Psicothema

Teaching quality: High school students' autonomy and competence

Jaime León, Elena Medina-Garrido and Miriam Ortega
Universidad de Las Palmas de Gran Canaria

Abstract

Background: How teachers manage class learning and interact with students affects students' motivation and engagement. However, it could be that the effect of students' representation of teaching quality on the students' motivation varies between classes. **Method:** Students from 90 classes participated in the study. We used multilevel random structural equation modeling to analyze whether the relationship of the students' perception of teaching quality (as an indicator of the students' mental representation) and students' motivation varies between classes, and if this variability depends on the class assessment of teaching quality (as an indicator of teaching quality). **Results:** The effect of teachers' structure on the regression slope of student perception of student competence was .127. The effect of teachers' autonomy support on the regression slope of student perception of student autonomy was .066. **Conclusions:** With this study we contribute a more detailed description of the relationship between teaching quality, competence and autonomy.

Keywords: Teaching quality, high school, secondary education, competence, autonomy.

Resumen

Calidad didáctica: autonomía y competencia en alumnos de Educación Secundaria. **Antecedentes:** la calidad didáctica de los profesores de Secundaria afecta a la motivación e implicación de sus estudiantes. Sin embargo, podría ser que la relación entre la motivación y la representación mental que crea el alumnado de la calidad didáctica de su profesor varíe entre las clases. **Método:** estudiantes de 90 clases de Secundaria participaron en el estudio. Se utilizó un modelo multinivel de ecuaciones estructurales. **Resultados:** el efecto del estilo didáctico sobre la pendiente de regresión de la percepción de la estructuración del aula sobre la competencia fue .127. Mientras que sobre la pendiente de la percepción del apoyo a la autonomía sobre la propia autonomía fue .066. **Conclusiones:** con este estudio contribuimos a describir con más detalle la relación que existe entre la calidad didáctica, la autonomía y la competencia de los estudiantes.

Palabras clave: calidad didáctica, institutos, educación secundaria, autonomía, competencia.

Teaching quality is one of the most important school factors that affect students' learning (Wallace, Kelcey, & Ruzek, 2016). Students share a great deal of time with their teachers, and depending on the teaching quality, these hours spent together can be of great value, a waste of time or even detrimental for students. Teaching quality, how teachers manage class learning and interact with students, affects student motivation and engagement (Fauth, Decristan, Rieser, Klieme, & Büttner, 2014).

Guided by Self-Determination Theory (SDT; Deci & Ryan, 1985) a positive teaching quality is characterized by promoting competence and supporting autonomy (Jang, Reeve, & Deci, 2010). A teacher to promote students' competence must provide a structured class by, for example, explaining what he expects from students. On the other hand, a teacher to support students' autonomy should, for example, provide different meaningful options or explain the utility of the class contents (León, Medina-Garrido, & Núñez, 2017). Several authors have observed a linear relationship between those two teaching dimensions (structure

and autonomy support) and students' motivation (Black & Deci, 2000; Ruiz-Alfonso & León, 2017). This implies that a low autonomy support or an unstructured class by the teacher leads to low feelings of autonomy and competence, and vice versa. Nonetheless, the relationship between these teaching dimensions and students' motivation can be understood differently. Following La Guardia, Ryan, Couchman, and Deci (2000), if teachers do not promote autonomy and structure in their classes, they do not become a sensitive or important people for their students and, consequently they do not affect students' motivation.

SDT proposes that students' academic functioning depends on autonomy and competence (Jang et al., 2010). Autonomy denotes the experience of will and psychological freedom, students feel autonomous students when they do interesting tasks and not feel school activities are a chain of obligations (Núñez, Fernández, León, & Grijalvo, 2015; Núñez & León, 2015). Competence refers to the beliefs in its own ability or capacity (Guay, Ratelle, Larose, Vallerand, & Vitaro, 2013). Students feel competent when they are efficient in daily life's school practices (Elliot & Dweck, 2005). These two needs have important implications in the school context for its effect on engagement and performance (Wang & Eccles, 2013).

The issue that arises is how is the relationship between students' autonomy and competence and teaching quality. To address properly this issue, we will explain three aspects: 1)

characteristics of an autonomy supportive and of a well-structured class, 2) importance of students' perception about teaching quality, and 3) two possible explanations of the relationship between the students' perception about teaching quality and the students' needs, autonomy and competence, when there is not an adequate teaching quality.

