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# Design, Motivation and Performance in a Cooperative MOOC Course

## Diseño, motivación y rendimiento en un curso MOOC cooperativo

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### ABSTRACT

MOOCs are seen as the latest evolution in online learning and, since their launch in 2008, they have become an integral part of university course curricula. Despite the social success of these courses, the learning design and efficacy of their results have been questioned. Most current research has focused more on discussing their potential to offer quality, large-scale education worldwide rather than measuring learning outcomes. This paper shows the results of a research study that focused on the pedagogical design of a cooperative MOOC and its influence on motivation and academic results. A Delphi study was used to validate the design, and the motivation variable was controlled using the Instructional Materials Motivation Survey (IMMS). Academic performance was assessed through evidence-based learning. The paper argues that design, which is defined by the students' intensive use of social networks and the activities they carry out in their Personal Learning Environments, has an influence on performance, and the variable that mediates in that relationship is the level of satisfaction with the perception of the design. The academic results obtained and the students' motivation support the use of cooperative MOOCs in university education.

### RESUMEN

Los cursos MOOC se han entendido como la última evolución del aprendizaje en red, y desde su nacimiento en 2008 se han puesto en práctica en un buen número de universidades. A pesar del éxito social de estas propuestas, tanto el diseño del aprendizaje como la eficacia de sus resultados han sido puestos en duda. Actualmente la mayoría de las publicaciones se centran más en discutir su potencial para ofrecer educación de calidad en todo el mundo a gran escala que en la medición rigurosa de los resultados de aprendizaje. El presente trabajo muestra los resultados de una investigación centrada en el diseño pedagógico de un curso MOOC cooperativo y su influencia en la motivación y en los resultados académicos obtenidos. El diseño se ha validado a través de un estudio Delphi y la variable «motivación» se ha controlado a través de un instrumento estandarizado (Instructional Materials Motivation Survey, IMMS). El rendimiento académico se ha evaluado a través de evidencias de aprendizaje. Se defiende que el diseño, definido por una utilización intensiva de redes sociales y realización de actividades por parte de los estudiantes en sus Entornos Personales de Aprendizaje, influye en el rendimiento, y es la satisfacción con la percepción del diseño la variable que media en dicha relación. Los resultados académicos obtenidos y la motivación de los estudiantes avalan la utilización de cursos MOOC cooperativos en estudios universitarios.

### KEYWORDS | PALABRAS CLAVE

Higher education, learning, motivation, personal learning environments, cooperative learning environments, virtual learning, educational innovation, educational research.
Educación superior, aprendizaje, motivación, entornos personales de aprendizaje, entornos de aprendizaje cooperativos, aprendizaje virtual, innovación educativa, investigación educativa.

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## 1. Introduction and state of the question

MOOCs have featured prominently in the scientific literature recently as a new way to provide training which is attracting millions of students across the world and forcing universities to reformulate their online education courses. MOOCs are seen to represent the next evolution in e-learning within a continuum which, according to Conole (2014), spans the earliest movements in multimedia in the 1980s to the MOOC that first emerged in 2008 followed by Learning Analytics two years later. The scale of MOOCs, the speed at which they have grown and the difficult questions they pose are increasingly prominent as the purpose of Higher Education and the very future of the university comes under scrutiny. It clearly indicates that something new is happening, something more than a mere trend. So, this is a subject of particular concern to anybody seriously interested in the digital future of education.

The interest this subject arouses is seen in a body of research centred on various MOOC projects. Works by Liyanagunawardena, Adams & Williams (2013), Castaño (2013) and Karsenti (2013) were systematic studies of investigations into MOOCs between 2008 and 2013. The main lines of research included the pedagogical design of MOOCs, interaction between students and the perspectives for learning and its associated variables (motivation, attitudes and perspectives). Other aspects were cost, universal accessibility to Higher Education and the problem of student drop-out rates.

Many authors state that MOOC are substandard in terms of educational rigour (Vardi, 2012; Zapata-Ros, 2013), and that the current discourse on MOOCs merely reflects strategic, institutional, economic, social and technological concerns whereas there is no real discussion of the courses' pedagogical value (Guàrdia, Maina & Sangrà, 2013: 4).

