

THE EFFICACY OF VIDEO COMPONENTS USED IN THE ONLINE EDUCATION OF HEALTHCARE STUDENTS

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ABSTRACT

Background: In healthcare education, practical learning and the application of knowledge are crucial for establishing professional skills and abilities. Throughout the COVID-19 pandemic, the practical form of education in medical schools faced great challenges, which resulted in the adoption of new digital teaching methods that allowed for distant learning. In our academic programs, video lessons were widely used and proved successful in terms of practical education. With the assistance of video materials and digital technologies, we were able to ensure a better visualization of resources and provide a space for developing professional habits and skills.

Aim of the study: To determine the extent to which this new e-learning process was effective with regards to gaining practical knowledge and how it was perceived by the students.

Material and methods: We carried out quantitative research among students who received both forms of education – in-person and online. Data was collected via a survey, where the students shared their views about the efficacy of the teaching methods on their practical education and their evaluations of the online learning. The results were based on the mathematical-statistical method.

Results: Overall, the students had a positive response towards the digital learning approach and 44% of them felt more motivated to study. Despite these findings, approximately three-quarters of the students (74%) believed that practical training should not be performed entirely via video materials.

Conclusions: The implementation of video components presents opportunities for practical training to be flexible, adaptive and stable given that the accompanying changes, challenges and problems are analyzed, comprehended, and solved.

KEYWORDS: practice, healthcare, online education, video

BACKGROUND

Today, there are various educational methods and digital resources that enable students in the healthcare field to obtain, develop and improve their professional skills with the use of online courses and lectures. This view is also shared by other professionals.

For example, Leisi Pei and Hongbin Wu, who carried out a similar study about online education in medical schools stated that “It has got its advantages and resources for improvement of the knowledge and skills of the students therefore it can be regarded as a potential method in the teaching in the college medical education as well” [1]. Efficient practical training is

of great importance in the education of healthcare experts. [2]. Over time, it's been undoubtedly proven that physical attendance and practical training are effective means of learning for healthcare professionals. Essentially, this well-established structure is stable; however, taking into account the changing conditions and thriving digital technologies, the need for modernization is inevitable. The development of practical skills through the use of interactive methods of study, such as interactive computer technologies (ICT), digital methods, simulation devices, roleplaying games, work on projects, etc. is ever more exigent [3]. Such modern methods play an important role in the education of healthcare professionals and allows them to be placed in situations closely related to real work environment, where they can be provoked into applying their knowledge and build problem solving skills in a professional setting. This 'novel' digital educational process requires the implementation of technical innovations in the healthcare field. The formation of a new of generation students is directly linked to the development of the digital world and the virtual assessment of practical skills, which separates current students from their predecessors. Based on this, the interactive methods of learning represent the next step in the upgrading of the current educational system [4].

Another key component in the education of the healthcare experts involves the establishment of professional habits and adequate actions in real-world situations. In the in-person form of education, there are already well-established models and methods to ensure this; however, it is unclear if this can be achieved in the online environment. Visualization of materials is one of the leading elements in the receipt of information. Studies have shown that when new information is provided, 10% of it is assimilated by hearing, 20% by vision, 40–50% with both senses, and up to 90% via active engagement and immediate participation in the educational process. In this aspect, interactive studying promotes understanding of the theoretical and practical value of newly acquired knowledge and skills [5]. Visualization is very important for practical learning, especially when it is aimed at the creation of new skills. When teaching practical exercises, the repetition of definite actions is used to form skills and habits according to a given standard. In this way, the knowledge is preserved, the professional skills are shaped, and a creative (not mechanical) comprehension of the material is achieved.

Teaching through instructive practice is crucial because of the great volume of theoretical knowledge used by medical specialists and because practical skills can only be developed via extensive training. This training is usually carried out in a specially equipped environment with models and mock-ups.

Incorrectly formed practical skills, can have fatal consequences for patients [6]. Visualization, demonstration and the repetition of information are important methods used in face-to-face teaching, which assist with the formation of practical skills. The most suitable means of implementing these methods in an online environment is via video training or e-learning, where demonstrations can be visualized with video recordings or live streams to promote the teaching process and elicit feedback from students. The neuron network offers an innovative tool for analyzing online learning processes. It provides effective solutions for both data description and problem solving in relation to forecasting [7]. High-quality practical training is an element of the educational process that allows for the fast and effective professional development of students and ensures high standards in the healthcare industry.

