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TIME-ON-TASK IN PRIMARY CLASSROOMS, DURING DIFFERENT TEACHING-LEARNING APPROACHES

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Abstract:
The entire education system is moving from the teacher-centered teaching-learning approaches towards student-centered teaching-learning approaches, with anticipation that it would increase the learning outcomes. This empirical study was carried out to compare the traditional and non-traditional classrooms. It also tried to understand the effectiveness of the Alternate Instructions in the Mathematics and Primary Language (Marathi) classrooms. This study collected about 8000 snapshots from the classrooms of Government schools. Based on the empirical evidences, study can claim that Non-Traditional classrooms show more Time-on-Task (ToT) as compared to the Traditional classrooms. Study could show interesting trends of ToT throughout a session of 35mins. It also compared those trends for Mathematics and Marathi.

Keywords: time-on-task (ToT), teaching-learning approaches, alternative instructional strategies

1. Introduction

There are a lot of efforts taken to improve the learning outcomes of children. Few of them are very focused on the pedagogy. Various innovative Instructional Methods (IM) are being deployed by the teachers. Again, wide scale policy-level changes are also being made to incorporate child-centered approaches into education; but it is still

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questioned whether it is really helping in achieving the expected learning outcome. There is paucity of the empirical research to respond to the comments of these skeptics.

There are few challenges and hurdles resulting in the lack of widespread studies on these lines. One of the important challenges is the lack of measurement techniques. Second important challenge is the alignment of these Alternative Instructional methods towards the learning outcomes. Lastly, an unending list of the Instructional Methods and a variation of using those in the classrooms. There are few studies comparing active vs passive teaching (Cui, January 2013) but that is not done for the primary classrooms. This study tried to address these challenges during this study. Snapshot tools were designed based on the tools developed by Walkup and colleagues (2009), to understand the children in the classroom settings. Tools were flexible so as to accommodate the dynamic Non-Traditional (NT) classrooms. Study articulated operational definitions for classroom instructions to align with the Expected Learning Outcome (ELO). Another important contribution during the study was to move the thought process from the Instructional Methods (IM) to Instructional Strategies (IS).

2. Research Design

2.1 Problematize

During the designing of the research, the need realized to convert it into different phases because establishing the correlation between IS and ELO is difficult. There are a few pre-requisites to achieving the ELO due to the mentioned IS. First important component is whether Alternative Instructional Strategies (AIS) can help in improving the ability to hold the attention of the students, which is termed as Time-on-Task (ToT) (refer Section II-C Operational Definitions for more details). ToT is measured in time as unit, and talks about how long IS can hold the attention of students. For example, if the teacher has given a task to read the text book and if the students can do so, for the mentioned amount of time, then it says that the students were 'On-Task' otherwise 'Off-Task'. The next step would be to understand whether students were meaningfully engaged while working on the mentioned tasks. There is a possibility that children could just be holding the text books to portray that they are following the instructions but actually could be thinking of something else. Once there is meaningful engagement, only then one can move to the next step and that is about the ELO which implies that if the students had really read the text book as instructed, whether they managed to achieve the expected learning outcome.

This study is restricted to the first component owing to practical limitations and the scope of the investigation of the present study. During the first phase, study

measured the ToT of the students in the Traditional and Non-Traditional Teaching Learning Approaches (TLA) (refer Appendix IV).

2.2 Objectives

The major objective of the research project was to compare the Time-on-Task in Traditional and Non-Traditional schools. It was hypothesized that Non-traditional (learner-centered) practices result in a higher average TOT, compared to the traditional (teacher-centered) practices. The study was a comparative study, utilizing a Between-groups design.

3. Research Objectives

1. Study of students' Time-On-Task (student engagement) in Indian lower-primary classrooms.
2. Comparison of TOT between primarily teacher-centered (traditional) vs. primarily learner-centered (non-traditional) classrooms.

3.1 Specific Objectives

1. To calculate the ToT in the classrooms by observing Teacher/Student in Traditional and Non-Traditional primary classrooms
2. To calculate ToT as per the Instructional Strategies
3. To calculate ToT for Mathematics and Marathi classes

4. Sampling

As this study concentrates on the primary schools, only the 3rd and 4th grade students were considered. Out of the entire school time, only two subjects were observed so as to sharpen the focus. It also reduced the other variables and susceptibility on the results. Therefore, observations were done for only Mathematics and the first language (Marathi in Maharashtra). Multi-grade classrooms were avoided during the selections. Even if there were Multi-grade classrooms, only single class was observed.

It covered both, Traditional and Non-Traditional types of school during the study. School types were identified based on the government records, where Activity-Based Learning (ABL) and Constructivist schools were treated as the Non-Traditional schools. Government is piloting the ABL and Constructivist approach in few of the ZP schools. Schools are not selected based on specific criteria. Largely, qualifications of the teachers, salary range, student contexts, infrastructure and other facilities, are similar across both the group of schools.

The school selection was done based on the suggestions from the government and travel convenience to cover maximum schools. Convenience Sampling was followed to accommodate maximum schools based on the proximity. For this study, schools from Maharashtra and particularly from Bhor and Maval talukas, of Pune district, were considered.

Table 1: Sample

	Total	Trad	Non-Trad
No. of schools	58	30	28
No. of classrooms	237	125	112
No. of subject periods	237	125	112
No. of students (appx 10/ class)	2370	1250	1120
No. of Snapshots	8,295	4375	3920

Initially it was decided to consider a sample of 50 schools but later on, decided to cover additional schools to avoid the possibility of losing the data due to any error, like some loud noise outside, washroom breaks taken by the students, observer's biases, etc. Few erroneous entries were observed in the raw data and those were discarded before the final calculations. Above figures are after the removal of the discarded data.

5. Operational Definitions

5.1 TOT (Time-on-Task)

TOT was to be primarily based on the instructions given by the teacher in the classroom. If the teacher had given some task to the students, then it was observed whether the students were following or engaging with the same. Therefore, researchers needed to judge every task based on the instructions and not by a general interpretation of the student's behavior. For example, sleeping in the class could be straight away judged as being Off-Task. But if the teacher had given instructions to close the eyes and listen to the sounds of nature then it would be a TOT.

5.1.1 ToT in Traditional classrooms

Such classrooms are very much lecture-based. This kind of classroom would expect the children to concentrate on whatever was being read out or explained by the teacher. Therefore, TOT would mean 'to listen patiently'. There are different variables which may contribute towards children listening patiently, like fear of the teacher, style of teaching, etc. Researchers were instructed to refrain from value judging the TOT. If the students were meeting the teachers' expectations and following the teacher's instructions then that would hold good as TOT.

