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Online Workshops Versus Live Medical Education on Self-Medication Literacy for Middle School Students. What Is the Best Pedagogic Method?

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Abstract

Objective. This study aimed to determine which pedagogic method, online workshops or live medical education, was the better way to teach about self-medication for middle school students. **Methods.** The following groups were formed: group O (students receiving online education), group L (students participating in live medical education animated by a medical practitioner and a science teacher) and group C (students without any medical learning). To compare them, the students answered three multiple choice questions before and after the educational intervention. The students in group L were evaluated immediately after the live medical training and group O immediately after the online workshops (t1). Group C was only evaluated at t0. **Results.** Group C N=195), group L (N=219) and group O (N=200, but 101 students who participated in the online workshops students dropped out before the end) were equivalent in terms of gender, but their ages and school grades were statistically different (P<0.001). A post-hoc test revealed that students in group O were older and in a higher grade than those in the other two groups (P<0.001) but the mean ages and school grades were equivalent in group L and group C. At t0, the results obtained were equivalent in the 3 groups. At t1, school students obtained better results in both groups (P<0.001) but these same results were significantly better in group L than those obtained in group O (P<0.001). Age, gender, school grade and school level had no effect on the students' results. Conclusion: The study's findings suggest that live medical education is a superior approach for imparting self-medication knowledge to middle school students.

Key Words: Online ▪ Medical Education ▪ Workshop ▪ Self-Medication ▪ Middle School.

Introduction

Abuse of self-medication is a major public health problem, especially in the teenager population (1, 2). Although self-medication and improvement of health care literacy could be useful tools in reducing medical overuse in high income countries, inappropriate self-medication can cause potential adverse events, leading to the need to create boundaries (3). For example, self-medication using antibiotics and psychoactive agents seems to give limited symptom relief, while potentially causing adverse events in cases of inappropriate use, which must be dealt with by a health care professional (4).

Paracetamol is one of the most widespread and accessible over the counter (OTC) drugs not requiring a medical prescription or medical advice. Self-medication with paracetamol should be well understood, especially in the young population, in terms of its posology, its secondary effects and its potential liver toxicity. However, Miao et al. (5) highlighted the fact that teenagers with low medical knowledge and literacy were most likely to use

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self-medication to treat pain and unfortunately to be more likely to misuse medication.

Self-medication misuse seems to focus on younger aged individuals (6). However, medical education regarding self-medication in middle school has been poorly studied (5). Nevertheless, many different pedagogic methods could be used given that the young population should be more receptive and more skillful in relation to multimedia approaches. Recently, online education, especially for health care professionals and schoolteachers, has spread, as a result of the epidemic context of COVID-19 (7). It is therefore consistent to wonder if online web education could not be a more relevant pedagogic strategy than conventional methods, such as live face to face education, for targeting the teenager population.

The present comparative study aimed to determine which pedagogic method, online workshops or live, in-person medical education, is better for teaching middle school students about self-medication. Our hypothesis was that students receiving live medical education would have higher post-intervention knowledge scores than those receiving online workshops.

Methods

The Population

This prospective study employed a pre-test and post-test design to evaluate the effectiveness of different educational methods on self-medication literacy among middle school students. Three different groups were constituted prospectively and randomly. All students were in the 7th to 9th years of the same middle school. The present study was accepted by the middle school management team. The "control group" (group C) corresponded to the students who had not undertaken any medical education. The second group was named the "live group" (group L) and included the students who received in-person, live medical education. The third group was named the "online group" (group O) and included school students receiving online medical education without any interaction with the medical practitioner or the science teacher. All the results were pseudonymized.

Procedure

Group L (Figure 1) and group C

In group L, each school student received medical education organized in small groups (10 to 15 students) for 40 minutes. The medical education was provided by a senior resident in general internal medicine, along with a middle school science teacher. Each class was divided into two different stages. The first stage focused on self-medication with OTC analgesics. Recommendations regarding the duration of paracetamol use and its posology, according to the symptoms, disease and the morphology of the patient, were presented in an interesting manner, in the form of clinical cases using fake patients presenting with different symptoms. Competition between the groups was used to engage the teenagers proactively. The teachers emphasized the temporary aspect of self-medication. In the context of the clinical cases, different OTC drugs, posology and treatment duration were proposed, and the school students had to choose between the suggested possibilities. The second session focused on the challenges related to the healthcare pathways used, with an explanation of the different routes in France. The clinical cases were presented (as role play) and the care pathways were debated by the students. In group C, the school students received no medical education nor online workshops. To ensure that differences in results were not due to handling, we carefully managed each group. Group C students were assessed only once at the beginning of the study to establish baseline knowledge. Group L students received consistent medical education through live sessions conducted by a senior resident and a science teacher in small groups, with assessments before and after the sessions. Group O students completed the online workshops individually, with engagement monitored to ensure completion, and they were also assessed before and after the intervention. This approach allowed us to isolate the effects of the educational interventions, providing a clear comparison between the different methods