Concerning the characteristics of an autonomy supportive class, León and Núñez (2015) consider that teachers who adopt an autonomy-supportive style design and use interesting and up-to-date activities with an adequate level of difficulty, identify and develop students' interests and preferences, use a warm language and interact patiently with students. With regard to competence, teachers can promote it by providing instruction step by step, preparing classes in order to provide a high level of structure and avoid chaos and providing optimal challenges and positive feedback (de Naeghel, van Keer, & Vanderlinde, 2014). More specifically, teachers who structure appropriately their classes, provide students clear, concise, and concrete guidance, and communicate students clearly what they expect (Jang et al., 2010).

Until now, we have focused on teaching quality, but what really matters is the students' mental representation about the classroom environment (Reeve, 2002; Stroet, Opdenakker, & Minnaert, 2013), more specifically, what influence students' autonomy and competence is how they perceive their teacher. Thus, we need to pay attention not only to the classroom evaluation of the teaching quality, but also the individual perception of each student in the classroom.

Lastly, about the third aspect, many researchers have observed a linear relationship between teaching quality, and autonomy and competence (Black & Deci, 2000; Ruiz-Alfonso & León, 2017). However, La Guardia et al. (2000) analyzed the relationship of a person with different relational partners (mother, father, romantic partner, and best friend). They detected variability in needs fulfillment across the different relational partners. These authors explained that the variability might not be a maladaptive response, instead, an expected reaction, because subjects might not evaluate the relational partner as an appropriate figure; to put it in other words, when one person does not fulfil the psychological needs of the other person, this other person adaptive functioning is not affected, perhaps because this subject does not consider the relational partner as a sensitive and important person.

Thus, in school contexts, when teachers do not promote autonomy support or structure well the class, students might obviate teachers' behavior, without letting it affect their autonomy and competence. Bearing in mind these two explanations of the relationship between teaching quality and students' competence and autonomy, when there is not an adequate teaching quality, we can forecast two possible scenarios: 1) students' mental representation about teaching quality affects negatively to students, and 2) students' mental representation about teaching quality does not affect students.

Drawing from La Guardia et al (2000) we wonder if the explanation of the results observed using relational partners could be transposed to the relationship between teacher-student. Therefore, we expect different patterns between classes in the relationships between: a) students' autonomy and their perceived autonomy support and b) students' competence and their perceived class structure. To put it differently, we expect some degree of variability in the regression of students' autonomy on students'

perceived autonomy support, and in the regression of students' competence on students' perceived class structure. Finally, we wonder if the variability in the above relationship depends on whether teachers support the students' needs. To sum up, our goal is to examine the effect of teaching quality in the relationship between students' perceived autonomy support and students' autonomy, and in the relationship between students' perceived class structure and students' competence (See Figure 1). More specifically, our study hypotheses are:

H1: The relationship between the students' perceived class structure and the students' competence will vary between classes.

H2: The relationship between the students' perceived autonomy support and the students' autonomy will vary between classes.

H3: The variability of the relationship between the students' perceived class structure and the students' competence will depend on teaching quality.

H4: The variability of the relationship between the students' perceived autonomy support and the students' autonomy will depend on teaching quality.

Method

Procedure

Students provided informed consent to participate, and participation was rigorously voluntary and confidential. Measures were collected at the end of the first quarter of the academic course. During the data collection, a researcher directed all measures to students, and explained how to complete the measures properly.

Participants

1964 compulsory secondary students participated in this study (50% males; mean age at the end of the academic year = 15.22 years, SD = 1.42). Students were from 90 classes within six high schools (urban and rural) located in Gran Canaria, Spain. The majority of students were from middle class families. The total sample comprised a similar number of students in each grade (Grade 1, n= 573, M_{age} = 13.76; Grade 2, n=489, M_{age}=14.91; Grade 3, n=491, M_{age}=15.88; Grade 4, n=411, M_{age}=16.86).