5.1.2 ToT in Non-Traditional classrooms

In non-traditional classrooms, it's very difficult to calculate the TOT. Such classrooms normally have group activities and are very democratic, wherein the groups take different decisions. When the teacher has delegated his/her authority to instruct, to the children, then it gets difficult to figure out who has given instructions and what is the time-on-task. However, the teacher assumes that the interaction and planning by themselves would help the children learn, because of which the assignment had been given to them. Therefore, instead of judging whose instructions the students follow, study calculated the TOT based on the expectations or tasks given by the teacher.

It does not mean that ToT measurements for both groups of schools were different. Both types of schools can use the same measurement. Students can be attributed On-Task if students work according to either the expectations or oral instructions by teachers.

Table 2: Tasks examples

Student listening to the class announcement	On-Task
Student talking to peers	Off-Task
Student talking to peers as instructed by teacher	On-Task
Student work preparing the origami model as part of the Art/Craft Class	On-Task
Student Sleeping in the classroom	Off-Task
Students appearing for the exams and teacher checking home work	On-Task
Teacher is lecturing and students not paying attention	Off-Task

5.3 Task

Task should also be clearly defined here. A 'Task' in a classroom is an activity which is aligned with the curriculum with reference to the Instructional Methods being used by the teacher. There is a possibility that the teacher has given a task which is not educational and is not aligned to the curriculum. For example, if the teacher requests (or instructs) students to go to the market and purchase vegetables for her, the teacher may give a justification that this task would teach some concepts to the children, but it will not be considered if not directly listed in the curriculum. Now even if the students were very much involved and would have completed the task properly it may not be counted as TOT. Few of the tasks have been mentioned below:

Attendance
Group Discussion
Exams/Assessment
Feedback
Vocabulary drills

1. Reading aloud
2. AV Display

Essay writing
Group activities
Use of pretest

3. Games
4. Art/Craft Activities

Textbook assignments
Study of maps and globe

Home Work Checking

5.4 Instructional Strategy (IS)

As the TASKS in the classroom or the instructional methods used by the teachers have countless possibilities, noting those things down during the class observation would be a challenge. Therefore, it was categorized under various strategies and just noted particular categories during the observations. It was sufficient to give a sense whether the strategy was teacher-centered or student-centered. Study used the following instructional strategies: (Instructional Approaches - A Framework for Professional Practice, 1991)

- Administrative Work
- Direct
- Indirect
- Interactive
- Independent Study
- Experiential Learning

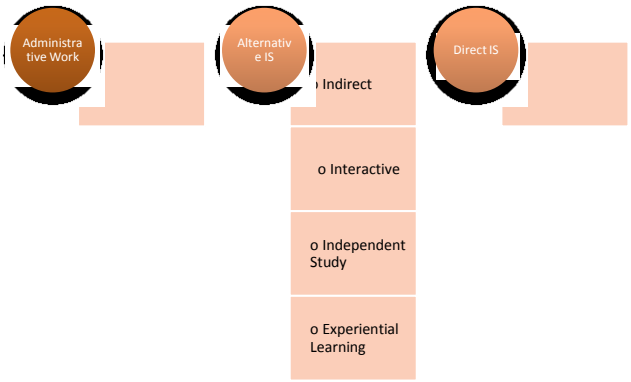

Diagram 1: Instructional Strategies

5.5 Tool Design

Study demanded tools which would be subject-neutral and neutral to the topics being taught in the classroom. Another expectation was about the accuracy and precision of the tool as most of the other studies had faced this challenge.

A snapshot tool was designed inheriting the tool by Walker and his colleagues during study " Bell to Bell: Measuring Classroom Time Usage" (Walkup, Farbman, & McGaugh, January 11, 2009). This tool measures the classroom status after every minute. The observer is expected to use a clock timer to make timely observations. The

classroom is divided into four virtual quarters after every minutes and the reading is taken against the quarter marks. This division in the quarters is dynamic and could vary for every minute observation. During the NT classrooms, there was a possibility that different sets of students could be receiving different instructions. Therefore, tools provided a facility to note down the IS against the respective sections of the students. Current tool look as shown in the Table 3.

Table 3: Tool sample

Timeline → Student ↓	0-5mins					6-10mins					11-15mins				
1/4th															
1/4th															
1/4th															
1/4th															

This tool does not take into consideration the teacher's expertise in handling any topic. Another important feature of this tool is that it's non-participatory and facilitates only passive observations. Observes presence could have affected the environment but study will be neutral to it as this possibility exists in the both type of classrooms.

5.6 Training and Pilot study

As it was very meticulous work to conduct the observations, field researchers were given extensive training. There was good possibility of misinterpreting the instructional strategies; therefore, every field researcher went through the in-depth training. Researchers could develop in-depth understanding about the different terminologies and different meanings. After the training researchers went through the videos and noted down the observations.

Apart from the in-house training and practice sessions, pilot study was planned to simulate the process and understand the applicability of the tools. During this simulation, sample data was analyzed and framework also validated. Field Investigators also got opportunity to understand the ground level situations and possible challenges.

During actual data collections, Field Investigators were expected to go through the videos and note down the observations. It was done with the intentions to understand if observers are thinking on the right track. It was planned to introduce the observers biases in the statistical calculations if larger deviations observed. But fortunately, wide deviations were not observed.

5.7 Assumptions

1. It is assumed that there would not be any impact of any influence due to inclinations, interests and motivation of the teachers; that such influences would be on the Traditional and Non-Traditional schools, different subjects and various Instructional Strategies, equally. Therefore, this influence could be ignored during this study.
2. Another assumption is that the motivation of the students, occasional variations would not influence the outcome of the study. Inclinations of the students would influence both categories of the schools equally.

6. Analysis

Study started with some hypothesis and therefore, initially hypothesis testing was done and then further analysis was conducted.

6.1 Hypothesis Testing

1. Ho (Null Hypothesis): TOT for Traditional and Non-Traditional TLA is same.
2. H1 (Alternative Hypothesis): Average TOT for Non-Traditional TLA is higher.

Levene's Test for Equality of Variances shows that two groups are significantly different at level .01. Therefore, it is assumed that variances are not equal while comparing the means. Keeping in mind the differences in sample sizes and variances (as shown by the Leven's test results of the independent samples t-test performed using SPSS Ver.20) of the comparison groups, pooled variance estimate was first calculated followed by independent samples t-test to increase the accuracy of the results. Mean comparisons done for all the Non-Traditional and Traditional schools (Table 7), the average ToT was 3.22 for Traditional schools and 3.78 for Non-Traditional schools, and a significant difference was observed ($t = -6.75$, $df = 235$, $p < .01$). Thus, the hypothesis stating that TOT for Non-Traditional schools is higher than for Traditional schools was supported. Similarly, it was calculated separately for the effective, attentive and non-attentive students (refer APPENDIX IV) to obtain the significant values less than .01. This held our alternative hypothesis which claims that there is a considerable difference in the ToT during the Traditional and Non-Traditional TLA. It provides a good base to start probing further.

