

ORIGINAL RESEARCH

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The Impact of Audience Response System in Changing Students' Attitudes Towards Lectures During Training Courses; A Before-After Study

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ABSTRACT

Background and Aims: The primary teaching approach known as “traditional lecture” has drawbacks, including being dull and reducing student participation, which has made students feel negatively about it. It seems that by implementing certain changes, active learning techniques like the “Audience Response System” could alter students’ perceptions of lectures. The purpose of this study is to find out how employing “ARS” throughout a course has affected nursing students’ perceptions of traditional lectures.

Methods: In present research, 44 nursing students participated in quasi-experimental study (Pretest-Posttest Design). A 5-item, 5-point Likert questionnaire and a pre-test question regarding the degree of participation during lecture were used to gauge the students’ attitudes towards lectures. Following that, a six-session pharmacology course including “Lectures + ARS” was held. Following the completion of the course, the original questionnaire, a posttest question regarding attitudes, and four 3-point Likert items regarding students’ opinions regarding the use of ARS going forward were used to assess changes in the students’ attitudes towards lectures. SPSS Ver. 26 was used for the data analysis. $p < 0.05$ was taken into consideration as the significance threshold.

Results: In comparison to before the course, the students’ attitudes towards lectures had changed in a positive and significant way, specifically in items such as learning quality improvement, decreasing boredom, increasing participation and class activity. However, in the domain of “decreasing the use of lecture,” the ARS had failed to change the students’ attitudes. 79.6% of students stated that the ARS had changed their attitudes towards lectures. More than 90% of students agreed with continued use of ARS in the future.

Conclusion: Lecturing could transform from a passive position to an active position by implementing ARS. Lecture + ARS could lead to improvement in students’ class participation and activity, both of which are essential factors of an optimal education.

1 | Introduction

Traditional lectures are the main method of teaching baccalaureate nursing students in Iranian universities. limitations

such as reduction of concentration after 20–30 min, reduction of content attraction, and consequently reduction of remembering the content, Being boring and focusing students on details instead of main concepts, limitations of interacting between

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teacher and students, short-term learning of content based on Bloom's perspective, and forgetting the content after evaluation [1–5] have caused performing lectures in the present routine to be one of the least effective methods of giving information to the students. Also, the inactive role of the students and their lack of participation in lecture-based sessions cause the students to find lectures exhausting and not show enough interest in them, all of which show the students' negative view of this teaching method [6–9].

However, many students continue to support the idea that lectures should be used to teach medical sciences, as active learning strategies allow for the modification and correction of lecture constraints [7, 9]. Active learning techniques are more successful at involving students in the educational process and producing more effective learning, as well as helping nursing students become more confident and improve their critical thinking [10–12].

The Audience Response System (ARS) is one of the expanding strategies that is designed for classroom learning [13, 14]. In this method, the teacher, after teaching a part of the content, shows types of questions like multi-choice questions (MCQ), yes or no, or true or false, by PowerPoint. Then the students send out their answers to the receiver using the keypads (physical handheld pieces), clickers, or cell phones at a specific time that has been given. Then the system immediately shows the answers of all the students by histogram, circular, or filamentary schema in the same slide of the questions [3, 5, 14–16]. This order lets the students compare their answer with other classmates and know how much they have learnt from the content [14, 17]. ARS provides instant feedback to the teacher, and accordingly, the teacher can determine the learners' gaps and adjust the teaching and speed of the lecture [8, 18, 19]. The presentation of periodic questions changes the usual lecture by shifting attention from the teacher and the PowerPoint towards the participation of the student in discussion and providing immediate feedback for both students and teachers [20]. Recently, several studies have used the ability of ARS in educational seminars (face-to-face teaching) with a large number of students and web-based courses and have been able to increase the activity level of the participants [21, 22].

Considering the increasing usage of ARS along with lectures in nursing education [8] and the willingness of nursing students to use technology in classrooms [23] in our present research, we have attempted to investigate how, following an audience response system course, nursing students' perceptions of lectures as a traditional teaching approach have changed.

2 | Materials and Methods

2.1 | Design and Setting(S)

This project was conducted as a quasi-experimental research in before-after design (One-Group Pretest-Posttest) at the Nursing and Midwifery School, Urmia University of Medical Sciences, Iran. Study was registered with the ethical code IR.UMSU.REC.1391.152 from the morality committee of the

Urmia University of Medical Sciences. Also voluntary participation, the statement of the study objectives, the consent of the school to conduct the study, and the confidentiality of the information as the principles of ethics were respected. Also voluntary participation, the statement of the study objectives, the consent of the school to conduct the study, and the confidentiality of the information as the principles of ethics were respected.

