



## Original Research Article

# Flipped classroom approach for trauma education: Attitudes of participants towards pre-course assignments before the advanced trauma life supports (ATLS) instructor course

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## ABSTRACT

**Background:** A flipped classroom approach in principle, denotes pre-course engagement for an upcoming educational course. Although never used in trauma education, other educational literature is resplendent with the beneficial effects of pre-course engagement on the learning outcomes of the course itself. In this article we share the attitudes and perspectives of prospective Advanced Trauma Life Supports Instructors towards pre-course assignments to see whether this works in the field of trauma education.

**Materials and Methods:** After an online pre-course session, we administered a validated questionnaire to 100 participants. The questionnaire had 4 categories - the first dealing with participants' characteristics and the rest with their attitude and perspectives towards the pre-course sessions. The last category included three open ended questions for qualitative analysis to explain the attitudes of the participants.

**Results:** The participants showed a significantly positive attitude ( $p < 0.029$ ) towards this flipped classroom approach. The reasons cited were "effective sensitization", "adequate feedback", "peer learning" "user friendly platform" "enjoyable" and "relevance". A significantly higher level of agreement with the questionnaire statements was seen amongst the private sector doctors as compared to those working in public sector medical colleges ( $p = 0.004$ ). Same was observed amongst clinical specialists as compared to pre or para clinical specialists ( $p = 0.001$ ). The Questionnaire had a Cronbach's alpha of 0.86.

**Conclusions:** The study concludes that a flipped classroom approach can work well in trauma education. A tailored approach, depending upon participant characteristics, may be needed to enhance the relevance of a flipped classroom approach.

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## 1. Introduction

Trauma is a burning problem all over the world and India is no exception. Since 2009, due to sincere and sustained efforts of the Advanced Trauma Life Support (ATLS) India Committee, there is now a throbbing network of ATLS centers in India, running ATLS Provider as well as Instructor Courses throughout the year. Cognitive,

psychomotor, organizational, and affective impact of ATLS is overwhelmingly positive in the Indian scenario and ATLS remains the best hope for critically injured patients.<sup>1</sup> The ATLS instructor Course is designed to train the trainers in imparting trauma management knowledge, skills and attitudes to the care providers. The quality of the provider courses and through that the quality of trauma care, is directly related to the quality of the Instructor Course.<sup>2</sup>

Literature on research in medical education states that conducting online pre-course engagement activities go a

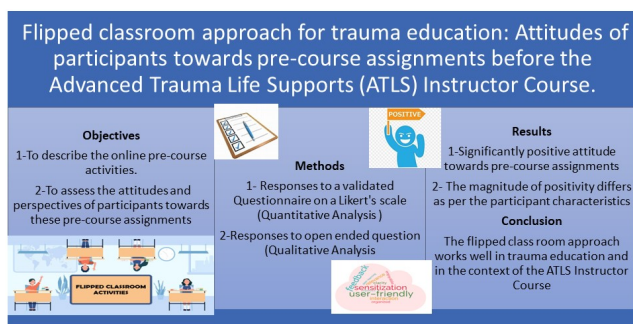
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long way in helping the participants adjust to and prepare themselves for the forthcoming training or course.<sup>3–5</sup> This mimics the flipped classroom approach. Taking cognizance of this fact and coupled with the aim to further improve the quality of the instructor course, we decided to introduce online pre-course activities and analyze responses and attitudes of prospective instructor candidates towards the same. Although hybrid learning is being used, a literature search of Life Supports Programs did not reveal any pre-course assignment activities or flipped classroom approach in use. The word “hybrid” signifies a combination of online and onsite activities. Flipped classroom is similar to hybrid learning in the sense that both use face-to-face and online learning. It differs from hybrid learning because of its inverted activities, students acquire content online and the subsequent class session focuses on analysis, and application. Whereas hybrid learning denotes activities both on line and onsite the flipped classroom is a type of hybrid learning where the course content is delivered on line and the learners are given assignments to ensure this learning. When onsite the learners use this content knowledge to do problem solving and in case of ATLS Instructor Course actually teach as Instructors. This takes the participants to a higher level of learning from “knows how” to “does”.<sup>4,5</sup>

## 2. Objectives

1. To describe the online pre-course (flipped classroom) activities.
2. To assess the attitudes and perspectives of participants towards these pre-course activities.