6.2 Attentive and Non-Attentive Analysis

It calculated three different indices to show the portion of the time that the students were on-task. This gave us the higher level summary of the minute by minute observations done in the classrooms.

The 'Attentive index' represents the proportion of total students in a class which is expected to be always on-task throughout the instructional time. The 'Non Attentive index' is reflective of the proportion of those students who are on-task only when the entire class is on-task, otherwise they are off-task. These portions vary over the duration of the class. Study calculated the indices for the Attentive and Non-Attentive students separately to understand the time-on-task.

The study revealed that in the Traditional classrooms, students were on-task anywhere from 23% to 65% of the time during Marathi with the use of Direct Instructions, whereas 17% to 34% of the time using Alternative Instructions. It clearly shows that Direct Instructions were better for the Marathi subject in the Traditional classrooms. Similarly, for the Non-Traditional classrooms, TOT was 7%-16% for Direct Instructions and 62%-86% for Alternative Instructions, while teaching Marathi. Therefore, Alternative Instructions should be preferred while teaching Marathi in the Non-Traditional classrooms over the Direct Instructions.

. For Mathematics, in the Traditional classrooms students were on-task for 15% to 40% of the time using Direct Instructions, whereas 27% to 53% using the Alternative Instructions. Similarly, for Non-Traditional classrooms, it was as low as 6%-18% for Direct Instructions and 57%-86% for Alternative Instructions. This shows that Alternative Instructions always work better for Mathematics.

6.3 Inclination Analysis Using Effective Indices

The 'Effective on-task' index shows the overall proportion of the students which were actually on-task during the observation time. If the effective index is closer to the Attentive index, then it shows disengaged students are relatively less. All Indices can be put in the format 'Non-Attentive to Effective to Attentive', to understand the scenario better. For Traditional classrooms with Direct Instructions in Marathi, this spectrum is 23%-47%-65% which shows that Effective Index is more inclined towards Attentive. Therefore, it can claim that Direct Instructions work better in Traditional Marathi classrooms and can expect more attentive students.

These inclinations can be represented numerically, where positive numbers will show inclination towards being on-task and negative numbers will show the tendency towards being off-task. It has calculated how far Effective index is away from the mid value between Non-Attentive and Attentive indices. It was calculated using the formula [$INDEX_{Effective}$ - ($INDEX_{Non\text{-}Attentive}$ + ($INDEX_{Attentive}$ - $INDEX_{Non\text{-}Attentive}$)/2)]. It will be translated to [$INDEX_{Effective}$ - $INDEX_{Non\text{-}Attentive}$/2 - $INDEX_{Attentive}$/2]. It gives following values shown in Table 4. (refer APPENDIX III for more details)

Table 4: Inclination details

	Non Traditional		Traditional	
	Marathi	**Maths**	**Marathi**	**Maths**
Direct IS	-0.01	-0.02	0.03	0.02
Alternative IS	0.02	0.04	0.00	0.01

The above table clearly shows that *"Direct IS doesn't work for any subject in the Non-Traditional classrooms. On the contrary, Alternative IS doesn't have any negative influence on the Effective On-Task duration for any class, though it is neutral for the Marathi class in Traditional classrooms".*

7. Detailed Analysis

This study could bring out interesting facts. It compared different TLA, IS, and Subjects, which helped in understanding trends over a class duration of 35mins.

7.1 Overall trends

As per figure 1, overall trends suggested a decline in the ToT over a period of time. There were a few things which needed to be taken into consideration while analyzing the following trends. Average ToT drastically dropped for Traditional classrooms; on the contrary, it was almost constant in the Non-Traditional classrooms.

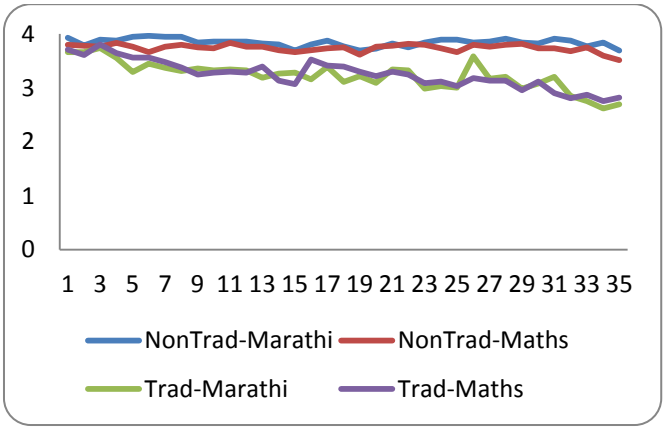

Figure 1: On-Task Trends

As seen in Table 7, the average ToT was 3.22 for Traditional schools and 3.78 for Non-Traditional schools, and a significant difference was observed ($t = -6.75$, $df = 235$, $p < .01$). Therefore, overall trends for Non Traditional classrooms are better.

7.2 Trends during the Non-Instructional Time

Teachers do variety of work in the non-Instructional time during the classrooms. Teachers tended to utilize the initial time span for gathering the class, attendance, collecting the ABL cards, taking out the books, etc. Whenever the teachers gave instructions, not directly related to the learning, the students tended to lose their interest and started zoning out.

It was observed that in both, Traditional and non-Traditional classrooms, students tended to lose interest and ToT dropped drastically. Therefore, it was a clear indication that teachers should try to restrict the non-Instructional time to the minimum. The following graphs show that safer non-instructional time would be within the first 3-5mins.

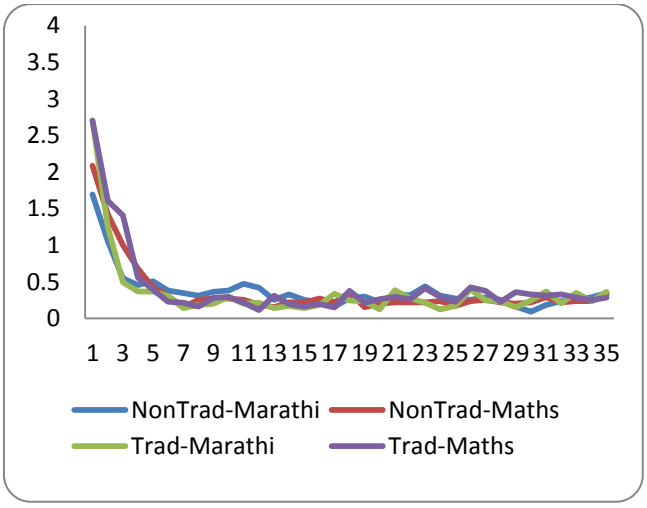

Figure 2: On-Task trends during Non-Instructional Time

7.3 Trends during Alternate Instructions

Figure 3, shows the trends recorded while Alternative Instructional Strategies in the Traditional and Non-Traditional classrooms were used. Even though it is claimed that Alternative Instructions worked better and helped to get a better ToT, it did not work in the Traditional Classroom set-up equally. There could be a few reasons for this drop in the ToT when similar Instructional Strategies were tried in the Traditional classrooms. A speculated reason was that students might not have been acquainted with such kind of instructions and felt lost in the classroom. Other possible reason could be that teachers themselves were not trained enough to use those strategies in the classrooms. Further probing on these lines was required to understand the specific reasons for these differences, but it would be the next course of action.