Despite these criticisms, and the fact that MOOC constitute a type of education that is flexible but not widely standardized (Shirky, 2013), various authors suggest there is a difference between c-MOOC (connectivist) and the more traditional x-MOOC (Downes, 2011; Siemens, 2012a; Rodriguez, 2013), making it impossible to talk of a single pedagogical design. Rodriguez (2012) analysed several courses of both tendencies and established that the difference between the two lies in their theory of learning and pedagogical model.

This initial description was too simplistic and is now more complex. Knox, Bayne, Macleod, Ross and Sinclair (2012) attempted to overcome these deficiencies by incorporating more interesting and innovative e-learning practices into their «E-learning and Digital Cultures» course, giving preference to content submission to the social networks of the process, the community and learning.

This proposal is in line with Lane (2012) who encountered difficulties in situating her approach within the «Stanford Model» versus the «Connectivist MOOC» debate, and proposed her own task-based project called s-MOOC (skills-MOOC).

This simplistic x-MOOC and c-MOOC classification has been bypassed thanks to alternative descriptions of the nature of MOOCs. Downes (2013) suggests four criteria: autonomy, diversity, openness and interactivity. Going further, Clark (2013) deploys a taxonomy of eight different MOOC types, claiming that they can be located at any point along the spectrum of traditional online courses. Conole (2013) proposes that they be classified as a set of 12 dimensions, which makes MOOC design even more complex.

In this sense cooperative MOOCs try to respond to MOOC student heterogeneity by producing an X-type course that nevertheless incorporates the advantages of connectivist courses (Fidalgo, Sein-Echaluze & García Peñalvo, 2013): intensive use of social networks, creation of learning communities (Alario-Hoyos & al., 2013) and the deployment of PLE, or personal learning environments (Castaño & Cabero, 2013: 102).

The efficacy of online training and MOOCs continue to represent an evolution in e-learning (Conole, 2014), and this theme is well-established in numerous research meta-analyses (Cabero, 2008; Means, Toyama, Murphy, Bakia & Jones, 2010). Although several studies have indicated that the pedagogical foundations of MOOCs are solid according to the various formats they employ (Glance, Forsey & Riley, 2013; Sonwalkar, 2013), the influence of different MOOC designs on learning outcomes has yet to be adequately researched. References to this theme are found in connectivist courses, the only in-depth studies are by Kop & Fournier (2011), Kop, Fournier & Mak (2011) and De Waard (2011, 2013), focussing more on their transformative effects on the conventional structures of knowledge generation than rigorously measuring learning outcomes.

From another viewpoint, some studies point to the potential of MOOCs to spur student autonomy (Kop, Fournier & Mak, 2011; Milligan, Littlejohn & Margaryan, 2014) and develop 21st century competences (Yeager, Hurley-Dasgupta & Bliss 2013; Sangrá & Wheeler, 2013).

Motivation has already been identified by Milligan, Littlejohn & Margaryan (2013) as a variable that enhances participation and academic success among students. Similar studies have recently appeared, such as Cheng (2014) on emotional competence in MOOC students, and Veletsianos (2013) on student learning experiences on MOOCs.

Research has also given rise to more sceptical voices on the use of MOOCs in Higher Education. Some authors show that the advantages of MOOCs are no different from those that were already known from distance learning (Fini, 2009; Yuan & Powell, 2013; Harder, 2013).

It is also known that student dropout rates have increased with the appearance of MOOCs. However, as Liyanaguna wardena, Adams & Williams (2013) point out, data on MOOC dropout rates are not readily available. Jordan (2013) examined 24 MOOCs and found that the highest rate of course completion was 19.2% while most barely reached 10%. Liyanagunawardena, Parslow & Williams (2014) show that MOOC students do not typically drop out for financial reasons since they do not pay enrolment or tuition fees; these authors suggest that abandonment has more to do with dissatisfaction at not achieving personal objectives.

**MOOCs have featured prominently in the scientific literature recently as a new way to provide training which is attracting millions of students across the world and forcing universities to reformulate their online education courses. MOOCs are seen to represent the next evolution in e-learning within a continuum.**

## 2. Research method

The aim of this investigation is to analyse the pedagogical design of a cooperative MOOC and measure its influence on student motivation and academic results. The questions addressed are:

a) Is there a relationship between academic performance and the pedagogical design of the course?

b) Is there a relationship between student motivation and the pedagogical design of the course?

c) Is there a relationship between academic performance and student motivation?