## 3. Materials and Methods

### 3.1. Study design and setting

This was a cross-sectional study over a period of two and a half years, from January 2021 to July 2023, and involved participants from nine Instructor Courses held at five ATLS centers, primarily in North India.

### 3.2. Study population

We sent the questionnaire to all 102 participants of the aforementioned courses. Out of which, 100 individuals responded. There was no exclusion or inclusion criteria. We included all the participants who enrolled for the Instructor Course.

### 3.3. Sampling process

A convenient sampling approach was employed to select participants. The questionnaire was distributed to individuals who were easily accessible and willing to participate. While convenient sampling may limit the generalizability of the findings, it was chosen for its practicality and efficiency in obtaining responses from a readily available population.

### 3.4. Data collection

#### 3.4.1. About the questionnaire

The questionnaire utilized in this study comprised two parts, encompassing both selected and constructed response questions. The first part focused on participant demographics, including age, affiliation, specialty, designation, and teaching experience. The second part consisted of four categories. Three of these categories contained selected response questions on a Likert scale ranging from "Strongly Agree" to "Strongly Disagree," with "Agree," "Neutral," and "Disagree" as intermediate options. The first category addressed organization, clarity of expectations, and the balance and appropriateness of the flipped classroom. The second category solicited responses regarding application and specific development resulting from the pre-course assignments. The third category aimed to gauge the theory or content knowledge acquired through the pre-course assignments. The final category featured a constructed response section in which participants were asked three questions: to identify the strengths of the pre-course assignments, provide suggestions for improvement, and offer advice to future participants. Each question in the constructed response section had a word limit of 50. (Appendix 1)

#### 3.4.2. Questionnaire development and administration

A panel of five medical teachers, all affiliated with teaching institutions and possessing experience in conducting flipped classroom and online courses finalized the items of the questionnaire through a Nominal Group Technique (NGT) consensus approach. Subsequently, the questionnaire was submitted to the ATLS Educators of India for final approval. The final questionnaire was pilot tested on 10 participants. The questionnaire was sent using a Google Form, which was made available to participants at the conclusion of the course, following the declaration of results. To maintain confidentiality, responses were collected anonymously.

## (Appendix 1)

3.4.3. *Conduct of the pre-course activities*

The online pre-course engagement was started a month prior to the onsite course. The content of the engagement was same as the onsite content for which the learning resources had already been provided to the participants. Assignments on domains of learning, adult learning principles, interactive discussions, questioning techniques, feedback and assessment were uploaded on WhatsApp. Each assignment response was given feedback by the Educator of the course, in terms of corrections or additions. Questions were invited and answered. Peer learning was encouraged. We did not assess candidates on the basis of their participation or responses. The assessment was onsite and as per the ATLS Instructor Course norms. The aim of the pre-course activities was to prepare the trainers for the onsite session and focus on the applicability of the learning on line.

Data analysis was done using SPSS V-29 and GraphPad Prism version 5.

Descriptive statistics were used for the category one questions. Internal consistency of the questionnaire for reliability was tested by Cronbach's alpha.

Data was summarized as median and the interquartile range stated for numerical variables that were not normally distributed. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. We tried to see the extent of agreement/disagreement with the questionnaire statements and also the association between this and participant characteristics. We summed the responses of "Strongly Agree and "Agree" as one entity and "Disagree" and "Strongly Disagree" as another. The median, mean and range were calculated and data was checked for normalcy by using the Kolmogorov-Smirnov and the Shapiro Wilk tests. Multivariate analysis was applied to check whether there exists any relationship between the total scores as obtained above and participant characteristics. This test was performed at 95% level of confidence such that  $p < 0.05$  was taken as level of significance. The last category was analyzed qualitatively. Word-clouds were generated in order to understand which perceptions or attitudes about this pre-course program and pertaining to the three questions asked, were most predominant among the participants.