AIM OF THE STUDY

The purpose of the current study is to explore the views of healthcare students on the effectiveness of online practical learning via the use digital components, such as video recordings, video materials, and virtual conference calls. The students were taught in the Health Care Department at the Medical College of "Yordanka Filaretova" by experts in the fields of medical aesthetic care, radiology, and physiotherapy.

MATERIALS AND METHODS

Study design

To achieve the aim of the study, the following analyses were conducted:

1. Analysis of the participants based on the following demographic characteristics: degree, course, and age.
2. An evaluation of the students' opinions on the usefulness of video recordings, video materials and video conferencing as a means of acquiring knowledge and developing practical skills.
3. Analysis of the students' perceptions of the use of video materials for problem solving.
4. Comparison between the views of the students who were taught online and those who received in-person instruction.

Participants

The participants were 192 students from the specialties of medical aesthetic care, radiology, and physiotherapy.

Inclusion criteria

The basic criteria for the selection of the participants were: identical methods for practical training in the three specialties, and students from the 2nd and 3rd courses having participated in both forms of education (i.e., in-person and distance learning).

Exclusion criteria

The exclusion criterion was lack of a willingness to voluntarily participate in the study. The group of chosen students was based upon “accessibility” and the conclusions drawn are not representative for all college students.

Ethical considerations

The participants were informed about the principles and purpose of the study. Participation was voluntary and the responses were kept anonymous.

Data sources/measurements

A direct survey was administered at the end of the distance form of education in November 2020. The survey contains 24 open and closed form questions. Preliminary analysis of the answers to the closed questions clearly showed outlined opinions on the usefulness of the methods applied for learning via video materials and remedies for synchronous communications in real time (video-conference connection). The answers to the open questions only added to the student evaluations and did not contribute any additional informational value to the overall analysis. Thus, the responses the open questions were not analyzed in the present study.

Mathematical-statistical methods

The answers to the survey questions were on nominal, rank and ordinal scales, which allows for the use of Pearson's χ^2 tests and non-parametric tests for hypothesis testing (Kruskal–Wallis ANOVA and Mann–Whitney U tests, and contingency coefficients (C). The results were analyzed with the software package SPSS v.19. The significance level was set at $\alpha=0.05$.

RESULTS

Under the conditions of a continuous pandemic state, the education of students from the Medical

College at the Medical University-Sofia was carried out at a distance. In view of the conditions, a teaching process known as the event-oriented design model was adopted for the web-based education. [8]. With the use of this model, the importance of the inter-relationship between the teacher and the students is as equally valuable as in face-to-face instruction. This ensures an easier adaptation of the students to the teaching conditions, as, among other things, it creates the sensation of being a part of a team and increases the chances that the students will retain the study material. [9]. The characteristics of the distance teaching process required the application of methods and approaches for practical instruction that differ from those used for in-person learning.

Emphasis was placed on the use of various video components, such as films, recordings, video conferencing, etc. It should be noted that, in the distance form of instruction, the students had to rely on materials available at home. As such, the distance environment is different from the real educational environment, and the learning environment cannot be established equally for all students. This factor was taken into consideration at the time of assigning the tasks for self-instruction.

The main concerns in the current study were the assimilation of the practical material through video lessons, performing exercises via video conferencing, and self-instruction by video recordings of the required tasks.

In the instruction process, videos were presented that showed the performance of a practice exercise. There were several survey questions that evaluated the usefulness of such an approach, including: “Do you think that watching a video recording is a sufficient enough condition in order to acquire the necessary knowledge?”, “To what extent watching video recordings contributes to the development of your practical skills (dexterity, organization and in-detail comprehension)”, and “In which cases the film is most useful for acquiring of the respective skills?”.

Distance education by means of video conferencing was also considered in the survey questions. The students were required to assess the usefulness of this method from an applicability point of view, and the impact on the development and enrichment of their knowledge.