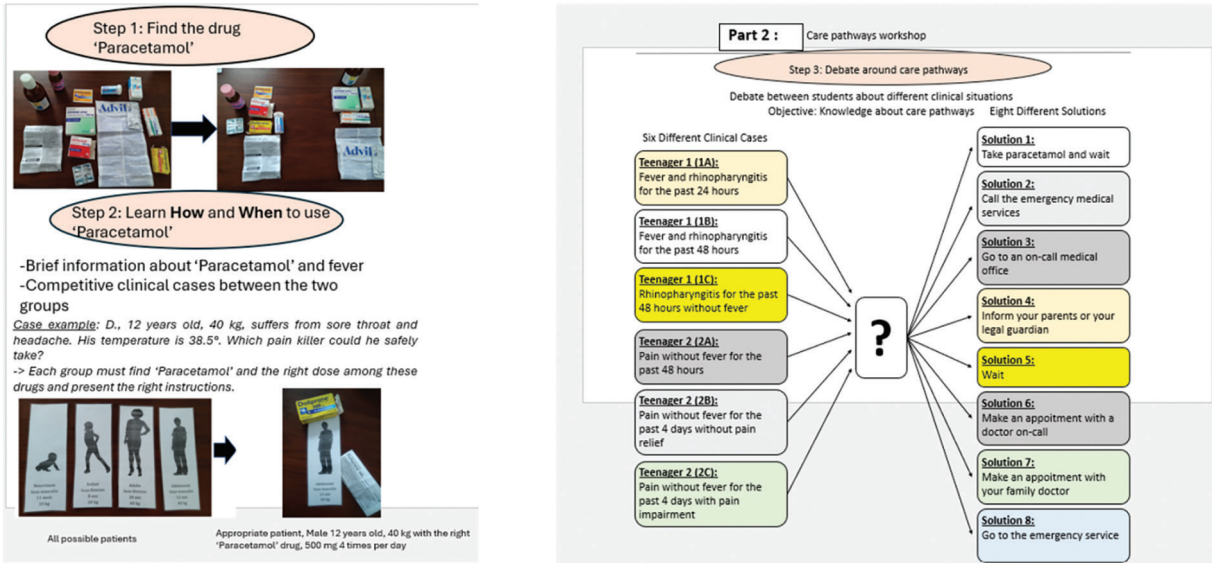

Figure 1. The medical education procedure: First part of the medical education given to group L students: self-medication workshop (Part 1). Second part of medical education given to group L students: self-medication workshop (Part 2).

Group O

In group O, the selected school students connected online to a specially created website. The interactive website was dichotomized into 4 different workshops. The first workshop (Figure 2) consisted of ranking six different medicines as either an OTC drug or other. The students had to decide in six cases involving a different drug either "I can take it without medical advice" or "I cannot take it before seeing a medical doctor". The