One of the mainstays of this research was the pedagogical design of the course which was cooperative in nature. For the design of the MOOC, we carried out a Delphi double to string study with 53 experts in e-learning and ICTs from European and Latin American universities. We asked them about MOOC types, ways of learning and assessment methods, and the roles and functions of tutors. We took their responses and resubmitted the design of the course, located on the Chamilo Metauniversity open source e-learning platform under GNU/GPLv3 licensing.

In addition, and to foment interaction between participants, we actively encouraged students to use social networks (Twitter, Skype, blogs, Facebook, LinkedIn, etc.). The platform's technical limitations were overcome by opening a Ning website to allow students to socially interact and discuss their contributions. They did e-activities on a weekly basis, all of which helped participants to construct their own PLE.

The statistical analysis of the data was carried out with the SPSS version 22 program. In the data collection process, besides the assessment of the e-activities by the tutors, there was a set of four questions on the course design with responses measured on the Likert scale.

The data on motivation was gathered by means of an IMMS (Instructional Materials Motivation Survey) which the MOOC students completed at the end of the course. This was a Likert-type questionnaire made up of 36 items divided into four categories (attention, confidence, satisfaction and relevance) based on Keller's ARCS motivation model (1987). In this case we took the proposal of Di Serio, Ibáñez & Delgado (2013) with a documented reliability coefficient of 0.96 and adapted it slightly to fit MOOCs.

### 2.1. Sample

The course was designed for students in the fourth year of a Primary Education degree course at the Universidad del País Vasco, although the very nature of the MOOC meant that it was accessible on the Net to all those interested in this subject, in line with other MOOC experiences (Siemens, 2012b; Knox, Bayne, Macleod, Ross & Sinclair, 2012).

Of the 744 students who enrolled on the MOOC the sample consisted of 186 participants, classified as N in the research. In terms of the dropout rate, 186 students began the course, 25.83% of those who had signed up, and 88 completed the course, 11.82%. Sample attrition was in line with general MOOC dropout rates although participation was slightly higher than the 10% indicated by Jordan (2013).

### 3. Analysis and results

We present the analysis of the data yielded by the scales used (IMMS and the scale for the course design) in the order of the research questions posed. The global results of the correlational analysis also come with a study based on the division of the MOOC students into two groups according to age, those who are 31 or under and those over 31, since the first group was formed of undergraduates and the second group was not.

The course design is based on four variables assessed by the participants using the Likert scale applied to these four items: the use of small video packages is a good idea; I was able to control the development of the course with ease thanks to carrying out e-activities; interaction with course colleagues via the network enhances learning; the use of a social network as a course complement has helped me to follow the course.

In reference to the first research question (Is there a relationship between academic performance and the pedagogical design of the course?), a direct relationship between these two factors is observed. The relationship is significant both in the overall result and in the results for the two age groups (table 1). The four items on the scale that relate to the course design were valued positively or very positively by 85% of the students.

The second research question (Is there a relationship between student motivation and the pedagogical design of the course?) emphasises the potential relationship between motivation and course design. The results in table 2 show a direct link between the type of course design and student motivation. The correlational analysis of the total sample is significant in this global aspect and is supported by the significance that emerges for each of the factors (attention, confidence, satisfaction and relevance) on which the level of motivation is based, according to the IMMS scale. These results are significant and they appear in all the factors and among all the students in the two age groups, just as occurred with the first research question. Thus, we can state that the course design influences student motivation.

Thus we can state that there exists a direct relationship between each of the four factors that measure motivation and course design.

With regard to the attention variable, the results (table 3) confirm that the items related to methodology (items 2 and 8), quality (11, 12, 15, 28 and 29), organization (17, 20 and 31) and use of material (22 and 24), as well as interaction via Internet (19), all positively contribute to student motivation on the MOOC.

In addition, there is an increase in each individual's confidence in learning, as gathered in the second factor on the IMMS scale (items 1, 3, 4, 7, 13, 25, 34 and 35 in table 3)

The same result is found in the factors that correspond to satisfaction and relevance (table 2). According to the data (table 4), the course design (items 6, 27, and 36) together with the material (9, 16, 18, 23 and 33), and the development of the MOOC (5, 10, 21 and 32) is relevant and satisfactory (14, 26 and 30).