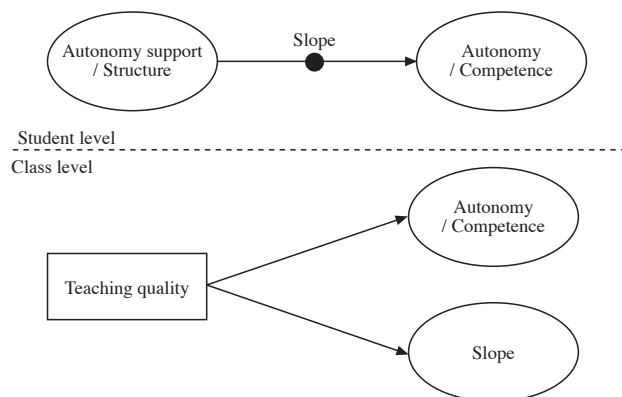**Figure 1.** Proposed models for the relationship between autonomy support-autonomy and between structure-competence

Instruments

To examine scales' reliability and validity we took into account that data might not be independent because students were nested within classes. To analyze how much variance is shared at the group level (L2) we estimated intraclass correlation (ICC1) and ICC2 to explore the reliability of the group average (Morin, Marsh, Nagengast, & Scalas, 2014). Values greater than .05-.10 for ICC and .70-.80 for ICC2 are indicators of not independency (Stapleton, McNeish, & Yang, 2016), therefore, in order to estimate parameters more accurately we need to accomplish multilevel instead of single level analyses of reliability (Geldhof, Preacher, & Zyphur, 2014) and multilevel confirmatory factor analyses (MCFA).

For the MCFA, model fit was assessed using several criteria: χ^2 test, root mean square error approximation (RMSEA), standardized root mean-square residual for the within-class ($SRMR_{within}$) and between-classes ($SRMR_{between}$) matrices Tucker-Lewis index (TLI) and the comparative fit index (CFI). With regard to the estimation method, bearing in mind that participants' ratings were on Likert-type scales, their responses are ordered categorically, so, the estimation method we used was weighted least square mean and variance adjusted (WLSMV), because it does not require multivariate neither univariate normality.

To analyze scales' reliability, we accounted for the fact that Cronbach's alpha can be deflated if loadings are not equal across all items (McNeish, 2017) and the nature of the data is not continuous (Elosua & Zumbo, 2008). Thus, we computed multilevel McDonald's Omega (McDonald, 1999) based on the MCFA factor loadings.

Competence. The next five items were used in order to assess the students' beliefs in their ability or capacity at school context: I often feel competent; I have the feeling that I do things appropriately; I believe that I can face with class requirements; I feel that I can show what I am capable of; I often feel that I am good at things. Students rated their responses using a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). With regard to construct validity and reliability: χ^2 value and fit indexes were χ^2 (1959, 20) =5074.729 (*p*=.00), RMSEA=.035, $SRMR_{within}$= .015, $SRMR_{between}$= .111, CFI=.995, TLI=.991. The internal consistency for the within part of the scale was ω =. 83 and for the between was = .96. Lastly, with regard to the variance partition, ICC=.03 and ICC2=.35.

Structure. The following six items were used to evaluate students' perceptions of teachers' structure: My homeroom teacher explains what he or she expects from me; My homeroom teacher shows me to solve exercises by my own; My homeroom teacher usually behave similar with me; If I cannot solve an exercise, my homeroom teacher shows me different approaches; My homeroom teacher ensures that I understand class contents before continuing; Before beginning a new topic, my homeroom teacher checks that I am ready. Students rated their responses using a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). With regard to construct validity and reliability: χ^2 value and fit indexes were χ^2 (1960, 18) =176.419 (*p*=.00), RMSEA=.067, $SRMR_{within}$= .029, $SRMR_{between}$= .049, CFI=.969 and TLI=.949. The internal consistency for the within part of the scale was ω =. 83 and for the between was = .97. Lastly, with regard to the variance partition, ICC=.24 and ICC2=.87.

Autonomy. In order to analyze the students' autonomy, we used four items: I generally feel free to express my ideas and opinions; I have the possibility to take decisions how to learn at class; I can contribute at the subjects' program; I can give my opinion about the development of class' program. Students rated their responses using a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). With regard to validity and reliability: χ^2 value and fit indexes were χ^2 (1960, 4) =78.965 (*p*=.00), RMSEA=.098, $SRMR_{within}$= .024, $SRMR_{between}$= .018, CFI=.983, TLI=.949. The internal consistency for the within part of the scale was ω =. 81 and for the between was = .99. Lastly, with regard to the variance partition, ICC=.10 and ICC2=.72.