The self-instruction via video recordings involved a process where the students were required to prepare and present to the teachers videos of the preparation and fulfilment of a previously assigned task. The survey questions also asked about the students' individual feelings regarding this form of learning. For example, students were asked “Please, indicate as to the way you were feeling at the time of using the method for fulfilment of the assigned task”, and they were given the possibility of choosing among the fol-

lowing answers: *a) it is amusing to me, b) it is more of hard to me, c) it is boring to me, d) it is motivating, and e) other*". There were also questions appraising the practical usefulness of the method, such as "By preparing a video recording do you have an opportunity to additionally develop and enrich your knowledge and skills?".

The preferences of the students for the distance vs. in-person forms of education were also considered in the survey with two questions. For example, "Do you think that the practice materials replace in terms of usefulness the live performance of exercises (in a lab, study, auditorium)?"

A total of 192 students from second and third year of education took part in the survey. 25.5% (n=49) of students were studying medical aesthetic care, 34.4% (n=66) radiology, and 40.1% (n=77) physiotherapy. The χ^2 test for one sample showed a statistically significant difference between the number of surveyed students from the different specialties (p=0.045).

The per cent ratio of the participants in the survey regarding the years of study did not show a statistically significant difference (p=0.083). 56.3% (n=108) of the surveyed students were in the second course and 43.8% (n=84) in the third course.

As for the age, the analysis indicated that the majority of the students fell into the age range of 18 to 30 years (76.6%, n=147). 14.1% (n=27) were aged between years 31 to 40 years, and 9.4% (n=18) were over 40. The χ^2 test for one sample showed that the numbers of students falling into the different age brackets was significantly different (p<0.001).

Video films aimed at exercising practical skills

In the process of instruction, videos were presented to the students that showed the performance of a practical exercise. The current study aimed appraise the opinion of the students on the practical usefulness of such a method of teaching. All of the 192 students answered the question: "Do you assume that watching video films is an adequate condition to acquire the necessary skills?". Sixty-three per cent of the students declared that it is not an adequate way to acquire the needed skills.

The students were also asked "To what extent video film watching contributes to the development of your practical skills (dexterity, organization and in-detail knowledge?" Answers were provided on a scale from 1 to 6, where 1 means minimum and 6 maximum usefulness. 21.4% of the 192 students rated this teaching method with a low degree of usefulness (rated between 1 and 2), 61.5% rated this method between 3 and 4 (medium high mark), and 17.2 % evaluated the method as having a high usefulness (between 5 and 6). It can be concluded from obtained results

that the development of practical skills, such as dexterity, organization, and detailed knowledge, can be achieved by watching video films with an approximately medium-high degree of success. The question of whether the opinions of the students from the three specialties differ significantly is also of interest. The Kruskal–Wallis ANOVA showed that there was a statistically significant difference between the opinions of the students from the three specialties (p=0.002). In order to establish between which specialties the opinions differ, the Mann–Whitney U test was used, and the results are presented in Table 1.

Table 1. Opinion of the students from the three specialties about video films aimed at exercising practical skills

No	Specialties	Medium ranking (%)	Mann–Whitney U p-value
1	Medical aesthetic care	76.56	0.001 (p<0.05)
	Physiotherapy	55.19	
2	Medical aesthetic care	65.81	0.023 (p<0.05)
	Radiology	52.20	
3	Physiotherapy	67.03	0.110 (p>0.05)
	Radiology	77.80	

The analysis shows that the opinion (medium or high degree of usefulness) of the students from the medical aesthetic care specialty differs considerably from their colleagues in the other specialties. They share a similar opinion about the degree of usefulness of the method of instruction and its capability for development of their practical skills (nearly a medium degree of usefulness).

All 192 students answered the question "Do you have the opportunity to additionally enrich and develop your knowledge and skills by watching video films?" Analysis of the data showed that 39.1% thought that this method gives them a chance to enrich and additionally develop their knowledge and skills, and 45.8% thought that it gives them a chance to some extent. The distribution of the same students is rather impressive when answering the question "Do you think that video film watching is a condition good enough so that you could acquire the needed skills?". The proportion were of students replying negatively to this question were 68.3% for medical aesthetic care, 66.7% for physiotherapy, and 50% radiology. This gives us grounds to assume that video film watching allows for the students to enrich and develop already acquired practical skills but not to create new ones.

The students were also asked "In which cases is the video film most useful for acquiring the corresponding skills?" All of the 192 students answered this question. 70.5% of all answers gave the opinion that the video film is most useful for acquiring the corresponding skills at the time of exercise with explanations on

the part of the teacher and after a performed exercise for revising the procedure. 42.6% of the answers indicated that video films were useful as an ancillary material and a means for self-preparing prior to the exercise in the lab.