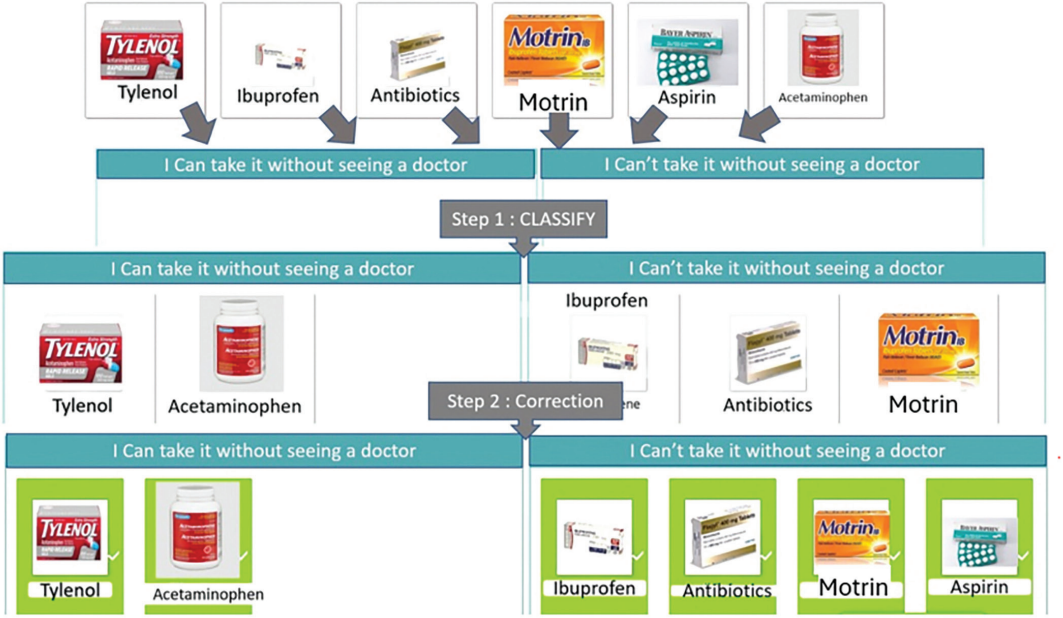

Figure 2. The first workshop for group O consisted of ranking six different medicines as either OTC drug or other. The students had to slide six cases containing a different drug either under "I can take it without seeing a doctor" or "I can't take it without seeing a doctor".

second workshop consisted of identifying the elements in the paracetamol notice (Physicians' Desk Reference) which allowed them to answer three questions regarding the use of paracetamol such as 'What time interval do I need to respect before taking another paracetamol tablet?' (Figure 3). In

Click on the notice :

1. How long can I take paracetamol without seeing a medical doctor if I have some pain or fever?

2. What interval time do I have to respect before taking another pill of paracetamol?
3. How many powders of 160mg do i need if I weight 80lbs?

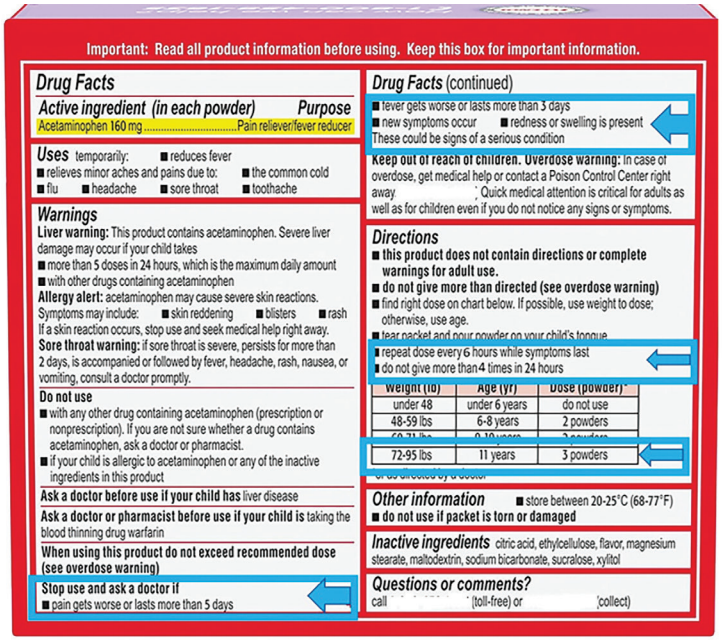

Figure 3. The second workshop consisted of identifying the elements in the paracetamol notice (Physicians' Desk Reference (PDR)) by clicking on the adapted part of the PDR which required answering three questions regarding the use of paracetamol (blue arrows and blue frames):
1. How long can I take paracetamol without seeing a medical doctor if I have some pain or fever?
2. What time interval do I need to respect before taking another paracetamol tablet?
3. How many 160 mg powders do I need to take if I weigh 80 lbs?

