good because it is above 0.80. Item reliability value=0.95. This data shows the quality of the instrument statement items, including special [54].

The test results to monitor the suitability of respondents with the model show that the educational transformation challenge instrument is in a suitable category. The test results using Winstep on the person table get the infit mean square (INFIT MNSQ) and outfit mean square (OUTFIT MNSQ) values moving from 0.94 to 0.96. This figure shows that the data with the model shows high suitability. In other words, respondents can understand the instrument about the challenges of educational transformation well. The outstanding value of MNSQ is 1.00; the closer to 1.00, the better. Still related to the suitability of the data with the model, the Infit Z-Standard (INFIT ZSTD) and Outfit Z-Standard (OUTFIT ZSTD) describes in the person table moved from -0.7 to -0.6. With the ZSTD value, it can be stated that there is a match between the respondents' understanding and the model of the educational transformation challenge instrument. The ideal value for ZSTD is 0.0, which means the closer to 0, the better the instrument quality [68], [77].

The test results using Winsteps on the item table get the INFIT MNSQ and OUTFIT MNSQ values moving from 0.98 to 0.96. This figure shows that the statement items with the model are appropriate. In other words, the respondents can understand the instrument's items regarding the challenges of educational transformation. The INFIT ZSTD and OUTFIT ZSTD figures in the table move from -0.4 to -0.6. With the ZSTD value, it can be stated that there is a match between the instrument's items and the model. In other words, the instrument items follow the model.

Instrument items are fit if the MNSQ OUTFIT value is $0.5<MNSQ<1.5$ [78]. Testing using Winsteps on item (column): Fit order on Wisntep with these criteria found that one item of the statement was a misfit or did not fit the model because the value was 1.59. The item is learning that utilizes technology has been implemented maximally (P3).

Using the OUTFIT Z-STANDARD (ZSTD) criteria in Winsteps, an item is a fit statement if the value is in the range $-2<ZSTD<+2$ [78]. Referring to these criteria, two statement items are misfits or do not fit the model because their values are 5.4 and 2.7. The two points are learning that utilizes technology has been carried out maximally (P3) and leadership has provided services as expected (E2).

The construct instrument can measure all respondents for the Likert's data type if the raw variance explained by measures value is above 40% [78]. The test results on Winsteps with the item dimensionality with the criteria show that the value of raw variance explained by measures for the instrument of the challenges of education transformation is 78.7%. Based on these facts, this instrument has construct validity or can measure the range of variables or all respondents.

The Winstep test uses a rating (partial–credit) scale to determine the respondent's ability to understand each rating. The test results show that each rating (1, 2. 3. 4. 5) has a separate peak as seen in Figure 1. This fact indicates that the probability of each rating is different for the respondent. In other words, the respondents can distinguish all the scales in the instrument on the challenges of education transformation.
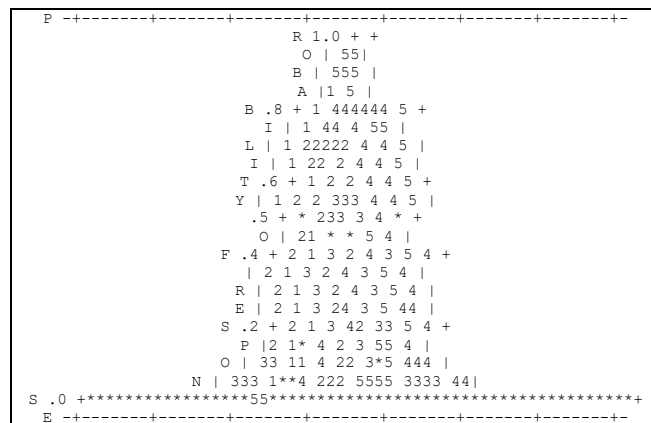

Figure 1. Rating test results (partial–credit) scale

The test results using Wisnteps on the item measure and variable map found items challenging to get approval for and easy to support. Table 2 shows that the top three items are the most difficult to get respondents' approval, namely: Differentiated learning (content, process, and product) has been implemented optimally (P2); Implementation of teaching based on the student's ability level has been carried out maximally (P5); and Diagnostic assessment to see the competence, strengths, and weaknesses of students has been carried out optimally (A1). The three items relate to the teacher's pedagogic ability and skills in assessing learning. This shows that implementing pedagogics is the most difficult for teachers to do.