Video recording for the purpose for self-instruction

In the process of their education, the students were required to prepare video material for the self-instruction and fulfilment of a given task. The aim of the current analysis was to assess the opinions of the students regarding the practical usefulness of this method of learning.

All 192 students answered the question “Do you think that the method is useful for the better understanding and assimilating of the study material?”. 45.3% of the participants responded affirmatively, 26% could not give an appraisal, and 28.6% claimed that it is not an adequate condition for assimilating the material studied. Kruskal–Wallis ANOVA showed a statistically significant difference between the opinions of the students from the three specialties ($p=0.036$). The respondents from medical aesthetic care had the highest percentage of positive answers (~ 90%), while, in the other two specialties, the answers were approximately equally divided between affirmative and negative answers (35.1% and 40.3% for physiotherapy), and between positive and those who could not make an appraisal (45.5% and 34.8% for radiology).

For the question “To what extent does the method contribute for the development of your practical skills?”, the students were given the opportunity to answer on a scale from 1 to 6 (where 1 means minimum and 6 maximum usefulness). 24.5% of the surveyed students (192 respondents) rated this method of instruction as one with a low degree of usefulness for the development of their practical skills (marks 1 and 2), 55.2% rated this method between 3 and 4 (medium-high mark), and 20.4% between 5 and 6. From the obtained results it can be concluded that the development of practical skills can be achieved by means of preparing a video recording with an approximately medium-high degree of success.

The question about how students from the three specialties rated the usefulness of this method is also of interest. The results from the multi-measure frequency analysis showed that 80.4% of the respondents from medical aesthetic care rated the usefulness of this method as medium high to high, 62.6% of students from physiotherapy rated the usefulness as medium-high, and 61.9% of students from radiology rated the usefulness from poor to medium high.

As for the question “By preparing a video recording do you have chance to additionally enrich and develop

your knowledge and skills?”, 91.5% of the students from all three specialties declared that this method of education allowed them to enrich their knowledge and skills to a certain extent (95.1% from medical aesthetic care, 87.6% from physiotherapy, and 85.7% from radiology).

In order to establish how this method influenced the emotional state of the students, they were asked to do the following: “Point out the way you feel at the time when using the method for performing the assigned task.” All 192 students provided answers. Students generally felt three types of sensations at the time of preparing a video clip for self-instruction: “difficulty” 35.9%, “motivation” 29.7%, and “amusement” 22.9%.

The question as to how much the feeling caused by using the method is linked to the way the students rate its usefulness is of interest to the present analysis. 43.7% of the surveyed students who thought that the use of video recording for self-instruction is useful for better comprehension and assimilation of the studied material also felt motivated during the time of its usage. The percentage of those who approved of the usefulness of the method and felt amused at the same time was also high (33.3%). 56.4% of the respondents who did not find the method to be useful declared that they also experienced difficulties at the time of its implementation. An examination of the correlations between the answers to these two questions indicates a moderate relationship ($C=0.426$, $p=0.001$). The results from the χ^2 test showed that there is a statistically significant dependency between the answers to both questions ($p<0.001$).

Video conferencing

A practical exercise was carried out through video conferencing between the students and teacher as part of the instruction process. The purpose of this analysis was to assess the opinions of the students regarding the practical value of this method of learning.

All 192 students answered the question “Do you think that the method is useful for the better comprehension and assimilation of the studied material?” 54.7% of the students replied affirmatively, 18.2% could not make an assessment, and 27.1% declared that performing a practical exercise through a video conferencing is not good enough for acquiring the necessary skills.

The students were also asked “To what extent does the method contribute to the development of your practical skills?” and gave their answers on a scale from 1 to 6 (where 1 means minimum and 6 maximum usefulness). 22.4% of the 192 students rated this method of teaching with a low degree of usefulness (marks 1 and 2), 49.4% rated this method between 3 and 4

(medium-high estimate), and 28.2% between 5 and 6 (a high degree of usefulness). Thus, the conclusion can be drawn that the development of practical skills can be achieved via video conferencing with an approximately high degree of success.