**Table 1. Total sample correlations by age group between performance and design**

| | | | PERFORMANCE | DESIGN |
|---|---|---|---|---|
| PERFORMANCE | Total sample | Pearson's r | 1 | .264* |
| | | Sig. (bilateral) | | 0.015 |
| | | N | 186 | 84 |
| | <=31 | Pearson's r | 1 | .268* |
| | | Sig. (bilateral) | | .046 |
| | | N | 96 | 56 |
| | >31 | Pearson's r | 1 | .442* |
| | | Sig. (bilateral) | | .040 |
| | | N | 83 | 22 |

The results for the third research question (Is there a relationship between academic performance and student motivation?) were different in terms of global perspective and age group.

The following results show that although there is no direct overall relationship between academic performance and motivation, there is some significance in the global relationship between performance and one of the IMMS factors, this being student satisfaction (table 5).

This significance is also seen in the students aged over 31 yet it has no correlation in the younger age group, 31 and under (table 5).

These results lead us to state that there is no direct relationship between global motivation and performance, yet there exists such a relationship between

| Table 2. Correlations for the total sample and the two age groups between design and IMMS scale factors | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | DESIGN | ATTENTION | CONFI. | SATISF. | RELEVANCE | TOTAL IMMS |
| DESIGN | Total sample | Pearson's r | 1 | **.558**** | **.363**** | **.631**** | **.529**** | **.588**** |
| | | Sig.(bilateral) | | **.000** | **.001** | **.000** | **.000** | **.000** |
| | | N | 85 | 81 | 83 | 84 | 84 | 80 |
| | <=31 | Pearson's r | 1 | .595** | .331* | .643** | .595** | .622** |
| | | Sig.(bilateral) | | .000 | .015 | .000 | .000 | .000 |
| | | N | 56 | 54 | 54 | 55 | 55 | 53 |
| | >31 | Pearson's r | 1 | .613** | .503* | .697** | .439* | .585** |
| | | Sig.(bilateral) | | .003 | .014 | .000 | .036 | .005 |
| | | N | 23 | 21 | 23 | 23 | 23 | 21 |

global motivation and one of the factors that constitutes motivation, namely satisfaction. Overall, satisfaction correlates directly to student performance on the MOOC.

Finally, an analysis was made of the mediation of the satisfaction factor in the relationship between course design and performance in the total sample. With the introduction of the mediatory variable (satisfaction) the relationship between the design factor and performance disappears and ceases to be significant, which means that the relationship between design and performance is based on the satisfaction factor because, when it is controlled, the previous relationship is nullified: b = 0.25* (E.T. = 0.10) / b = 0.16ns (E.T = 0.12) (*p < .01). Hence, satisfaction mediates between design and performance, so the greater the satisfaction with the design of the course, the better the student performance.

## 4. Discussion and conclusions

MOOCs are defined by the huge number of students they attract and their heterogeneity, and also by high dropout rates. The study shows that a mixed course design that is cooperative in nature and which incorporates social networks as a learning strategy can help to reduce this phenomenon (Fidalgo, Sein-Echaluze & García Peñalvo, 2013). These data reinforce the validity of interaction for learning on online courses, as shown in previous research (Vidal & Camarena, 2014).

Course design influences performance since there is a direct significance between both factors in the glo-