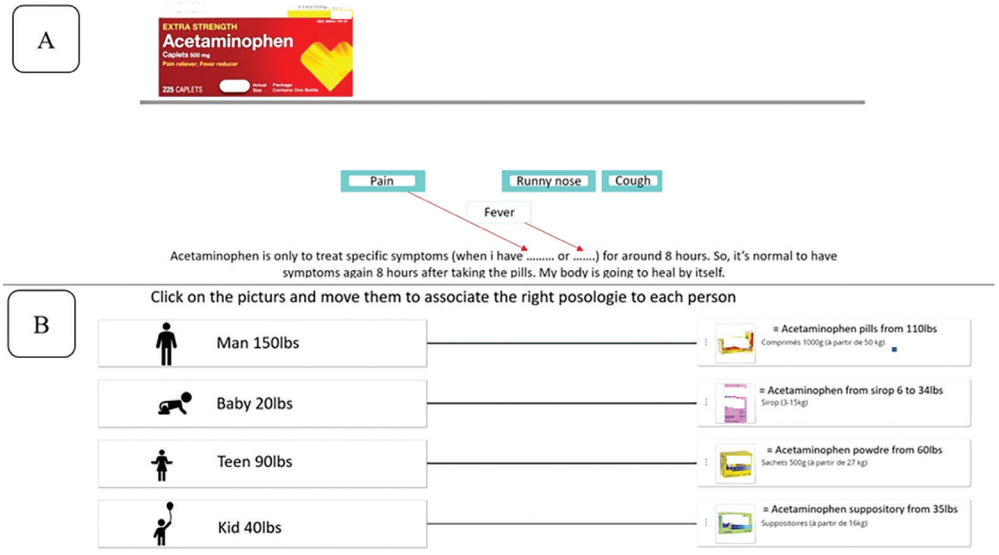

Figure 4. In the third workshop, the school students had to find the symptoms which allow someone to take paracetamol (A). In the fourth workshop, the school students had to find the appropriate posology for paracetamol according to the age and weight of the proposed patient (B).

the third workshop, the school students had to find the right symptoms which authorized the taking of paracetamol. In the fourth workshop (Figure 4), the school students had to find the appropriate posology for paracetamol, according to the age and weight of the patient in question.

School Student Evaluation

Two assessments of the students' knowledge about self-medication were conducted: before the medical education for group L and before the online workshops for group O (t_0). Subsequently, the students in group L were evaluated immediately after the in-person medical education and group O immediately after the online workshops (t_1). Each time, the same assessment was used, containing 3 multiple choice questions (MCQ) based on knowledge of self-medication and corrected. Each MCQ contained between 5 and 7 items. The students included in both groups L and O completed the assessment twice (t_0 and t_1). Regarding group C, the students were only assessed once (t_0). The correction scale was as follows: each MCQ was scored according to the number of items (Question 1: 7 points / Questions 2: 6 points Question 3: 5 points). Each question with a correct answer (can either be true or false) was scored 1. For wrong answers, the score was set at 0. If the student did not give any responses to a question, the assigned score was 0. The students' evaluations were never corrected. In group C and group L, each student had 15 minutes to answer the questions. In group O, no time limit was imposed but the response time was measured for each question. The school standard of each middle school student was given *a priori* by the relevant teacher of each class. The school standards were graded as follows: level A indicated a very good student, level B a good student, level C an average student and level M students with a low level of school success.

Statistical Analysis

Categorical data were expressed as percentages and were compared using Pearson's Chi-square test; continuous data were expressed as the mean and 95% confidence interval (CI) and were compared using one way ANOVA. To compare the observed results from the three groups constituted (group C, group O and group L), four-way (age, sex, school level and school grade) repeated measure ANOVA was performed. A post hoc Bonferroni test was conducted to find differences between the three groups. The statistical significance of all variables was set at a P-value of < 0.05. Data were anonymously recorded in Excel 2008 (Microsoft, Richmond, WA, USA). Statistical analysis was performed with SPSS Advanced Statistics 20.0 software (IBM, Armonk, NY, USA).

Results

The characteristics of each group are presented in Table 1.

One hundred and ninety-five students were enrolled in group C, 219 in group L, and 99 in group O. Initially, 200 students connected through the website for the online workshop in group O, but 101 dropped out, leaving 99 students who completed the final evaluation (t1). The students who dropped out of group O were younger ($P<0.001$) and in a lower school grade ($P<0.001$) compared to those who completed the study, but there was no gender difference. The mean ages were 12.1 years (95% CI [12-12.3]) for group C, 11.9 years (95% CI [11.8-12]) for group L, and 12.7 years (95% CI [12.5-12.9]) for group O, with a statistically significant difference in age between the groups ($P<0.001$). A post-hoc test indicated that students in group O were older than those in the other groups ($P<0.001$), but the mean ages for groups L and C were equivalent. Gender distribution was similar across the three groups. School grades were significantly different between group O and the other groups ($P<0.001$), but equivalent between groups L and C. Additionally, the school standard differed between groups O and L ($P<0.001$).