As seen in Table 7, the average ToT for Attentive students was 0.32 for Traditional schools and 0.76 for Non-Traditional schools, and a significant difference

was observed ($t = -13.36$, $p < .01$). Thus, **students could demonstrate a higher ToT in a Non-Traditional classroom when Alternative Instructions were used.**

There was another important observation that **Alternative Instructions were rarely used at the start of the session** because teachers were doing non-Instructional activities, after which the teachers started with the Direct Instructions and/or the Alternative Instructions. Therefore, ToT slowly increased after the initial few minutes.

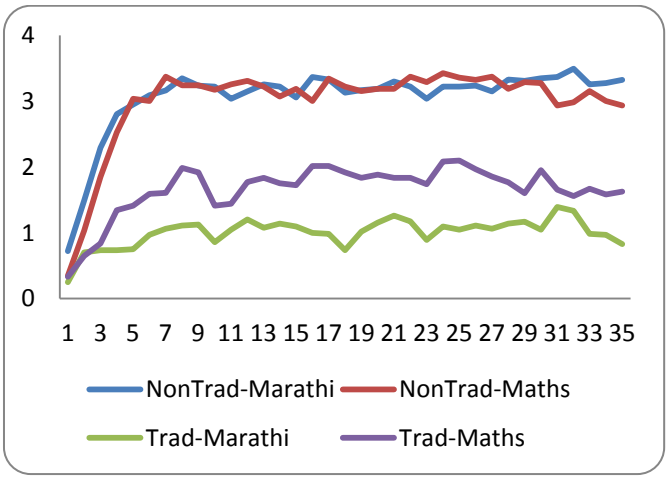

Figure 3: On-Task trends during Alternate Instructions

7.4 Trends during Direction Instructions

It was observed in Figure 4, that the Direct Instructions caused a drop in the overall ToT of the students. Maximum ToT itself never crossed 2.5 quarters of the classrooms which was a little less as compared to that of the Alternative Instructional Strategies. As seen in Table 8, the average ToT was 0.47 for Traditional schools and 0.11 for Non-Traditional schools, and a significant difference was observed ($t = 9.64$, $p < .05$). Thus, TOT for Traditional schools and Non Traditional schools are significantly different and its higher for Traditional. When it compared the language in different types of classroom set-up, Direct Instructions seemed to work best in the Traditional Marathi classrooms.

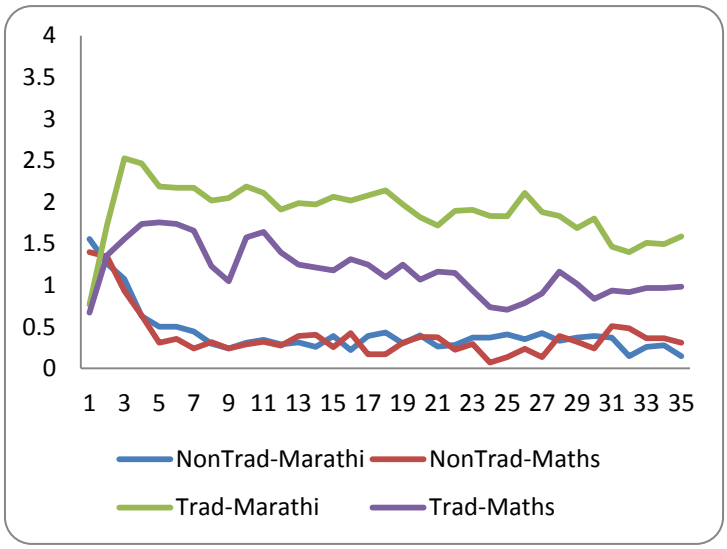

Figure 4: On-Task trends during the Direct Instructions

a. Direct Instruction strategies were useful only during the first 3-5 min in the Non-Traditional classrooms. Teachers normally gave few instructions for continuing the Alternative Instructional Strategies. However, when the teacher continued using the Direct Instructions in such classrooms then there was a high possibility that the learners might have lost the connection.

b. Direct Instructional Strategies did not cause serious variation in the Traditional classrooms though. Possible reasons could have been that students were very well acquainted with those strategies. The other possible reason could have been that the learners had set expectations and did not really look beyond that, which was exactly opposite to what was seen in the Non-Traditional classrooms.