## 4. Results

### 4.1. *Quantitative analysis*

A hundred respondents answered the questionnaire. Most were in the 26-40 years group ( $n = 69$ ), followed by the 41-54 years group ( $n = 29$ ), with 2 participants above 55 years. Majority of participants ( $n = 79$ ) were affiliated to public Medical Colleges, and rest ( $n = 21$ ) were from the



**Figure 1:** Word Cloud: Responses to the first open ended question "Please identify what you consider to be the strengths of the pre-course assignments"



**Figure 2:** Word Cloud: Responses to the second open ended question "Please identify areas where you think this program /pre-course assignments could be improved"

private Sector. Clinical specialties were predominant ( $n = 81$ ), pre and para-clinical specialties ( $n = 19$ ) comprised the rest. Assistant Professors represented the largest group ( $n = 41$ ) followed by postgraduates ( $n = 32$ ), with consultants ( $n = 12$ ) and Associate Professors ( $n = 9$ ) making up the rest. (Table 1) The Cronbach's alpha for the questionnaire was 0.869, indicating good internal consistency.

Our study had 100 participants responding to 16 statements on a Likert's scale, so the total number of respondent points were 1600. We summed Agree and Strongly agree as a single entity and Disagree and Strongly disagree as another and then obtained a total of 1076 responses as agree 112 responses as neutral and 412 responses as disagree. A significant ( $p < 0.029$ ) majority, comprising 67.25% of the respondents, expressed agreement with the statements of the questionnaire

**Table 1:** Participant characteristics

Age	Number	Percentage	P value
26-40yrs	69	69.00%	<0.001
41-54yrs	29	29.00%	
Above 55	2	2.00%	
<b>Affiliation</b>			
Corporate hospital	21	21.00%	0.024
Medical College	79	79.00%	
<b>Specialty</b>			
Clinical	81	81.00%	0.019
Para Clinical	19	19.00%	
<b>Designation</b>			
Assistant Professor	47	47.00%	0.189
Associate Professor	9	9.00%	
Consultant	12	12.00%	
Postgraduates	32	32.00%	

**Table 2:** Assessing the degree of agreements/ disagreements to the statements in the questionnaire

Total Responses	Score Level	Number	Percentage	P value
1600	Agree + Strongly Agree	1076	67.25%	0.029
	Neutral	112	7.00%	
	Disagree + Strongly disagree	412	25.75%	

**Table 3:** Mean median and mode and interquartile range of the response scores after summation

<b>Median</b>	46
<b>Mode</b>	45
<b>Mean</b>	47.66667
<b>Q1</b>	43
<b>Q3</b>	54
<b>Max</b>	64
<b>Min</b>	20
<b>Range</b>	64-20

**Table 4:** Showing association between participant characteristics and the degree of agreement/ disagreement with the questionnaire statements -Chi square test at 95% confidence interval and  $p < 0.05$  as significance

Affiliation	Agree	Neutral	Disagree	Chi-square value	Degrees of freedom	P-value
Corporate hospital	735	12	84	1.12	2	0.004*
Government medical college	239	81	312			
Others	102	19	16			
Specialty	Agree	Neutral	Disagree	Chi-square value	Degrees of freedom	p-value
Clinical	679	38	119	0.89	1	0.001
Para Clinical	397	74	293			

indicating a positive attitude. 7% adopted a neutral stance and 25.75% of participants expressed disagreement with the questionnaire statements.