Table 2. The results of the item measure

Item	Statements	Dimension
P2	Differentiated learning (content, process, and product) has been implemented optimally.	Pedagogic
P5	The implementation of teaching based on the student's ability level has been carried out maximally.	Pedagogic
A1	A diagnostic assessment to see students' competence, strengths, and weaknesses has been carried out optimally.	Assessment
P4	The "playing is learning, meaningful and in context" approach has been implemented maximally.	Pedagogic
P3	Learning that utilizes technology has been implemented maximally	Pedagogic
T1	The Teacher is independent in planning and implementing learning	Teacher
A3	A summative assessment that supports the evaluation of learning outcomes has been carried out in a differentiated manner.	Assessment
A2	Formative assessment involving students to support an effective learning process has been done maximally.	Assessment
P1	Student-oriented learning has been implemented optimally	Pedagogic
C1	The implementation of the curriculum is flexible and contextual by the teacher.	Curriculum
T3	Teacher training is based on practice	Teacher
C3	The curriculum has focused on soft skills and student character development.	Curriculum
E5	There is harmony between the implementation of education at home and school.	Ecosystem
T2	Teachers have become facilitators of various sources of knowledge	Teacher
C4	The curriculum has been implemented collaboratively by subject teachers	Curriculum
C2	The curriculum has been implemented, referring to students' learning competencies/achievements.	Curriculum
E4	School management/managers are competent	Ecosystem
T4	Teacher competence includes pedagogic and socio-emotional	Teacher
E3	School management/managers have collaborated with partners in internal and external schools.	Ecosystem
E2	The leadership has provided services as expected	Ecosystem
E1	The school has become a fun activity	Ecosystem

The lowest item shows the most accessible item for the respondent's approval. There are three items, namely: school has become a fun activity (E1); leaders have provided services as expected (E2); and school management/managers have collaborated with partners in internal and external schools (E3). This shows that teachers already feel comfortable with the work environment at school.

The first important finding shows that more teachers agree on instrument items related to the school ecosystem, teachers themselves, pedagogical mastery, curriculum, and assessment systems. In other words, more teachers have made efforts to realize the challenges of education into transformations in education. This means that the school ecosystem, teachers, pedagogic mastery, curriculum, and assessment systems are better than before. The findings of person reliability reinforce this, Cronbach's alpha, and item reliability, which are high or above 0.90 in testing using the Rasch model.

The results of interviews with informants who work as school principals (SL) strengthen the finding that the ability of teachers to carry out educational transformation is good. However, the change in education has not been implemented optimally. An informant from a private high school (SL1) stated that

"…education transformation has been carried out well, although not optimally because the quality of human resources in schools is diverse, so it is difficult to create a solid team…."

The head of a private junior high school (SL2) stated,

"…the transformation has been good, but the information is not evenly distributed, causing each school not to be able to transform optimally…"

The principal of the public senior high school (SL3) stated,

"…the transformation of education has been going well because the government supports it through the drive school program; even though its form varies between schools, this transformation needs to be continuously supported by all education stakeholders…."

The head of public junior high school (SL4) stated,

"…transformation is only limited to public schools, so greater intervention is needed to make it happen in all schools…."

Educational transformation takes a long time and often causes adverse societal effects [79]. However, educational transformation works well if there is transformative leadership [80]–[82], the teacher can do reflection [83]–[85], and the teacher's high pedagogic ability [72], [86], [87]. In addition, the transformation of education is realized maximally if the school environment supports it [88], [89], a student-oriented curriculum [90]–[92], and a sound learning assessment system [74], [93], [94]. Based on the findings, the education transformation in Indonesia is on the right track. However, the Government and the House of Representatives plan to continue improving education's transformation to strengthen the national education system law. In addition, all parties must support the education change to become more meaningful.

The second important finding is that the statement of educational transformation is the most difficult for teachers to agree with or realize. The most challenging statement to agree on relates to pedagogics, especially the Teacher's ability to carry out differentiated learning. Differentiated learning is the implementation of teaching by teachers with content, processes, and assessments tailored to students' talents and interests [40]. Informants acknowledged the difficulties of teachers in realizing differentiated learning.