2.2 | Participants and Sampling

We invited all last-year nursing students (54 students) to participate in the study, and finally 44 students agreed to participate in study ($n = 44$).

2.3 | Tools/Instruments

The questionnaire used in this research was developed based on Uharis' study [9]. Content validity were evaluated by eight university professors, and additional adjustments were made based on their comments in the versions below.

A comprehensive validation process was carried out on the questionnaire, which involved a pilot study involving a representative sample of the intended audience. We were able to obtain important input and improve the questionnaire thanks to this pilot study. During the pilot, we computed Cronbach's alpha and were able to obtain a high reliability score that was the 0.83 criterion. This suggests that the items are measuring the same underlying construct in an effective manner. Overall, the validity and robustness of the questionnaire are supported by the thorough validation process.

The questionnaire was in Persian and included five items with the 5-score Likert scale (1 = completely agree; 2 = agree; 3 = no idea; 4 = disagree; 5 = completely disagree) in the items of:

- a. The quality of learning through lectures.
- b. Ease of asking and answering questions during the lectures.
- c. Understanding of classmates' thoughts.
- d. Boringness of lectures.
- e. How much they agreed with the use of lectures as a teaching method.

Also, one question concerning the amount of activity and participation of the students in previous courses that were based on lecturing was asked.

The second questionnaire about students' views on the use of ARS in the future was designed with 4 items on a 3-score Likert scale (1 = disagree, 2 = no idea, and 3 = agree) in the items of:

- a. I would like to use ARS in other courses.
- b. I recommend the use of ARS in a pharmacology course for nursing students.

- c. I recommend the use of ARS in other nursing courses and to other students.
- d. What do you think about using ARS instead of paper exams?

2.4 | Data Collection Methods

Before conducting the course with ARS, a questionnaire was given to the students to answer (pretest). After completing the initial questionnaire, students participated in a 1-month educational course (six sessions) about pharmacology in cardiovascular diseases through active learning with the Audience Response System. Many of the ARS systems include the following components.

1. Keypads; which students use to send out their answers [24]. New generation of ARS is web-based, and students can use their mobile phones as keypad [16].
2. Receivers or computers; which are used to receiving and listing answers of students.
3. Software [24] displays the educational content in the form of a PowerPoint and the questions that were added to it before the class.

In the first session, all the students were taught how to use the clickers (keypads). After presenting each subject in the classroom, we presented questions in MCQ format in PowerPoint, and students had to answer with their keypad at a certain time that was displayed in the corner of the slide. The students could only choose one option among the provided options, but they could change their answer before the end of the time allotted. The answers would be sent through the remote controls to the system's receiver.

Immediately after the answering time was over and all the students had answered the question, the diagram of the answer would be shown, and students would be able to see their answers, compare them with the answers given by other classmates, and then discuss their answers with the other students as well as the teacher (Figures 1 and 2). In Figure 1, the participants provided informed consent for the publication of their images as part of this manuscript.



FIGURE 1 | Sample of a question asked by the ARS. ARS, Audience Response System.

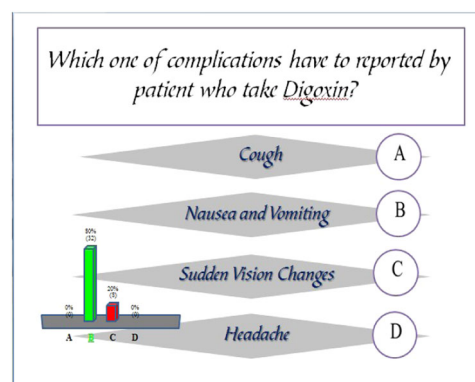


FIGURE 2 | Conducting the course with the ARS. ARS, Audience Response System.

Also, based on the immediate feedback received, the teacher clarified the reason why the answer to the correct option was correct and the other three options were incorrect and repeated the parts of the lecture that the majority of students had answered incorrectly. After the course had ended, the initial questionnaire with one additional question with yes or no options, “Has your attitude changed towards lectures with the use of the ARS?” was again presented to the students to re-examine the lecture method considering the use of the Audience Response System (posttest). Considering that a change in attitude can affect a person's desires in the future, we asked the students about their views on the future use of ARS, and for this purpose, another questionnaire was provided to them separately.