Autonomy support. Students' perception of the autonomy support provided by the teacher was assessed with the four following items: My homeroom teacher offers different options to do the homework; My homeroom teacher pays attention to my ideas; My homeroom teacher explains the utility of what I am learning at class; My homeroom teacher highlights why is important what we do at class. Students rated their responses using a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). With regard to validity and reliability: χ^2 value and fit indexes were χ^2 (1960, 4) =58.555 (*p*=.00), RMSEA=.083, $SRMR_{within}$= .028, $SRMR_{between}$= .004, CFI=.983, TLI=.949. The internal consistency for the within part of the scale was ω =. 79 and for the between was = .98. Lastly, with regard to the variance partition, ICC=.32 and ICC2=.91.

Data analysis

To test if students' perception of competence or autonomy support predicted student's needs fulfillment, we ran two single level structural equation model (SEM), one for autonomy and one for competence. As explained above, because observed variables were ordered categorically, the estimation method used was WLSMV. To avoid standard errors underestimation produced by the violations of independency, we estimated standard errors using a sandwich type estimator (Muthén & Muthén, 2017). Next, we ran two multilevel random SEM, one for each need, to test if the effect of students' perception of autonomy or competence support on student's needs fulfillment varied between classes, and to test if this variability was due to teachers support for both needs, that is, to test if this effect was stronger/weaker in classes where homeroom teachers supported stronger/weaker the students' needs; this second level variable was an aggregation of students' perception of the teachers support.

It is worth noting that variables at the individual level versus the group level might have different meanings, for instance, students' frequency of homework at the individual level is an indicator of study habits, but at the class level is an indicator of the frequency teachers assign homework (Fernández-Alonso, Suárez-Álvarez, Muñiz, & Muñiz, 2015). Therefore, students' perception of teachers' support at the individual level is an indicator of the student's mental representation of the class, which varies a 76% and 66% for structure and for autonomy respectively, and at the group level (class mean) can be understood as teaching quality. Lastly, we used full information maximum likelihood method (Enders, 2010) to estimate missing data. All of the calculations were done with Mplus 7.4 (Muthén & Muthén, 2017).

Results

Descriptive statistics

Statistics for competence and structure

Table 1 reports means, standard deviations, and correlation among all items of competence and structure.

Table 1
Descriptive statistics and correlation for competence and structure items

	Media	DT	Comp01	Comp02	Comp03	Comp04	Comp05	Struc01	Struc02	Struc03	Struc04	Struc05
Comp01	4.84	1.78										
Comp02	5.33	1.52	.39									
Comp03	5.41	1.52	.35	.45								
Comp04	5.86	1.42	.31	.45	.43							
Comp05	5.42	1.54	.39	.56	.45	.53						
Struc01	4.67	1.89	.17	.20	.27	.17	.19					
Struc02	4.59	2.02	.14	.20	.22	.16	.19	.36				
Struc03	4.89	1.97	.18	.25	.28	.20	.25	.37	.44			
Struc04	5.08	1.91	.14	.26	.30	.22	.24	.38	.43	.60		
Struc05	5.09	1.96	.15	.28	.32	.22	.25	.35	.39	.51	.58	
Struc06	4.42	2.04	.16	.30	.29	.18	.25	.35	.43	.48	.54	.59

Note: Comp = competence. Struc = structure

Statistics for autonomy and autonomy support

Table 2 reports means, standard deviations, and correlation among all items of autonomy and autonomy support.