7.5 Trends in different classrooms for different grades

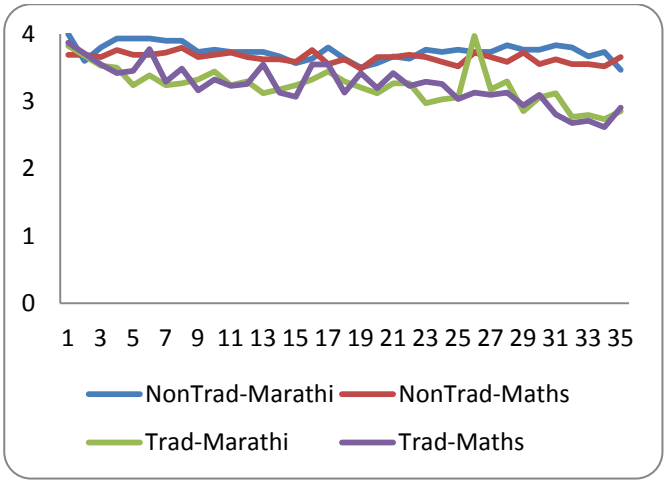

Figure 5: On-Task trends - All Instructional Strategies for Grade 3

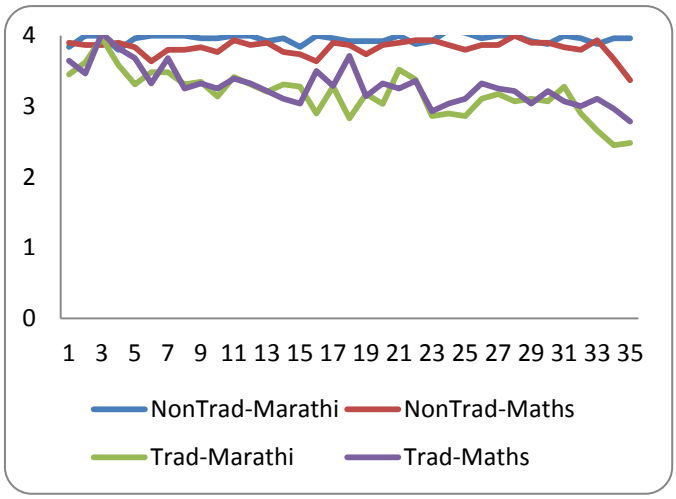

Figure 6: On-Task trends - All Instructional Strategies for Grade 4

Figure 5 and Figure 6, clearly show variations in the ToT trends in different types of classrooms. Moreover, both the grades showed almost similar trends. 4th grade dropped a little lower till 2.5 quarters. Above Figure 6 is the average of all types of instructions and non-instructional time. Further analysis was done for Instructional Strategies as per the grades.

7.6 Trends during Direction Instructions across different grades

When trends were observed during the Direct Instructional Strategies in the 3rd grades, it was very clear that ToT was at the bottom for the Non-Traditional classrooms. Similar was the case with the 4th grade students as well.

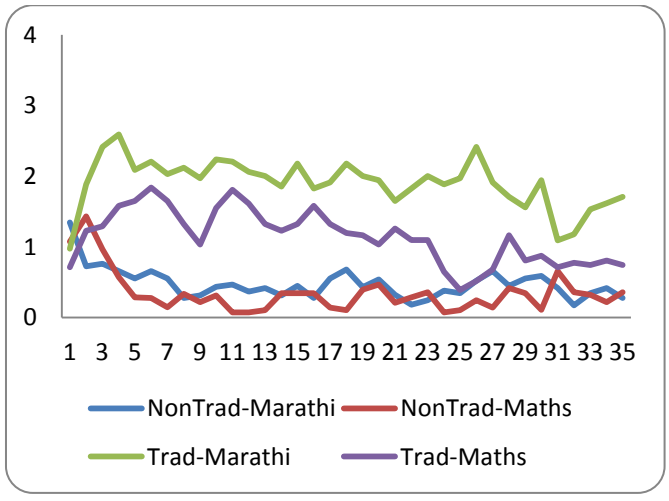

Figure 7: On-Task trends - Direct Instructions for Grade 3

When trends were compared across classrooms (Figure 7,8), it was observed that Mathematics had a lower ToT than Marathi even in the Traditional classrooms, with Direct instructions were used. This has been further elaborated in the point 8.

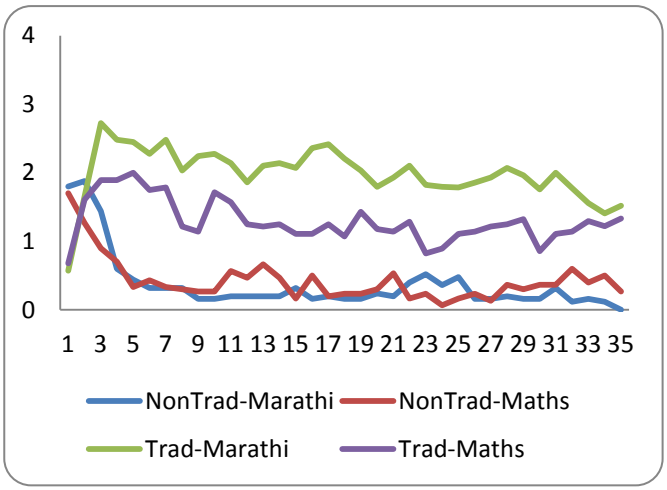

Figure 8: On-Task trends- Direct Instructions for Grade 4

7.7 Trends during the Alternative Instructional Strategies across different grades

Figures 9 and 10 show the ToT due to Alternative Instructions in the Grade 3rd and 4th respectively. Alternative Instructions had similar trends for both the grades. There weren't many deviations when compared across the two grades.

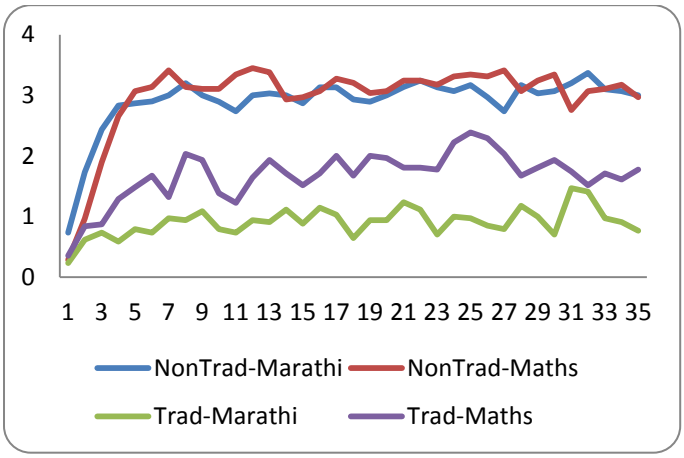

Figure 9: On-Task trends - Alternate Instructions for Grade 3

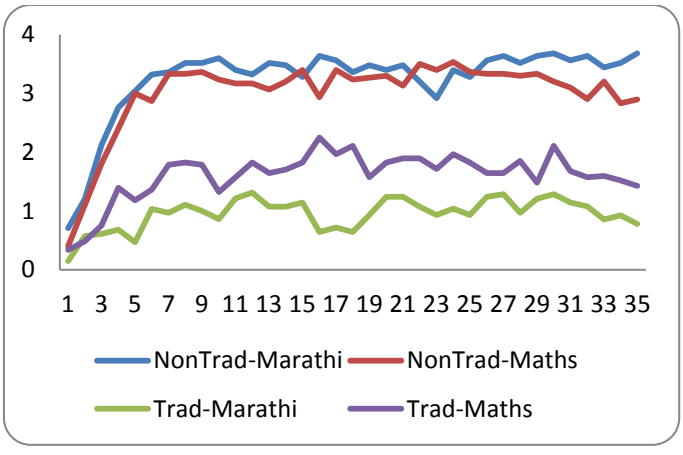

Figure 10: On-Task trends - Alternate Instructions for Grade 4

7.8 Comparing Direct and Alternative Instructions for 4th grade

After comparing the Figure 8 and Figure 10, it can strengthen the claim that Alternative Instructions worked better in the Non-Traditional Classrooms and Direct Instructions worked better in the Traditional Classrooms. Additionally, it is observed that for Traditional classrooms, Alternative Instructions were appreciated by students more in Mathematics and Direct Instructions for the Marathi language.