After summation the median, mode, and mean were calculated as 46, 45, and 47.6 respectively. Additionally, quartiles were determined to further understand the spread of the data. The first quartile (Q1) was calculated as 43, indicating that 25% of the data falls below this value. The third quartile (Q3) was found to be 54, signifying that 75%

of the data falls below this value. Furthermore, the range, was computed as 44 (64 - 20), showcasing the extent of variability within the dataset. (Table 3). The Kolmogorov-Smirnov and the Shapiro Wilk test showed that the data was normally distributed. A Chi square test was performed at 95% level of confidence interval and  $p < 0.05$  as the level of significance to look for association between variables. For the affiliation variable, respondents from corporate hospitals, demonstrated a notably higher agreement with the



**Figure 3:** Word Cloud Responses to the third open-ended question: “What advice would you give to another student who is undergoing or about to undergo these pre-course assignments?”

given statements of the questionnaire as compared to those from government medical colleges and other affiliations. ( $\chi^2 = 1.12$ ,  $p = 0.004$ ). Similarly, for the specialty variable clinical professionals were found to be more in agreement with the questionnaire statements as compared to their paraclinical counterparts and the chi-square test with 1 degree of freedom resulted in a statistically significant value ( $\chi^2 = 0.89$ ,  $p = 0.001^*$ ).

Qualitative analysis was done using the free version of the NVivo software to generate themes for creating 3 word clouds each of which depict the predominant perceptions or concepts that emerged in response to the three open ended questions. In response to the first open ended question “Please identify what you consider to be the strengths of the pre-course assignments” the concepts that emerged were “sensitization” ( $n=81$ , 78%), “user friendly” ( $n= 80$ , 78%) and “feedback” ( $n= 76$ , 74%). In our analysis we took words and phrases like “served as a trailer”, “what to expect onsite”, “priming” “preparing”, “setting the stage” and “relevant” to be synonymous with sensitization. We took phrases like “could do assignments in my free time” “could respond on my phone anytime and anywhere” as synonyms for user friendly. The concept “Feedback” was independently analyzed and did not have any synonyms. Other concepts that emerged were, “clarity of concepts” ( $n=70$ , 68%) “relevance” ( $n=70$ , 68%), “organization of the course content” ( $n=70$ , 68%), “interaction” ( $n= 70$ , 68%), “enjoyable” ( $n=70$ , 68%) “peer-learning” ( $n=66$ , 65%) and “comprehensive” ( $n=50$ , 47%).

The predominant suggestions for improvement as gathered by the responses to the second question was to substitute assignments with close ended questions ( $n=90$ , 89%) We used “MCQs”, “True/False”, “Objective assignments” as synonyms for close ended or “Objective

questions”. A second suggestion was to provide “videos” of microteaching sessions ( $n=78$ , 75%). We used “links to videos” as synonymous for “videos”. Two other suggestions emerged one for the educator to do an “on line session” with the participants where they could ask questions and clear doubts ( $n=50$ , 50%). Another opinion was to design a small handbook which would give key points, or take-home messages for the topics elaborated during the Instructor Course sessions ( $n= 35$ , 30%).

In response to the third open ended question: “What advice would you give to another participant who is about to undergo these pre-course assignments?” Advice to the forthcoming Instructor Potentials was illustrated by words and phrases as “engage”, “participate”; “interact”; “pay attention”, “complete assignments”, ask questions” All of the participants used at least one of these words. We interpreted all these words and phrases to mean a single theme and that was “advice to complete pre-course assignments”. About 60% of them advised future participants to preserve these assignments for later reference. Forty percent advised literature search for more in depth learning on effective teaching practices.