"... teachers are not innovative; some teachers have implemented it even though it has not met expectations..." (SL1)
"... teachers still find it difficult to implement differentiated learning because teachers are not used to making media learning according to the student's learning style or interest…." (SL2)
"…requires continuous practice because they are used to the one-way learning model and teacher-centered learning…." (SL3)
"...the understanding of teachers is still lacking, intensive guidance from working groups, supervisors and principals is still lacking, and there are no sanctions when not carrying out differentiated learning..." (SL4)

Implementing differentiated learning is part of the teacher's ability to master pedagogics [40]. Teachers who have pedagogic mastery are reflected in student-oriented learning [95], implementation of differentiated learning [40], use of technology in learning [96], [97], implementation of learning through

games that are appropriate to the context of students [42], [98], and carry out teaching based on the student's ability level [25]. Many characteristics of teacher mastery in pedagogical, differentiated learning are the most difficult to realize. Differentiated learning requires a variety of abilities [14], [99], such teacher must have social-emotional mastery [100], the ability to master learning technology, so the learning is more interactive [101]. In differentiated learning, teachers need training and support from all education stakeholders [96].

The third important finding concerns the statement of educational transformation that teachers most easily agreed upon or realized. Things that are easy to decide are related to the school ecosystem and enjoyable school activities. The results of interviews with informants confirmed this finding.

> "…the atmosphere is fun at school because the school can offer activities and facilities that make children feel at home and tired at school…." (SL1)
> "…the driving force is to feel at home in school because the digitalization era makes it easier and more flexible for teachers to explore and transfer knowledge to students…." (SL2)
> "…the school atmosphere has changed because the mindset of the teachers also keeps on changing so that activities at school are more fun…." (SL3)
> "The teacher paradigm does not only transfer knowledge but also stimulates the emergence of students' interests and talents already starting to feel so that activities at school are fun…" (SL4)

The school ecosystem is vital in supporting the achievement of educational goals [102]. The education ecosystem feels good if the leadership has created services that meet the expectations of the school population [33], collaborative and competent school administrators [103], and the implementation of education in schools is in line with teaching at home [104]. In addition, a supportive and pleasant school ecosystem contributes significantly to educational transformation [82], [105]. Therefore, efforts to create a supportive and enjoyable ecosystem need to be continuously encouraged and realized, for example, through effective leadership and management in schools [82], [105], [106].

4.   CONCLUSION

Every nation continues to strive to achieve the ideals of its country. One way to make it happen is through educational transformation. The role of teachers in realizing educational transformation is vital. Based on this survey, teachers' perceptions of their ability to recognize the educational transformation are on the right track. However, the challenges and transformations that teachers face are not accessible. Teachers have tried to turn challenges into shifts in the context of the school ecosystem, teachers themselves, pedagogic mastery, curriculum, and learning assessment systems. The transformation of education that has been going well is related to the education ecosystem. The educational shift requires more complicated work related to pedagogical mastery by teachers, especially in implementing differentiated learning. The implications of this research include the need for efforts to maintain and maintain a pleasant educational ecosystem. In addition, efforts are needed to improve the ability of teachers in pedagogical mastery, especially those related to differentiated learning. Strategies to strengthen differentiated learning abilities include increasing teacher understanding, intensive guidance and training from work groups, supervisors, and school principals, and the need for rewards and punishments for teachers.

The limitations of the research are: first, the potential biases in the sample selection. Sampling is one of the stages in research to take data from the research object. This study used the purposive sampling technique, which is included in the category of non-random sampling techniques. Researchers take and assign data based on specific characteristics to obtain samples that match the study. In this subjective determination, the samples used in this study may have weaknesses and shortcomings that interfere with the accuracy and precision of the research results. Second, the limitations of the Rasch model in interpreting the data. Using the Rasch model in data analysis falls into the non-classical category, allowing researchers to be less precise in analyzing data. This condition enables the occurrence between research findings and communication conveyed in research to have errors. The selection of informants to discuss the results of this study is not the correct number and profile. It can also undermine the discussion of research findings.

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