7.9 Trends during the Non Traditional Marathi and Mathematics classrooms

It was difficult to distinguish much in the trends during the use of Direct and Alternative Instructions in the Non-Traditional Marathi and Mathematics classrooms. Both the graphs as shown in Fig 11, 12, ran almost in synchronization; but the 4th grade students were engaged more in the Non Traditional compared to the 3rd grade, while using Alternative Instructions.

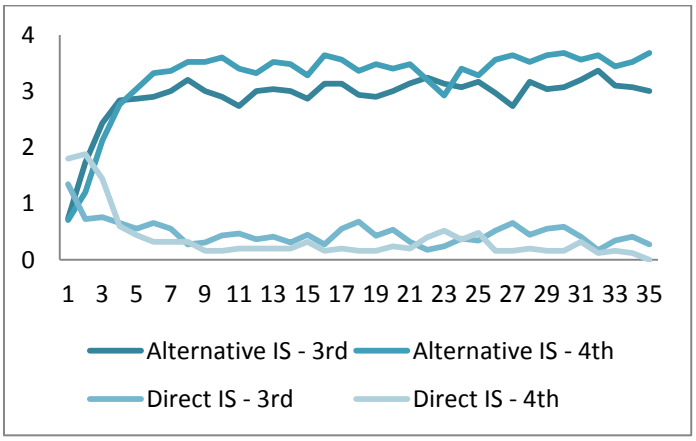

Figure 11: On-Task trends - the Non-traditional Marathi Classrooms

Figure 12 shows that there was not much variation between grades and IS, during the non-traditional Mathematics classrooms. However, as stated earlier and also reflected in Figure 11 & 12, the TOT in both grades was higher during Alternative Instructions than Direct Instructions in the non-traditional Marathi and Math classrooms.

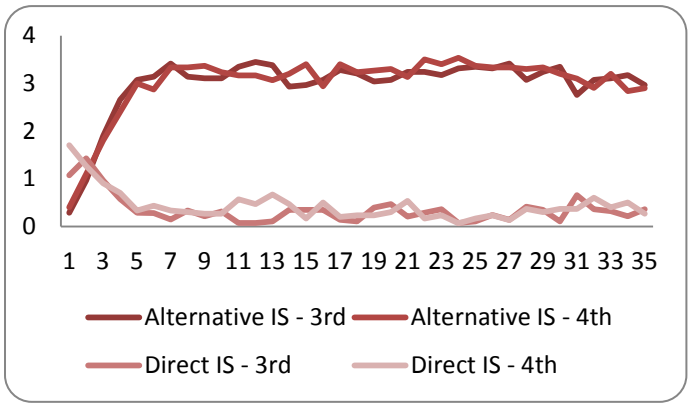

Figure 12: On-Task trends – Non-Traditional Math Classrooms

7.10 Trends during the Marathi and Mathematics classrooms in Traditional Classrooms

It was difficult to identify the variations between grades for each type of TLA using a different IS for Marathi (Fig 13).

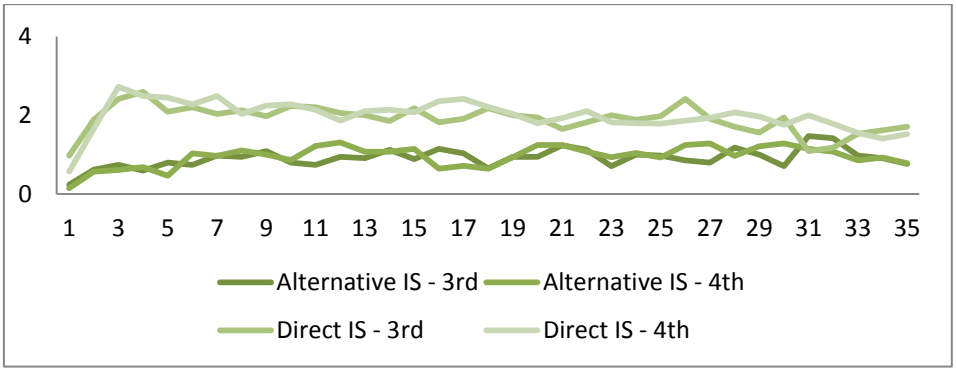

Figure 13: On-Task trends - Traditional Marathi Classrooms

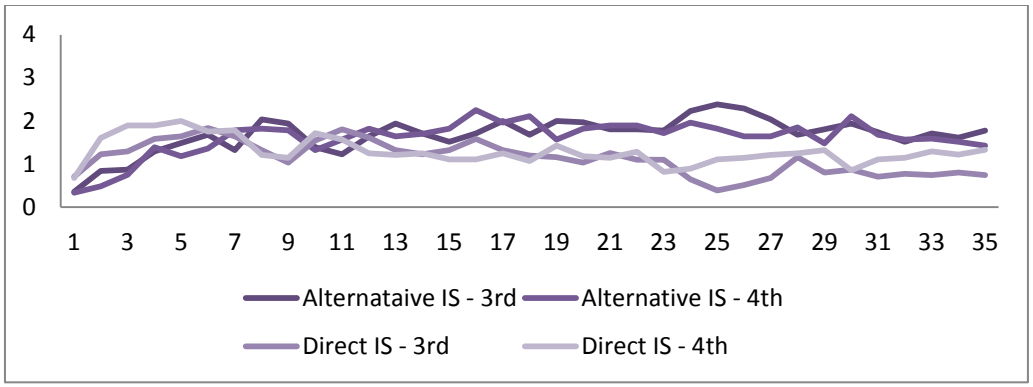

Figure 14: On-Task trends during the Traditional Math Classrooms

Similarly, for Mathematics, there was a good amount of overlap and it was difficult to identify the grade doing better. However, as stated earlier and as reflected in Fig 13 & 14, the ToT in both grades was higher during Direct Instructions than Alternative Instructions in the traditional Marathi and Math classrooms.

8. Conclusions

This study concludes that the Average ToT in the Traditional and Non-Traditional classrooms were significantly different. The overall trends show that the Traditional classrooms noted a decrease in the ToT over a period of time. The use of Direct Instructions in the Non-Traditional classrooms tended to decrease the overall ToT. On the contrary, Alternative Instructions worked better in the Non-Traditional classrooms; but it did not mean that there would be a similar reflection of the Alternative Instructions in the Traditional Classrooms. Therefore, Non-Traditional classrooms with proper use of Alternative Instructions can only assure the expected ToT.

When subjects were compared, it was observed that Alternative Instructions worked better in the Non-Traditional Mathematics classrooms and Direct Instructions were observed to be working best in the Traditional Marathi classrooms.