## 5. Discussion

Over the last few decades faculty development programmes have become the backbone of improving quality of medical education in Higher Educational Institutes. This has resulted in an improved landscape of medical education where current teachers are performing very different from the teachers by whom they were taught.<sup>6</sup> The realization that trainers need to be trained has long been ingrained in the ATLS ideology and Instructor Courses which train the trainers are very much a part of the ATLS Program. A questionnaire evaluation of Instructor Course participants has shown increased confidence not only during teaching in ATLS Courses but also in any medical education circumstance after the course.<sup>7</sup> ATLS is one of the few life supports training programs which has a faculty development program in-built into its mission to combat trauma.<sup>8,9</sup> In this context significant consensus exists on the fact that face-to face lectures cannot be replaced by online lectures.<sup>10,11</sup> At the same time the findings under evaluation of new faculty development programmes include high levels of faculty participation in virtual classrooms supporting the utility of using online formats as ways of supplementing and improving the actual face to face course.<sup>12</sup> Taking cognizance of this we designed an online pre-course program as a preparatory to the onsite course and assessed the attitude and perceptions of the participants towards the same. According to Kirkpatrick levels of program evaluation this would be the first step in assessing the utility of such a program and would enable to understand whether this could be included as a regular feature for increasing preparedness. Whether such a program was really effective

in terms of better performance during the course and internalization of the principles of adult learning by the learners, would reveal its real worth.<sup>13</sup>

Out of the 100 participants who responded majority were in the age group of 26-40 years, belonging to the clinical specialities and working in the government sector. Unlike several countries India has not made ATLS training mandatory. Despite this, most surgical specialities realize that effectively dealing with trauma, requires a protocolized, team approach and hence the demand for ATLS Courses is high. As per our study the numbers coming for ATLS courses are more from the government sector. However almost 87% of health care in India is provided by private practitioners and private institutes which seems to be having a much lesser representation in this study.<sup>14</sup> This finding cannot be extrapolated to the whole of the ATLS program in India as this study was done at 5 ATLS centres which conduct Instructor Courses whereas there are several more.

The second, third and fourth sections of the questionnaire were in the form of statements to which the participants were expected to respond on a Likert's scale from "Strongly Agree" to "Strongly disagree" with Agree, "Neutral" and "Disagree" in between. All the statements were positively worded. There was a significant degree of agreement to all the statements in the three above categories indicating an overall positive attitude towards the pre-course activities.

Course material sent earlier is done with the purpose of encouraging self-directed learning. However, lack of time, busy schedule, cognitive overload, lack of engagement are often cited as reasons for inability to read the same. Having some assignment to "complete" or "do" provides the necessary impetus to read and engage with the course material. Interaction with peers is another positive aspect of these activities which drives learning. These are probably the reasons for positive attitude towards these pre-course activities. Although we could not find any studies which dealt with participant attitudes towards pre-course assignments in trauma education, medical education research is resplendent with the success of the concept of "flipped class room" which involves giving specific tasks and assignments to students and utilizing the classroom hours for problem solving and development of skills.<sup>15,16</sup> Our study seems to suggest that using the "flipped classroom idea" (pre-course assignments) and keeping the onsite session for honing teaching skills might also be an option in trauma education. We took all precautions to rule out bias in these perceptions. The assignments were not made compulsory. Assessment was done onsite as per ATLS dictums and was in no way related to either participation or performance in these assignments. This was conveyed to them before the start of the pre-course assignments. The questionnaire was anonymous, sent after the onsite course was over and results declared.

Further analysis revealed this positive attitude towards the pre-course activities was not uniform and differed based on the participant characteristics. Participants working in private or non-teaching hospitals demonstrated a notably higher agreement with the given statements of the questionnaire as compared to those from government medical colleges. Trying to explain this we can cite only one reason -The National Medical Council of India has made it mandatory for all faculty to undergo training in the basic concepts of effective teaching and having undergone this, medical college doctors may have found the pre-course activities less appealing as compared to the corporate sector clinicians who have not had any training in education technologies.<sup>17</sup> Similarly, clinical professionals displayed a higher level of agreement with the statement of the questionnaire as compared to para-clinical professionals. This emphasizes the need for targeted strategies or interventions (pre-course activities) based on participant (instructor potentials) characteristics. Overall, these findings highlight the importance of considering organizational affiliations and specialty categories when interpreting the responses and designing approaches.