2.5 | Data Analysis

Data were analyzed using the Statistical Package for Social Sciences, SPSS, version 26. Frequency (percent) was used to report qualitative variables. Analytical tests (Chi square and paired t-test statistical tests) were used for the effect of the “Audience Response System” before and after the intervention among the study participants. A p -value of ≤ 0.05 was considered statistically significant.

3 | Results

In present research, 44 students who had completed the initial questionnaire, after going through the course with the ARS, re-answered the same questionnaire. Eighteen (40.9%) of students were males and 26 (59.1%) were females. The average age of students was 22.28 ± 1.02 , and their average scores of all previous semesters was 15.20 ± 1.17 (out of 20). Considering the answers (agree) and (completely agree) as “satisfaction/agreement” and the answers (disagree) and (completely disagree) as “dissatisfaction/disagreement,” the following diagrams show a comparison between the given answers to each question before and after the course with ARS.

Before conducting the course, only 29.6% of the students had stated that they would learn well through lectures. After adding ARS to the lectures, 61.4% stated that their learning was good;

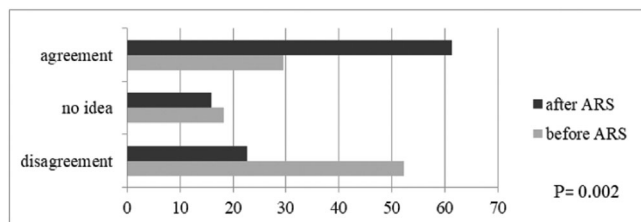


FIGURE 3 | My learning through lecturing is good.

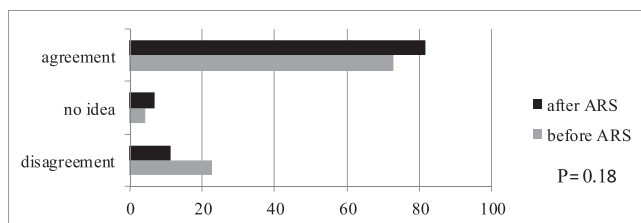


FIGURE 4 | Asking and answering questions during lectures is easy.

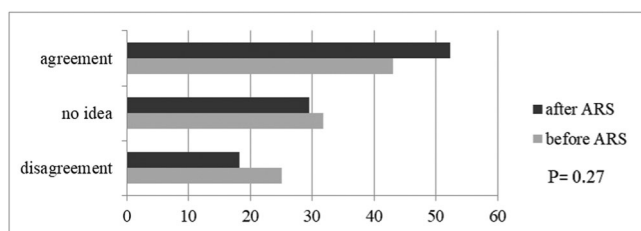


FIGURE 5 | During lecture, I understand what classmates think about subject matter.

and Chi-square showed that this increase was statistically significant ($p = 0.002$). Figure 3.

In domains of “easy to ask and answer questions” and “understanding classmates’ thoughts,” in comparison with before the course, the “agreement” had increased slightly but wasn’t statistically significant (Figures 4 and 5).

Before ARS implementation, 86.4% of students said that lectures were uninteresting; however, after implementing the ARS, this percentage decreased to 59.1%, demonstrating a significant decrease in this item ($p = 0.002$) (Figure 6).

However, 65.9% of students still thought that lectures should be utilized less frequently as a teaching style, and the ARS was unable to reduce this percentage of students ($p > 0.99$) (Figure 7).

Before using the ARS and in the analysis of the amount of participation, more than 60% (61.4%) of students had estimated their participation at about 20%–40%. After using the ARS, the number of students with the minimum participation (20%) had decreased to about one-sixth. Although ARS was poorly able to increase the percentage of participation to 40% and only slightly improve participation up to 60%, the difference was statistically significant ($p < 0.001$) (Figure 8).

In analyzing the question added to the posttest questionnaire about students’ view on the change of attitude towards lectures

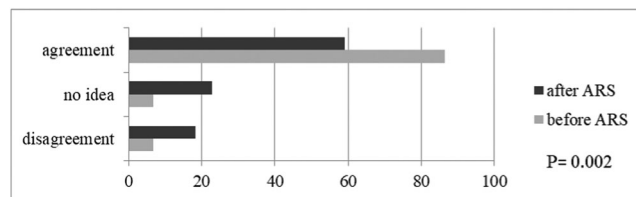


FIGURE 6 | Lecture is boring.