Comparison of the different pedagogic methods (Table 2).

Table 1. Characteristics of Each Student Group

Characteristics	Groups			P-value*
	Control (N=195; %)	Live learning (N=219; %)	Online workshop (N=99; %)	
	$\bar{x}$ [CI]	$\bar{x}$ [CI]	$\bar{x}$ [CI]	
Age	12.1 yr [12-12.3]	11.9 yr [11.8-12]	12.7 yr [12.5-12.9]	P<0.001
Gender (N; %)				
Male	109 (56)	116 (53)	41 (41)	0.06
Female	86 (44)	103 (47)	58 (59)	
Middle scholar grade (N; %)				
6th year	59 (30.3)	81 (37)	16 (16.7)	P<0.001
7th year	71 (36.4)	70 (32)	21 (21.9)	
8th year	65 (33.3)	68 (31)	34 (35.4)	
9th year	0 (0)	0 (0)	25 (26)	
Scholar level (N; %)				
Level A	No data	68 (31.1)	25 (25.3)	P<0.001
Level B	No data	92 (42)	34 (34.3)	
Level C	No data	57 (26)	21 (21.2)	
Level M	No data	2 (0.9)	16 (16.2)	

*Four-way ANOVA.

Table 2. Results of the Multiple Response Questions Evaluations in Each Group. T_0: before the Medical Education for Group L and before the Online Workshop for Group O. T_1: Immediately after the Medical Education for Group L and Immediately after the Online Workshop for Group O

MRQ* evaluation		T_0† Mean Points [CI 95%]	T_1† Mean Points [CI 95%]
Live learning group (N=219)	Question 1	5.7 [5.6-5.8]	6.7 [6.6-6.8]
	Question 2	4.6 [4.6-4.7]	5.2 [5.1-5.4]
	Question 3	4.3 [4.2-4.5]	5 [4.8-5.1]
	Cumulative result (Q‡1 to Q3)	13.7 [13.4-14]	16.9 [16.6-17.1]
Online group (N=99)	Question 1	6 [5.8-6.1]	6.1 [5.9-6.4]
	Question 2	3.5 [3.3-3.7]	3.8 [3.5-4]
	Question 3	4.3 [4.1-4.5]	4.6 [4.3 -4.8]
	Cumulative result (Q‡1 to Q3)	13.7 [13.3-14.1]	14.5 [14-15]
Control group (N=195)	Question 1	6 [5.1-6.2]	-
	Question 2	3.8 [3.6-4]	-
	Question 3	4.2 [4 -4.3]	-
	Cumulative result (Q‡1 to Q3)	[13.6-14.4]	-

*Multiple Response Questions;†Time; ‡Question.

At T_0, the results obtained before the medical education (group L) and the online workshops (group O) were equivalent with the control group (group C). At T_1, after participating in the online workshop or the medical education, the school students attained better results in both groups (P<0.001) but these same results were significantly better in group L than in group O (14.5 (95% CI [14-15]) in group O versus 16.9 (95% CI [16.6-17.1]) in group L (P<0.001)). Age, gender, school

grade and school standard had no effect on the school students' results. As regards group O, the cumulative response time of the evaluations was 166 seconds (95% CI [137.5-195.5]) and 84.6 seconds (95% CI [71.2-99.2]) at T0 and T1, respectively. The cumulative response time tended to fall after the online workshops, but this was not statistically significant. Age, gender, school grade and school level had no effect on the response time in the different evaluations.

Discussion

The present study highlights the superiority of live medical education given by a practitioner and a science teacher in comparison with open access online workshops in relation to education regarding self-medication for middle school teenagers. Another advantage of live, in-person medical education is that it avoids any loss to follow-up. In fact, in group O, only one third of the students initially connected finished the entire online workshop, while all the students in group L participated completely in the medical education. Furthermore, the students who dropped out of the workshop in group O were mainly younger than the other students who finished the entire online workshop, suggesting that online pedagogic support does not seem to be relevant for young teenagers. Moreover, despite the fact that the school students in group O were older and hypothetically more experienced than those in group L, they obtained worse results than the students in group L.