| Table 3. Items related to the Attention and Confidence factors | | | | | | |
|---|---|---|---|---|---|---|
| **IMMS** | % | | | | | |
| **Items related to the Attention factor** (1 strongly disagree, 6 strongly agree). | 1 | 2 | 3 | 4 | 5 | 6 |
| 2. I noticed something interesting when this MOOC first caught my attention. | 1.1 | 11.7 | 8.2 | 21.1 | 30.5 | 27 |
| 8. The MOOC methodology really stands out. | 11 | 0 | 2.3 | 17.6 | 35.2 | 42.3 |
| 11. The quality of the material helped to hold my attention throughout the course. | 1.1 | 2.3 | 3.5 | 25.8 | 48.2 | 18.8 |
| 12. The material is so abstract that it was difficult to keep focussed on it. (Inverted) | 11.7 | 42.3 | 28.2 | 10.5 | 4.7 | 2.3 |
| 15. The videos and texts that were part of the course were not in the least attractive. (Inverted) | 24.7 | 29.4 | 32.9 | 10.5 | 1.1 | 1.1 |
| 17. The way the information is organized helped to hold my attention throughout the course. | 1.1 | 1.1 | 7.05 | 29.4 | 47.05 | 14.1 |
| 19. Interaction with my course colleagues via Internet helped to hold my attention throughout the course. | 3.5 | 8.2 | 7.05 | 25.8 | 38.8 | 16.4 |
| 20. The information I found throughout my learning experience on the course aroused my curiosity. | 0 | 8.2 | 2.3 | 14.1 | 51.7 | 23.5 |
| 22. I found that the number of e-activities I had to do was annoying. | 11.7 | 29.4 | 34.1 | 10.5 | 9.4 | 4.7 |
| 24. Carrying out the e-activities helped to hold my attention throughout the course. | 2.3 | 2.3 | 7.05 | 22.3 | 42.3 | 23.5 |
| 28. The variety of the audiovisual material helped to hold my attention throughout the course. | 1.1 | 1.1 | 5.8 | 35.2 | 38.8 | 17.6 |
| 29. The audiovisual material is boring. | 28.2 | 32.9 | 25.8 | 9.4 | 2.3 | 1.1 |
| 31. There is so much content that it is annoying. | 17.6 | 35.2 | 24.7 | 15.2 | 5.8 | 1.1 |
| **Items related to the Confidence factor** | | | | | | |
| 1. When I first saw this course, I thought I would find it easy. | 17.6 | 16.4 | 22.3 | 24.7 | 16.4 | 2.3 |
| 3. This material was more difficult to understand than I would have liked. | 7.05 | 29.4 | 15.2 | 31.7 | 12.9 | 3.5 |
| 4. Following the presentation of the information, I felt sure I knew what it was that I had to learn on this course. | 1.1 | 3.5 | 17.6 | 22.3 | 43.5 | 11.7 |
| 7. There was so much information that it was difficult to recall the most important points. | 3.5 | 20 | 28.2 | 34.1 | 9.4 | 4.7 |
| 13. As I was working through the course, I felt sure that I could learn from the content. | 0 | 1.1 | 7.05 | 21.1 | 45.8 | 24.7 |
| 25. After working a while on this course, I felt sure that I could pass an exam on the subject. | 0 | 4.7 | 9.4 | 32.9 | 43.5 | 9.4 |
| 34. I could not understand most of the course material. | 23.5 | 45.8 | 15.2 | 11.7 | 2.3 | 1.1 |
| 35. The material was well-organized, which gave me the confidence to believe I could learn from it. | 0 | 1.1 | 4.7 | 32.9 | 41.1 | 20 |

bal result and in the characteristics of the pedagogical design proposed (use of micro-content, video micro-packages, intensive social network activity and the carrying-out of online activities within students' own PLE).

Likewise there is a direct link between course design and the four motivational factors on the IMMS scale: attention, confidence, satisfaction and relevance. This connection affects methodology and the quality and organization of the written and multimedia material used on the course as well as the interaction between students. These data reinforce the potential of cooperative designs for learning in Higher Education.