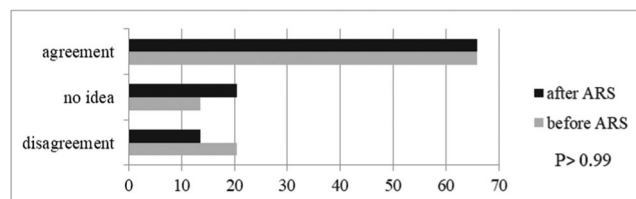


FIGURE 7 | Lecturing should be used less as a teaching method.

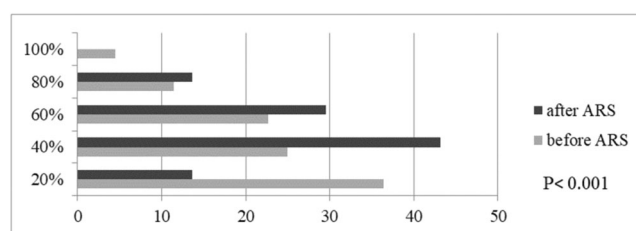


FIGURE 8 | The percentage of students’ participation during lecture.

after performance of the course with ARS, 79.6% of students stated that their attitude had changed towards traditional lectures.

Regarding the use of ARS in the future, the majority of students showed their willingness to participate again in courses with ARS and, use it for other courses and other students and even instead of paper exams (Table 1).

4 | Discussion

Adding the ARS to lectures can change the students’ attitude towards lecturing. In the pre-course investigation, it was determined that students overall didn’t have a positive attitude toward the traditional lecture method, but after combining an ARS with the lecture, there were positive changes in some aspects of the students’ attitude.

In this research, the number of students who believed that their learning by lecture method was good increased from 29.6% in the pretest to 61.4% in the posttest, which indicates that lecture can respond to student learning needs by making adjustments such as a combination with ARS. In Fifer’s study, 88% of nursing students stated that their learning had improved with ARS [15]. ARS is an effective and useful tool for improving the acquisition of medical knowledge [18]. ARS can help students better understand both theoretical and practical concepts, as well as conceptual knowledge [16, 25]. The reason for these

TABLE 1 | students' views on the use of ARS in the future.

Items	Number (%)		
	Disagree	No idea	Agree
I would like to use ARS in other courses	1 (2.3%)	3 (6.8%)	40 (90.9%)
I recommend the use of ARS in a pharmacology course for nursing students	0 (0%)	2 (4.5%)	42 (95.5%)
I recommend the use of ARS in other nursing courses and to other students	1 (2.3%)	1 (2.3%)	42 (95.5%)
What do you think about using ARS instead of paper exams?	4 (9.1%)	7 (15.9%)	33 (75%)

positive results may be related to this finding that ARS can overcome the obstacles of good learning, so the students will learn the content more efficiently [9].

Our study showed a positive change in the students' views about the simplicity of questioning and answering during lectures, as well as their perception of how their classmates think after using ARS. Similar to our finding, in Uhari's study, the number of students agreeing with the simplicity of questioning during the course of using ARS increased [9]. Feedback in ARS sessions does not need to be communicated verbally, so it is easier to answer questions that make it more compatible with the learner [26]. The findings of the McKenzie study showed a higher level of student "comfortableness" to answer questions [19]. A sense of freedom, feelings of effectiveness, a desire to communicate with classmates, and increasing intrinsic motivation, which are created by ARS, can make any class activity easy [27]. Medina declares that the perception of classmates' thinking and comparing yourself with them is one of the advantages of using the ARS during lecture [28].

The lecture's boringness is one of the students' criticisms of this method, especially when it is presented badly [9]. Before using the ARS, the number of students who knew lectures were exhausting was so high (86.4%) that after the performance of the course with the ARS, this statistically significant amount decreased to 59.1%. Hall expresses that lectures with ARS become more engaging and motivating [29]. Advantages like the ability to stay focused on the lecture, which makes it exciting [15], and attracting the learning environment that reduces students' physiological distress [30] are factors gained from different studies that can justify the effect of ARS on the reduction of boredom during traditional lectures. Nevertheless, in our study, more than half of the students still believed the lecture was boring. This could be due to the fact that students were in the hospital in the morning and educational sessions were conducted in the evenings.

In the present study, ARS increased the level of the students' participation significantly. 81% of subjects in Rahman's study believed that they were more active during lectures with ARS [31]. The increase in students' participation in classes by ARS is so high that some studies mention that students' satisfaction with ARS is because of the increase in participation [32, 33]. In our study, ARS failed to bring the amount of participation above 50%, which can be attributed to students' fatigue due to clinical presence in the morning.