The question of whether the opinions of the students from the three specialties differed substantially deserves special attention. The Kruskal–Wallis ANOVA showed a statistically significant difference between the three groups of students. In order to establish which specialties differ significantly, the non-parametric Mann–Whitney U test was applied, and the results are presented in Table 2.

Table 2. Opinion of the students about the use of video conferencing to carry out a practical exercise

No	Specialty	Medium ranking (%)	Mann–Whitney U p-value
1	Medical aesthetic care	75.66	0.002 (p<0.05)
	Physiotherapy	55.76	
2	Medical aesthetic care	58.82	0.816 (p>0.05)
	Radiology	57.39	
3	Physiotherapy	62.12	0.002 (p<0.05)
	Radiology	83.52	

The analysis of the results shows that the opinions of the students from the three specialties differ substantially from one another. The students from medical aesthetic care and radiology thought that the usefulness of video conferencing for the development of practical skills ranged from small to medium-high, and their colleagues from physiotherapy rated the usefulness of the this method as medium-high.

The students were also asked “Does the effectuation of an exercise by a video connection render the possibility for an ancillary enrichment and development of your knowledge and skills?”. All 192 students supplied answers. Analysis of the data shows that performing an exercise through video conferencing did enrich and develop their knowledge and skills (35.4%), while 45.3% thought that this was only possible to a certain extent.

It was also important for us to understand how and in what way the method produced an impact on their emotional state. Thus, the students were asked “Point out the way you feel when using the method for performing an exercise”. 191 students gave answers. It was found that the students from the three specialties mainly felt three types of sensations at the time of using the method: “difficulty” 29.8%, “motivation” 30.9%, and “amusement” 20.9%.

Of interest for the present analysis is the question as to what extent the feeling caused by the use of the method is related to how the students rated its usefulness. 44.8% of the students who thought that doing a practical exercise by means of video conferencing is a useful method also felt motivated at the time of its implementation.

Of those who responded affirmatively to the question of its usefulness, 24.8% simultaneously got amused. 51.9% of the participants who did not find the method useful also declared that they experienced difficulties when using it. An examination of the correlations between the answers to these two questions showed a moderate relationship ($C = 0.423$, $p < 0.001$). The results from the χ^2 test showed that there is a statistically significant dependency between the answers to both questions ($p < 0.001$).

Video components

To evaluate the usefulness of video components in practical education, several more questions were included to clarify the penchant of the students to use them.

After posing the question “Do you think that the use of video components is a useful approach for the better build-up of practical skills?”, 181 students gave answers. A half of them (49.7%) thought that the use of video components is a fruitful approach for the development of practical skills. Approximately one-third did not approve of the method (34.3%), and 15.5% were unable to make a judgement.

Also of interest for the present analysis is the question of whether the opinions of the students from the three specialties about the use of video components differed substantially. The Kruskal–Wallis ANOVA showed a statistically significant difference between the students from the three specialties ($p = 0.001$). In order to establish between which specialties the opinions differ, the Mann–Whitney U test was implemented, and the results are presented in Table 3.

Table 3. Opinion of the students about the usefulness of video components in practical education

No	Specialties	Medium rank (%)	Mann–Whitney U p-value
1	Medical aesthetic care	46.64	0.000 (p<0.05)
	Physiotherapy	71.18	
2	Medical aesthetic care	48.61	0.164 (p>0.05)
	Radiology	55.59	
3	Physiotherapy	73.29	0.06 (p>0.05)
	Radiology	60.98	

The analysis shows that the opinions of the students from the three specialties substantially differ from one another. The students from medical aesthetic care stated that the use of video components is a helpful approach for the acquisition of practical skills. The better part of the participants from physiotherapy thought that they could not acquire practical skills this

way. The participants from radiology generally shared the opinion of their colleagues from medical aesthetic care, but the percentage of those who could not make a judgement was relatively high as compared to their colleagues from the other specialties.

The students were asked to rate on a scale from 1–6 “*To what extent can video materials replace in terms of being useful the performance of live exercises (in a lab, studio, auditorium)?*”, with 1 meaning minimum and 6 maximum. 181 students supplied answers. 51.3% of the students stated that the usefulness of video materials compared to the in-person performance of the exercises is low (marks 1 and 2). Over one-third rated the usefulness as medium-high (marks 3 and 4), and only 10% as high (marks 5 and 6).