The initial time of 3-5 mins was the only suitable time for giving out non-instructional messages or administrative instructions. Again, the use of Direct instructions in the Non-Traditional classrooms was better only during the initial 3-5 mins otherwise, it tended to decrease the ToT.

There were no significant variations due to the grades. Alternative Instructions seemed to be working slightly better in the Non Traditional 4th grades. Acquaintance, comfort or expectation of the Instructional Strategies could be the possible reason behind it.

Direction Instructional Strategies don't work in Non-Traditional classrooms effectively. On the contrary, Alternative Instructional Strategies don't cause any negative influence in any of the classrooms. Therefore, Alternative Instructional Strategies are safe to experiment with.

9. Limitations of the Study

1. The study was conducted in very specific geographical locations. It could be extended to other locations to understand more about the behaviours.
2. Only Mathematics and a Primary Language were taken into account for arriving at the conclusions. The trends in TOT for other curricular subjects also need to be understood.
3. The current snapshot tool was very detailed and covered minute observations; but it was very tiresome for an observer when one needed to do multiple classroom observations back to back.

10. Possible Enhancements in This Study

1. Diverse aspects to this study like comparison of the different grades, comparison with private schools, comparison between different Instructional Strategies (Indirect, Independent, Experiential, etc) could be further added to provide more dimensions.
2. This study could further conducted across different geographical locations to understand the influences of the contexts.
3. Consideration to teachers' attitudinal variations, natural inclinations, subject interests, etc. could be included.
4. The learners' characteristics like gender, socio-economic conditions (SEC), learning abilities, earlier academic performance, etc. could also be included.

11. Future Scope

1. This study could help us clearly identify that there were variations in ToT between Marathi and Mathematics. Direct Instructions seemed to be working better during Marathi classrooms. Further probing is required on these lines.
2. There was a slight variation according to the grades as well. 4th grades observed better ToT than the 3rd during the Alternative Instructions. Observing other grades may bring forward more perspectives.

12. Proposed Next Phases

- **Phase I**: Current study, concentrated on understanding ToT for different TLA, which is considered as the first phase of this study.
- **Phase II**: The logical next phase would be to understand whether Alternative Instructions could 'meaningfully engage' the students for different TLA.
- **Phase III**: After the completion of PHASE II, attempts will be made to understand whether the 'meaningful engagement' actually contributes to the Expected Learning Outcome.

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Table of Diagrams, Tables, Figures

Appendix I: Glossary

1. TLA (Teaching Learning Approach)

Study divided classrooms into only two Teaching-Learning Approaches:

a) **Traditional** Category talks about the less active involvement of the students in the classrooms. This kind of classroom is teacher-centered. Teacher-centered practices heavily rely on chalk-and-talk, one-size-fits-all methods, i.e. mainly lecturing and memorization.

b) **Non-Traditional classrooms** use a student-centered approach. This category gives priority to students and all activities are planned considering the learner in mind. There are more customized activities, which may include activity-based and/or project-based learning methods, a mix of individual, peer and group learning, but with minimal use of lecturing and memorization.

2. IS (Instructional Strategy)

Instructional Methods were categorized into Instructional Strategies like, Direct, Indirect, Interactive, Independent, Experiential. Non-Instructional was added as one of the categories to segregate the list of instructions not contributing to curricular instructions.

3. ToT Indices

Following diagram 2 is representation Attentive and Non-Attentive student behaviours in the classrooms by Walker and his colleagues. (Walkup, Farbman, & McGaugh, January 11, 2009). Here orange box represents total observation time, Black represents academic engagement and dotted box represents the effective engagement.

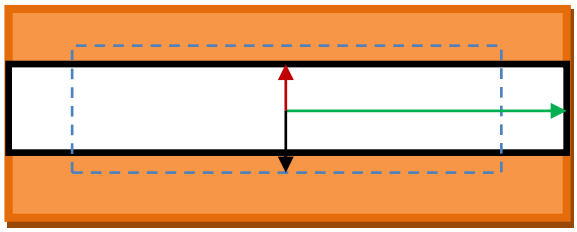

Diagram 2: Representation of the classroom timing

Attentive Students ToT Index (Green Arrow): This index talks about the students who are following the instructions, whenever they are expected to do so.

Non-Attentive Students ToT Index (Red Arrow): This index attributes to the students who follow instructions only when the entire classroom is doing so, otherwise they are not on-task.

Effective ToT Index (Yellow Arrow): This index accounts for the portion of the students who typically appear to be engaged at any time during the observation.

Population of the Attentive and Non-Attentive students varies during the entire class time. Researcher need to look at the entire class observation while calculating the Indices.

Appendix II: Index - Effective, Attentive, Non-Attentive

Table 5: Indices - Effective, Attentive, non-Attentive

		Non Traditional		Traditional	
		Marathi	**Maths**	**Marathi**	**Maths**
ToT (Effective)	**Total**	0.96	0.94	0.81	0.81
	Direct IS	0.10	0.10	0.47	0.29
	Alternate IS	0.76	0.75	0.25	0.41
ToT (Attentive Stud)	**Total**	0.99	0.98	0.96	0.94
	Direct IS	0.16	0.18	0.65	0.40
	Alternate IS	0.86	0.86	0.34	0.53
ToT (Non-Attentive Stud)	**Total**	0.86	0.81	0.54	0.56
	Direct IS	0.07	0.06	0.23	0.15
	Alternate IS	0.62	0.57	0.17	0.27

Appendix III: Inclinations towards Attentive or Non-attentive

Table 6: Inclinations to Attentive or Non-Attentive

		Non Traditional		Traditional	
		Marathi	**Maths**	**Marathi**	**Maths**
Direct IS	**Non-Att**	0.07	0.06	0.23	0.15
	Eff	0.10	0.10	0.47	0.29
	Att	0.16	0.18	0.65	0.40
	Inclination	-0.01	-0.02	0.03	0.02
Alternative IS	**Non-Att**	0.62	0.57	0.17	0.27
	Eff	0.76	0.75	0.25	0.41
	Att	0.86	0.86	0.34	0.53
	Inclination	0.02	0.04	0.00	0.01

Appendix IV: T-tests with Pooled variance

Table 7: Summary of t-test for School-wise Comparison (Total Sample)