**Table 4. Items related to the Satisfaction and Relevance factors**

| IMMS | % | | | | | |
|---|---|---|---|---|---|---|
| **Items related to the Satisfaction factor** (1 strongly disagree, 6 strongly agree). | 1 | 2 | 3 | 4 | 5 | 6 |
| 5. Carrying out e-activities on this course gave me a feeling of satisfaction at having achieved something. | 1.1 | 2.3 | 0 | 14.1 | 34.1 | 34.1 |
| 14. I enjoyed this course so much that I would like to know more about the subject. | 1.1 | 4.7 | 9.4 | 29.4 | 29.4 | 25.8 |
| 21. I really enjoyed studying this course. | 3.5 | 5.8 | 5.8 | 15.2 | 44.7 | 24.7 |
| 27. The comments I received on completing an exercise, or during my course work, made me feel that my hard work had been worth it. | 3.5 | 7.05 | 8.2 | 37.6 | 34.1 | 9.4 |
| 32. I feel good about having completed the course satisfactorily. | 2.3 | 3.5 | 2.3 | 8.2 | 32.9 | 50.5 |
| 36. It was a pleasure to work on such a well-designed course. | 1.1 | 2.3 | 5.8 | 27.7 | 30.5 | 35.5 |
| **Items related to the Relevance factor** | | | | | | |
| 6. For me the content of the material is clearly related to things I already know. | 0 | 9.4 | 14.1 | 28.2 | 40 | 8.2 |
| 9. There are videos and texts that show me that this material could be important to some people. | 0 | 0 | 0 | 5.8 | 44.7 | 49.4 |
| 10. Completing the e-activities satisfactorily was important to me. | 1.1 | 2.3 | 2.3 | 3.5 | 40 | 50.5 |
| 16. The content of this material is relevant to my personal interests. | 1.1 | 4.7 | 10.5 | 18.8 | 31.7 | 32.9 |
| 18. There are explanations or examples of how to use the knowledge acquired on this course. | 0 | 4.7 | 3.5 | 35.2 | 43.5 | 12.9 |
| 23. The content and audiovisual material on this course give me the impression that they are worth knowing. | 0 | 1.1 | 4.7 | 29.4 | 44.7 | 20 |
| 26. This course was irrelevant to my needs because I already knew most of the content. | 45.8 | 35.2 | 11.7 | 4.7 | 1.1 | 1.1 |
| 30. I can relate the course content to things I have seen or done, or to issues I have thought about in my life. | 0 | 2.3 | 2.3 | 27.05 | 45.8 | 22.3 |
| 33. The course content will be useful for me. | 1.1 | 2.3 | 2.3 | 15.2 | 27 | 50.5 |

Yet this does not occur when the scale and its four motivational factors correlate to academic performance. There is no global significance between motivation and performance, but we observe that one of the factors on the IMMS scale, satisfaction, indicates that there is a direct link to performance in the global results and in references to students over 31 years old. At a time when universities are rethinking their online training courses, traditional MOOCs may attract new students to university but it is cooperative MOOCs that can increase the level of student satisfaction and help cut dropout rates. Possibly a hybrid design like the one proposed here fits better with the different types of student that take MOOCs (Milligan, Littlejohn & Margaryan, 2013), and enables them to reach their personal objectives (Liyanagunawardena, Parslow & Williams, 2014). This would allow universities to offer continuous training and Lifelong Learning with course designs that better adapt to students' needs. Indirectly, it also reveals the capacity of this pedagogical design to develop in students those learning competences that are essential in the 21st century.

Finally, the general sample's level of satisfaction derived from the positive perception of a good course design and the consequent, good academic performance achieved by those students supports the use of massive open online courses in graduate studies.

After the analysis of the mediation of the satisfaction factor in the relationship between the pedagogical design of the course and performance, we observe that the relationship between both ceases to be significant. It is, therefore, the level of satisfaction regarding the pedagogical design of the course that influences academic outcomes. It would be interesting to broaden these results with an analysis of students' learning experiences on MOOCs.

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**Table 5. Correlations between performance and IMMS by factors in the two age groups**

| | | | PERF. | ATTENTION | CONFI. | SATISF. | RELEVANCE | TOTAL IMMS |
|---|---|---|---|---|---|---|---|---|
| PERFORMANCE | Total sample | Pearson's r | 1 | .025 | .048 | .244 | .166 | .085 |
| | | Sig.(bilateral) | | .827 | .667 | .025 | .130 | .453 |
| | | N | 186 | 81 | 83 | 84 | 84 | 80 |
| | <=31 | Pearson's r | 1 | .157 | .264 | .110 | .163 | .240 |
| | | Sig.(bilateral) | | .257 | .054 | .426 | .235 | .084 |
| | | N | 96 | 54 | 54 | 55 | 55 | 53 |
| | >31 | Pearson's r | 1 | .227* | .209 | .432* | .172 | .220 |
| | | Sig.(bilateral) | | .322 | .338 | .040 | .434 | .339 |
| | | N | 83 | 21 | 23 | 23 | 23 | 21 |


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