In our study, 65.9% of the students believed that lecture should be used less, and only 20% of the students agreed with lecture as

a method of teaching; even using the ARS couldn't increase this amount. This finding is in contrast with the results of the Al-Modhefer study, in which the nursing students supported a structural lecture with the ARS as a method of teaching [34]. Also in Uharis' study, most of the students agreed with having lectures in teaching [9]. The reason for this incompatibility is that traditional lecture is the most common way of teaching in Iran's educational system from the beginning of education at school until higher education in college, and the continuous use of this method to present a high volume of content has made a negative point in the students' views.

More than 90% of the students in this study had shown their desire to continue using ARS in future courses. This shows the success of ARS as an educational tool. In another study, students showed that the preferred style for future learning is ARS [19].

Finally, about 80% of the students in our study stated that the ARS had changed their attitude towards lectures, which can be considered a positive finding. Using ARS during lectures can lead to an adjustment of teaching style [8] and a more interactive and positive learning environment [31]. This advantage can lead to a change of attitude in the students towards lectures, and maybe that's why 96% of respondents in Shah's study stated that they would like ARS to be used more in education [14].

The limitation of the present study was that research was performed in the evening while students were in the hospital that morning, but on the other hand, the same conditions for participants can be considered an advantage of this study. For future studies, it is recommended that ARS be used in more sessions and courses and that students' attitudes toward ARS be investigated after evaluating their final scores.

5 | Conclusion

The use of the Audience Response System (ARS) can lead to positive changes in students' attitudes towards lectures. A key reason for this improvement is the ability of ARS to create opportunities for increased engagement and participation among students. By allowing students to answer questions in real-time, ARS creates a more interactive environment where learners feel more connected to the material and their peers. This increased level of engagement can significantly reduce the fatigue often associated with passive listening in traditional lecture formats and make the classroom experience more enjoyable and stimulating.

In addition, ARS encourages students to think critically about the material presented, as they must formulate their own answers and often engage in discussions with classmates based on their answers. This active participation not only increases their understanding of the subject but also promotes a collaborative learning environment where students can learn from each other's perspectives.

The improvement in learning outcomes associated with the use of ARS can also be attributed to its immediate feedback mechanism. Students get instant confirmation of their understanding and can identify areas that may need more focus, which is especially helpful in promoting mastery of complex topics. Additionally, this feedback allows instructors to adjust their instructional strategies on the fly, address misconceptions, or clarify difficult concepts in real time, thus creating a more responsive and tailored learning experience. The benefits of using online Audience Response Systems (ARS) to improve webinars and lengthy lectures are becoming more widely acknowledged. To counteract feelings of isolation in online settings, ARS provides a dynamic learning environment where participants can actively engage through the facilitation of real-time interaction. ARS guarantees that every student, regardless of comfort level, is heard in big classes by encouraging participation by all students. It also allows teachers to quickly evaluate how well their students absorb a lesson and modify their approach. Teachers can enhance curriculum design and empower students to take responsibility for their own learning with the support of the ARS data collection. Better educational outcomes are the overall result of ARS's enhancement of inclusion and engagement. Research on its advantages and successful integration in diverse contexts should be pursued in the future.

Overall, the integration of ARS into lectures represents an important step toward modernizing instructional approaches that not only increase student engagement but also foster a deeper and more lasting understanding of course content. The dynamic nature of ARS transforms the ordinary lecture into a collaborative and interactive learning journey, ultimately leading to improved student attitudes and achievement.

Author Contributions

Farzad Zareie: validation, data curation, resources, writing–review and editing. **Rahim Baghaei:** writing–review and editing, formal analysis, writing–original draft. **Naser Sheykhi:** writing–original draft, resources, data curation, formal analysis. **Davood Rasouli:** writing–original draft, investigation, conceptualization, resources.

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Ethics Statement

Before the implementation of the research, the students were asked to consent to participate in the study and to allow the publication of photos from the research implementation stage in research journals. They were

informed that if they did not want to cooperate at any stage of the research, they could leave the study. Additionally, if they did not wish to have their faces published, their faces would be covered in any photos. In this study, Figure 1 shows the stage of the research implementation, where the students participating in the study are answering questions asked during the training using their keyboards. Informed consent was obtained from the students for the publication of their pictures.

Conflicts of Interest

All authors have read and approved the final version of the manuscript. FARZAD ZAREIE had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Transparency Statement

The lead author Davood Rasouli affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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