Models for Structure and Competence

First, we tested a model where students' perception of structure predicted competence fulfillment: β=.53 [.49, .57]; the χ^2 test and the fit indexes were χ^2 (1963, 43) =258.04 (p=.00), CFI=.980, TLI=.974, and RMSEA=.050[.045, .056]. Next, we ran a multilevel model with a random slope between classes, the slope's variance was .040 (p=.023); -2 log likelihood (-2LL) =67759.610 and the Akaike information criteria (AIC) was 67917.611. This model explained a 32% of the variance compared to a multilevel model without random slope. Lastly, we tested multilevel random model to analyze the effect of teachers' structure on the slope between students' perception and students' competence, we observed an effect of .127 (p=.003); -2LL=67751.07, AIC=67911.070. We observed that teachers' structure moderated the relationship between students' perception of class structure and competence, and, as can be seen in Figure 2, in classes where the teacher provided an adequate structure (one SD above the mean), there was a positive relationship between students' perception and competence, while in classes where the teacher did not provide structure (one SD above the mean), there was an inverse relationship between students' perception and competence, that is, the lower the students' perception, the higher the competence.

Models for Autonomy

We followed the same steps as in the above paragraph. In the single level model students' perception of structure predicted competence fulfillment: β=.67 [.63, .70]; the χ^2 test and the fit indexes were χ^2 (1963, 19) =238.54 (p=.00), CFI=.973, TLI=.960, and RMSEA=.077[.068, .086]. With regard to the multilevel model with random slope, the variance of the slope was .027 (p=.059); -2LL=49632.048, AIC=49748.049. This model explained a 15% of the variance compared to a multilevel model without random slope. Lastly, the effect of teachers' autonomy support on the slope between students' perception and students' autonomy was .066 (p=.040); -2LL=49628.708, AIC = 49746.708. We observed that teachers' autonomy support moderated the relationship between students' class mental representation and autonomy, and as can be seen in Figure 3, when teachers provided and adequate autonomy support (one SD above the mean), they seemed to affect students' autonomy, but when they did not (one SD above the mean), they still affected students, but in a lower intensity.

Discussion

The purpose of this study was to examine the effect of teaching quality on the relationship between students' perceived autonomy

Table 2
Descriptive statistics and correlation for autonomy and autonomy support items

	Mean	SD	Aut01	Aut02	Aut03	Aut04	Supp01	Supp02	Supp03
Aut01	5.36	1.71							
Aut02	5.09	1.64	.44						
Aut03	4.88	1.67	.43	.48					
Aut04	4.86	1.71	.44	.48	.62				
Supp01	4.74	1.98	.23	.26	.26	.26			
Supp02	5.20	1.88	.41	.36	.39	.39	.44		
Supp03	5.07	1.89	.30	.35	.37	.35	.44	.55	
Supp04	5.21	1.92	.29	.32	.34	.34	.46	.50	.68

Note: Aut = autonomy. Supp = autonomy support

support and students' autonomy, and on the relationship between students' perceived class structure and students' competence. We hypothesized that the relationship between students' perceived class structure and competence, and the relationship between students' perceived autonomy support and autonomy would vary between classes. With regard to competence we gathered evidence of our hypothesis, variability was significant ($p=.023$), but with regard to autonomy, variability was smaller and not significant ($p=.059$). The following hypotheses we tested were that this variability would be due to teaching quality. We observed that the relationship between perceived class structure and competence was due to teacher's class structure. With regard to autonomy, the little variability in the relationship between perceived autonomy support and autonomy was due to teacher's autonomy support.

When we analyzed the relationship between students' perceived class structure and students' competence, we observed variability between classes. This means that students' mental representation affected more to students' competence in some classes than in others. However, when we analyzed the relationship between students' perceived autonomy support and students' autonomy, there was a small variance, meaning that student's perceived autonomy support affected students' autonomy similarly (but not equal) between classes. Thus, for further research it is important to acknowledge that when analyzing the effect of class structure on competence, the single level approach might hide the full picture, but this approach might not be so harmful when analyzing the relationship between students' perceived autonomy support and students' autonomy as the regression between these variables showed less variability across classes.