Variable	School Type	*n*	Mean	S.D.	s^2_p	*t*
ToT	Trad.	125	3.2233142857	0.73	0.395	-6.75**
	Non.Trad.	112	3.7760204081	0.49		
Engagement (Att)	Trad.	125	0.9487999999	0.10	0.009	-2.86**
	Non.Trad.	112	0.9852040815	0.10		
Engagement (Att)(Dir)	Trad.	125	0.5284571428	0.31	0.072	10.28**
	Non.Trad.	112	0.1688775510	0.22		
Engagement (Att)(Other)	Trad.	125	0.4301714286	0.30	0.062	-13.21**
	Non.Trad.	112	0.8604591836	0.18		
Engagement (NonAtt)	Trad.	125	0.5597714285	0.35	0.096	-7.11**
	Non.Trad.	112	0.8466836734	0.26		
Engagement (NonAtt)(Dir)	Trad.	125	0.1924571428	0.21	0.028	5.81**
	Non.Trad.	112	0.0642857143	0.11		
Engagement (NonAtt)(Other)	Trad.	125	0.2166857142	0.27	0.092	-9.56**
	Non.Trad.	112	0.5959183673	0.34		
Engagement (Efft)	Trad.	125	0.8058285714	0.18	0.024	-6.75**
	Non.Trad.	112	0.94400510202	0.12		
Engagement (Eff)(Dir)	Trad.	125	0.3841714286	0.24	0.037	11.23**
	Non.Trad.	112	0.0998724490	0.13		
Engagement (Eff)(Other)	Trad.	125	0.3276000000	0.28	0.060	-13.36**
	Non.Trad.	112	0.7562500000	0.21		

Table 8: Summary of t-test for School-wise Comparison (Subject: Marathi)

Variable	School Type	*n*	Mean	S.D.	s^2_p	*t*
ToT	Trad.	65	3.2004395604	0.69	0.308	-6.15**
	Non.Trad.	54	3.8301587302	0.33		
Engagement (Att)	Trad.	65	0.9578021977	0.08	0.004	-3.02**
	Non.Trad.	54	0.9931216930	0.02		
Engagement (Att)(Dir)	Trad.	65	0.6465934065	0.29	0.071	9.81**
	Non.Trad.	54	0.1645502646	0.23		
Engagement (Att)(Other)	Trad.	65	0.3362637362	0.31	0.068	-10.85**
	Non.Trad.	54	0.8592592592	0.18		
Engagement (NonAtt)	Trad.	65	0.5468131868	0.35	0.089	-5.95**
	Non.Trad.	54	0.8746031745	0.22		
Engagement (NonAtt)(Dir)	Trad.	65	0.2268131867	0.24	0.038	4.26**
	Non.Trad.	54	0.0730158731	0.12		
Engagement (NonAtt)(Other)	Trad.	65	0.1661538461	0.26	0.088	-8.41**
	Non.Trad.	54	0.6259259259	0.34		
Engagement (Efft)	Trad.	65	0.8001098900	0.17	0.019	-6.15**
	Non.Trad.	54	0.9575396824	0.08		

Engagement (Eff)(Dir)	Trad.	65	0.4671428572	0.24	0.041	9.64**
	Non.Trad.	54	0.1052910053	0.15		
Engagement (Eff)(Other)	Trad.	65	0.2465934066	0.27	0.062	-11.32**
	Non.Trad.	54	0.7666666666	0.22		

Table 9: Summary of t-test for School-wise Comparison (Subject: Maths)

Variable	School Type	*n*	Mean	S.D.	s^2_p	*t*
ToT	Trad.	60	3.2480952381	0.77	0.486	-3.71**
	Non.Trad.	58	3.7256157635	0.61		
Engagement (Att)	Trad.	60	0.9390476189	0.12	0.015	-1.70 (NS)
	Non.Trad.	58	0.9778325122	0.13		
Engagement (Att)(Dir)	Trad.	60	0.4004761905	0.27	0.058	5.11**
	Non.Trad.	58	0.1729064039	0.21		
Engagement (Att)(Other)	Trad.	60	0.5319047619	0.25	0.047	-8.20**
	Non.Trad.	58	0.8615763546	0.17		
Engagement (NonAtt)	Trad.	60	0.5738095237	0.35	0.104	-4.15**
	Non.Trad.	58	0.8206896551	0.30		
Engagement (NonAtt)(Dir)	Trad.	60	0.1552380952	0.17	0.018	3.98**
	Non.Trad.	58	0.0561576355	0.09		
Engagement (NonAtt)(Other)	Trad.	60	0.2714285714	0.28	0.095	-5.21**
	Non.Trad.	58	0.5679802955	0.34		
Engagement (Efft)	Trad.	60	0.8120238095	0.19	0.030	-3.71**
	Non.Trad.	58	0.9314039409	0.15		
Engagement (Eff)(Dir)	Trad.	60	0.2942857143	0.20	0.026	6.62**
	Non.Trad.	58	0.0948275862	0.11		
Engagement (Eff)(Other)	Trad.	60	0.4153571428	0.25	0.052	-7.82**
	Non.Trad.	58	0.7465517241	0.20		

Key

s^2_p	Pooled variance estimate
**	$p < .01$
NS	Not significant i.e. $p > .05$
	Results in favor of rejection of the null hypothesis (consistent with expectations)
	Results in favor of retention of the null hypothesis (contrary to expectations)
	Results in favor of retention of the null hypothesis (consistent with expectations, but results not statistically significant)

Appendix V: Independent Sample T-tests

Table 10: Independent Samples Test for Attentive

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Engagement (Att)(Dir)	Equal variances assumed	40.662	.000	9.382	242	.000	.3331213	.0355077	.2631776	.4030649
	Equal variances not assumed			9.617	227.416	.000	.3331213	.0346382	.2648684	.4013741
Engagement (Att)(Alter)	Equal variances assumed	70.814	.000	-12.404	242	.000	-.4103489	.0330822	-.4755148	-.3451831
	Equal variances not assumed			-12.840	207.150	.000	-.4103489	.0319587	-.4733550	-.3473429

Table 11: Independent Samples Test for Non-Attentive

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Engagement (NonAtt) (Dir)	Equal variances assumed	55.219	.000	5.453	242	.000	.1189165	.0218070	.0759608	.1618723
	Equal variances not assumed			5.662	199.916	.000	.1189165	.0210036	.0774995	.1603335

Engagement (NonAtt) (Alter)	**Equal variances assumed**	12.840	.000	-9.153	242	.000	-.3605514	.0393897	-.4381418	-.2829609
	Equal variances not assumed			-9.029	217.378	.000	-.3605514	.0399324	-.4392557	-.2818471

Table 12: Independent Samples Test for Effective

Independent Samples Test										
		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
Engagement (Eff)(Dir)	**Equal variances assumed**	70.513	.000	10.301	242	.000	.2673694	.0259544	.2162440	.3184948
	Equal variances not assumed			10.693	200.605	.000	.2673694	.0250052	.2180627	.3166761
Engagement (Eff)(Alter)	**Equal variances assumed**	19.790	.000	-12.509	242	.000	-.4067862	.0325187	-.4708420	-.3427304
	Equal variances not assumed			-12.759	234.899	.000	-.4067862	.0318816	-.4695967	-.3439757