It is important to know whether an intervention worked or had the desired effect; it is more important to know why it happened so and this is where our qualitative analysis shed some light. "Sensitization" "user friendliness and "effective feedback" were identified as the strengths albeit the reasons for the positive attitudes. The message therefore to the educators is that when designing assignments these should be in alignment with the actual course topics, the platform used for the delivery of the assignments should be user friendly and each assignment should be given the appropriate feedback. The other concepts that emerged were "clarity", "good organization", "interaction", "enjoyable" which corroborated the reason for the positive attitude. When asked for suggestions to improve the course most of the participants came out with two important suggestions: one to give assignments as multiple-choice questions and to provide videos which demonstrated good teaching. While the first suggestion reveals that the participants would appreciate focused or objective questions which needed lesser time, the second suggestion has been pointed out before. An international review of the ATLS Instructor Course which looked at Instructor training in UK, USA and Australia has also suggested something similar Quoting from the review "Time spent in "lesson planning"(Australia) or "micro teach planning" (US) could arguably be switched to the pre-course phase" and videos of effective teaching would help them plan well before the course."<sup>9</sup> When asked for advice to future participants all the respondents were unanimous in advising them to participate in completion of the assignments, and also to preserve these assignments for future reference.

## 6. Conclusions

The study concludes that participants consider pre-course assignments as an effective means of preparedness for the onsite course with objective questions being the better means for this. Although universal, this attitude is significantly more visible in the private sector doctors and the clinical specialty doctors who come for the course. Finally, the study concludes that flipped classroom techniques could work well in trauma education with special reference to ATLS Instructor course.

## 7. Author Contributions

1. Conceptualization: Ray, Mishra, Jain
2. Data collection: Ray, Mishra, Jain
3. Formal analysis: Ray, Ghosh
4. Methodology: Ray, Ghosh
5. Project administration: Ray, Mishra, Jain
6. Validation: Ray, Ghosh
7. Writing – Original draft: Ray, Ghosh
8. Writing – Review & editing: Ray, Ghosh, Mishra, Jain

## 8. Source of Funding

None.

## 9. Conflict of Interest

None.

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## Appendix 1- Questionnaire

1. Age
2. Medical college or private practice
3. Specialty
4. Involved in teaching or not
5. If Teaching then whom medical, nursing or physiotherapists
6. Other lifesaving courses attended like Basic Life Supports (BLS), Advance Cardiac Life Supports (ACLS), Pediatric Advanced Life Supports (PALS) etc.

### Category 1

Responses to following statements on a Likert's scale (Strongly-Agree, Agree, Neutral, Disagree, Strongly-Disagree)

1. The Pre-course assignments were appropriate for the stated level of the on-site Instructor course

2. The Pre-course assignments provided a mixture of explanation and example
3. The Pre-course assignments were effectively organized
4. The Pre-course assignments and the on-site teaching usefully complemented each other
5. The technology used for delivering the pre-course assignments was appropriate and user friendly
6. The pre-course work helped me understand concepts more clearly

### Category 2

1. The pre-course provided guidance on how to inculcate adult learning principles.
2. The pre-course developed my ability to think critically about teaching and learning.
3. The pre-course helped me improve my writing of specific assignments.
4. The pre-course helped me conceptualize the ideas required for presentations during the onsite sessions.

### Category 3

Responses to following statements on a Likert's scale (Strongly-Agree, Agree, Neutral, Disagree, Strongly-Disagree)

1. The pre-course developed my ability to apply theory to practice during the on-site course.
2. The pre-course allowed me to synthesize fundamental knowledge and skills of teaching.
3. The pre-course gave me a deeper insight into the topic of ATLS teaching
4. In this pre-course, I learned a great deal.
5. The pre-course developed my ability to think critically about the on-site Instructor Course.
6. I received adequate feedback on my pre-course assignments.

### Category 4

Please identify what you consider to be the strengths of the pre-course assignments (Limit to 50 words).

Please identify area(s) where you think the pre course program / assignments could be improved (Limit to 50 words).


What would be your advice to a future participant undergoing this course (Limit to 50 words).

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