More central to the study is whether or not this variability is due to the teaching quality. We observed a significant effect of teachers' class structure on the relationship between students' perception of class structure and students' competence. More specifically, we observed that in classes where the teacher structure well the classes, students' competence depended on students' perception, but when teachers do not structure well the class, we observed an inversed regression of students' perception on students' competence. Thus, students seem to take advantage of "good" teachers as observed in many single level studies. Nevertheless, when they have "bad" teachers, although they do perceive that their teacher is not structuring well the class, it does not seem to affect their competence, not only that, but it seems that "bad" teachers are assigned to students who feel competent.
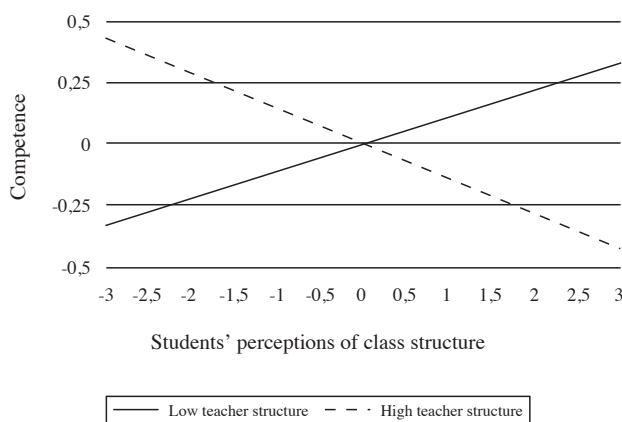
These results are in line with La Guardia et al. (2000) as these authors observed that when one person does not fulfil the relational partner psychological, this person adjustment does not seem to be affected, probably because this person does not consider the other as an appropriate figure. Based on these results, we believe that we can transpose La Guardia et al. (2000) explanation to the school context, probably the student with a "bad" teacher does not think about the teacher as a person to take into account.

With regard to the effect of teachers' autonomy support, we an effect ot the teachers' autonomy support the relationship between students' perceived autonomy support and students' autonomy. As can be seen in Figure 3, in the regression of students' perception on students' autonomy, in the high teacher structure scenario there is a steeper slope than in the low structure scenario. This means that a teacher's positive influence within a high autonomy support classroom is higher than the negative influence within a classroom of a low autonomy support. That is, in the contexts where a teacher does not support autonomy, the negative effects on students are not so detrimental.

Current findings are promising but subject to certains limitations. La Guardia analyzed the relationships between different relational partners, in our study we only focus on the homeroom teacher. It would be interesting for futures studies to analyze the effect of different teachers or even relational partners; because it could be that the different behaviors of both needs might be due to the fact that competence is fulfilled by other figures, such as other teachers, family members or friends. Furthermore, it may be interesting to assess teachers' interpretation of their own teaching quality, and observe whether the relationship between students' perception of the teaching and their needs depends on this measure. Future research could also focus just on one subject, because stronger relationships might be observed in subjects with more hours per week, such as math or english. Finally, we would like to highlight that not taking into account previous achievement or socioeconomic variables might alter true relationships between the studied variables.

Study results contribute to describe a more detailed picture of the relationship between teaching quality and student needs. Our findings show that students are resilient in the face of a teacher that do not structure well enough the class. However, when teachers hold a teaching quality that promotes an adequate functioning, our study underline the importance of promoting students' competence
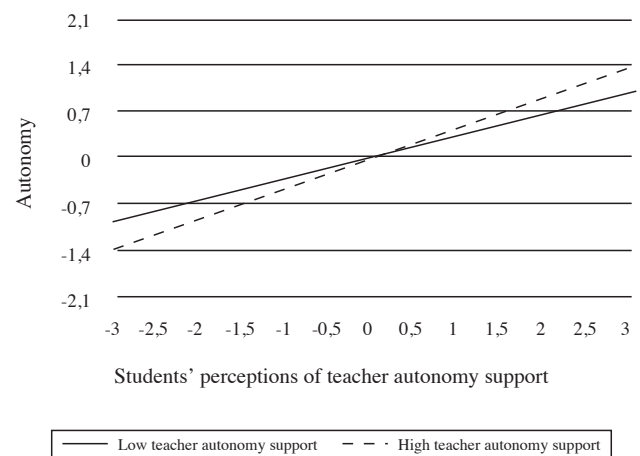

Figure 2. Relationship between students' perception of class structure and student's competence

Figure 3. Relationship between students' perception of teacher autonomy support and student's autonomy

and autonomy, which are two basic factors in the students' engagement and achievement (Jang et al., 2010; León, Núñez, & Liew, 2015). Thus, we highly recommend teachers to acknowledge students' feelings, provide school contents' meaningful rationales, use non-controlling language, offer multiple choices, nurture inner motivational resources, provide instruction step by step, prepare classes, and provide optimal challenges and positive feedback.

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