Face to face, live medical education represents the gold standard as a pedagogic method to improve teenagers' medical literacy, giving better results than online education (8). Previously, Hudson et al. (9) demonstrated in the same way that a brief educational intervention, similar to our live medical education for middle and high school students statistically improved the teenagers' cancer literacy and knowledge. Miletics et al. (8) in a study comparing online versus live seminars relating to obesity, also noted that the live seminar had a more positive effect than the online seminar, leading to an increase in office visits and bariatric surgeries after participation in live seminars. Live medical education allows a direct link between the teachers and the students, and person-to-person interaction. Live medical education is a more interactive and didactic pedagogic method than online workshops, which are more passive and discouraging, especially for young teenagers. Nevertheless, live medical education has some drawbacks. It is a time-consuming pedagogic method, requiring one or more health care professional. Thus, as a result of the interactive and participative aspect of live medical educations, sessions have to be organized in small groups, which increases their time-consuming character.

To the best of our knowledge, no study has compared conventional live education with online remote education for middle school students. Most of the published studies comparing both pedagogic methods in the literature concern health care professionals, undergraduate or graduate students, or an older targeted population (10). For example, Jain et al. (11) compared tele-education versus classroom training as regards neonatal resuscitation, in relation to nurses. No difference was found. Most published studies on this topic found equivalent results from both educational procedures, and mentioned some of the advantages of online education, such as open access and its apparent flexibility (10). In the literature, it is stated that online education gives equivalent results because, we believe, these studies included more experienced and older populations, whereas in our study we focused on a young population, less accustomed to using online educational support. Online educational support certainly requires a more mature target population, such as adults and younger students after completing their high school education.

In the present study, even if the results obtained after the online workshop were not as good as the results obtained after the live medical education, the students in group O did progress somewhat thanks to the online workshop. Despite the lower efficiency of online workshops in comparison with live medical education given by a health care professional, online pedagogic support has several

advantages (12). Online workshops are openly accessible, less time consuming, because they do not need a teacher, and less expensive than conventional medical education. Online education could be used in conjunction with conventional medical education to create a positive synergetic effect regarding the medical knowledge of middle school teenagers, and online education could also allow teenagers' knowledge to be up-dated and maintained over time.

Limitations of the Study

This study has certain limitations. The populations in the three different groups were heterogenic and these differences can introduce confounding variables that affect the comparability and validity of the results. In fact, the students in group O were older than those in the other two groups. This is explained by the fact that 101 students were lost to follow-up in group O who did not finish the online workshops. The students lost to follow-up were younger than the remaining students who mainly finished the online workshops. This high attrition may indicate that the students who remained in group O were those most enthusiastic about online education. This age difference between the groups underlines the importance of considering variations in school achievement and grades between groups. In addition, including a follow-up test for group C could have provided additional insights into the natural progression of knowledge retention without any intervention. The other limitation concerns the self-medication knowledge of the three groups because only short-term follow-up was possible. Long-term evaluation of their self-medication literacy is needed in order to determine clearly if the medical education and online workshop had any impact on the teenagers' knowledge. Finally, the four way ANOVA used could present some limitations, including the complexity and difficulty of interpreting interactions, the risk of multicollinearity, and the potential issues with the generalizability of the findings.

Conclusion

Live medical education seems to be the better pedagogic method in order to improve self-medication practices. Online workshops certainly improve school students' knowledge, but seem to be less efficient than conventional medical education. The significant problem of students dropping out of the online pedagogic method remains. However, online education is currently taking a growing place and gives access to education to underprivileged and remote populations (13). Even if online pedagogic support does not seem to be able to be a substitute for conventional live medical education, it could have a synergistic effect together with online pedagogic support that is easily reusable, openly accessible and less expensive.

What Is Already Known on This Topic:
In the literature, online medical education, either as e-learning or interactive medical workshops, has not proven its superiority over conventional live medical education.

What This Study Adds*:*
Significantly better results were achieved by conventional live, face to face medical education at school in comparison to online medical education using online workshops.

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Conflict of Interest: The authors declare that they have no conflict of interest.

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