The student were also posed with the question “*Do you think that the practical education can be entirely carried out via video materials?*”. 181 students gave answers. Approximately three-quarters of the students (74%) indicated that practical training cannot be carried out entirely using video materials. 15.5% found it possible, but only to a certain extent. 8.3% answered affirmatively and 2.2% were unsure in their judgement. These results show that, as a whole, the opinions of the students from all three specialties is similar. The only exception is the relatively high percentage (29.3%) of students from radiology who answered “*To some extent*”. This was also confirmed by a Kruskal–Wallis ANOVA, which showed a statistically significant difference among the students from the three specialties ($p=0.003$). The analysis of the results showed that the opinion of the students from radiology substantially differed from that of the students from the other specialties. The difference is due to the relatively high percentage of students assuming that practical education can to some extent be carried out entirely by means of video materials. This, however, does not change the fact that, like their colleagues, the students from radiology also accept that this method cannot replace live practical instruction.

DISCUSSION

One of the great challenges in modern times is the large scale insertion of new information and communication technologies (IT) into all aspects of social life, as well as in education. The IT sector offers a variety of methods and remedies that provide new opportunities for higher education. These technologies allow for the teaching process to be organized in a way that can take into account the individual needs of students, and that promotes the development of important digital competences necessary for our “knowledge based” economy [10].

The use of video components in the education process has also encouraged the development of active learning methods where the student plays the central role and the teacher is more of a partner in problem solving [11]. The variations in the preparation of lessons using the Cloudy medium are innumerable, depending upon the goals of the teacher, the level of the students, and the materials taught [12]. In this aspect, the use of video materials in various types and forms can help with the instruction of health experts, even in the development of practical skills. Colleagues investigating the web-based education of nurses in clinical practice have arrived at the same conclusion. According to these authors, the addition of visual-based materials to web-based teaching effectively helps in the education process as it can be used to reduce the differences between theory and practice, and to upgrade the knowledge of already qualified nurses [13].

Key results

The current results show a generally positive attitude on the part of students regarding the use of video components in practical education. For example, 61.5% of the students rated the usefulness of carrying out an exercise via a video recording as medium-high. In their opinion, the development of practical skills can be helped by watching video recordings as the students rated this teaching method at a medium degree of usefulness. These results show that the implementation of video lessons should be emphasized when developing instructive methods.

The results concerning the suitability of self-instruction by video recordings show that 43.7% of the students thought that this method was useful for improving comprehension and assimilation of the studied material, and they felt motivated at the time of its use. Taking into account the creative nature of the method, it has been shown that positive emotional memory leads also to a better assimilation of course material [14].

As for carrying out practical education by video conferencing, 49.4% of the students rated the value of this method of learning as medium-high. 44.8% of the students also felt motivated at the time of its application, but 51.9% of the students did not find it useful and they experienced difficulty with it. An analysis of the relationship between improvements in the material and the technical basis and the employment of interactive methods for instruction shows that it can positively influence the motivation of students to study [15]. This suggests that the method of teaching needs improvement in order to raise its usefulness as well.

Professional education involves a complex combination of intellectual and practical activities that mutually potentiate one another to accomplish the essence of a “professional qualification.” Expansion of the students’ potential and their self-affirmation as professionals at the time of instruction represents a challenge to the modern system of education, but it also provides an opportunity to ensure a suitably educated staff in the continuously developing field of healthcare.

CONCLUSIONS

One of the most important steps in the modernization of higher education is the introduction of innovative forms and methods of instruction that increase the activity of the students and their motivation to obtain a high-quality professional education. The methods of interactive instruction do not replace didactic learning, but only add to what is al-

ready known and they allow for more precision in the systems of instruction.

The current results indicate the positive attitudes of students regarding the use of video components as an ancillary method in practical education. However, half (51.3%) of the participants stated that the usefulness of video materials compared to in-person learning is low, while approximately three-quarters of the students (74%) thought that practical education cannot be entirely accomplished by only using video materials.

In conclusion, it can be stated that the implementation of video components enriches and contributes to the development of practical skills, but it is not suitable as a basic form of practical education. Their introduction presents opportunities for practical training to be flexible, adaptive and stable in its development when the accompanying changes, challenges and problems are analyzed, comprehended and solved.

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