EFFECTIVENESS OF FLIPPED CLASSROOM INSTRUCTION FOR NURTURING PROSPECTIVE TEACHERS' REFLECTIVE THINKING SKILLS

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ABSTRACT

Title: Effectiveness of Flipped Classroom Instruction for Nurturing Prospective Teachers' Reflective Thinking Skills

The objectives of the research study were to assess the change in reflective thinking skills of prospective teacher as a result of studying through traditional/Flipped Classroom Instruction (FCI) and to examine the change in their academic performance after the intervention. The concurrent embedded strategy (QUAN+qual) of mixed-methods research design (Creswell, 2009) was employed. Prospective teachers of BS Ed. (Hons.) in a teacher education institution in Islamabad participated in this study. Previous academic record of prospective teachers was used to identify high, average and low achievers in the sample to be assigned to control and experiment group. Two teachers having equal academic qualification and almost equivalent teaching experience were involved in this study for teaching the experimental and the control group. The validity and reliability of research instruments was ensured. The study consisted of two phases. Reflective Thinking Skills Scale (RTSS) and academic achievement test were administered to experimental and control group before and after phase one and two. At the end of second phase, the perception of prospective teachers of experimental group was investigated through perception scale about Flipped Classroom Instruction (FCI) and the focus group discussion. The results of the study revealed that there was no statistically significant change in experimental group during first phase of the study, and a positive change in their reflective thinking skills and academic performance of prospective teachers during second phase of the study. The difference among academic achievement sub-groups in experimental group was statistically non-significant on ‘Reflective Thinking Skills Scale (RTSS)’ and ‘academic achievement test’. The data results for perception of prospective teachers of experimental group about Flipped Classroom Instruction (FCI) showed that they considered FCI as interesting and helpful for their subject comprehension and grooming of thinking skills. The research study recommended to provide professional training to teacher educators and prospective teachers for effective use of FCI in the classroom.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
FC	Flipped Classroom
FCI	Flipped Classroom Instruction
HE	Higher Education
RTSS	Reflective Thinking Skills Scale
SD	Standard Deviation
TE	Teacher Education

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DEDICATION

I dedicate this thesis to my parents who helped and supported me in every possible way to make it happen.

CHAPTER 1

INTRODUCTION

1.1 Background of the Research Study

For learners' success and survival as citizens and workers in the 21st century, teachers have to train their higher-order cognitive skills and performance. Teachers require the skills for managing classroom activities, communicating, using technology and reflecting on their practice to learn and improve themselves on a regular basis (Darling-Hammond, 2006). Teacher education must be designed in accordance with the changes occurring in k-12 classes (Dickenson, 2015) across the globe.

To cope with the changing demands of the 21st century (Schleicher, 2012, p.36), teachers must work to advance their professional knowledge and that of the profession. They are expected to work for innovations in curricula and pedagogy (Elmore, 2002 as cited in Schleicher, 2012, p.36). But, keeping in view the system where the quality of teaching and learning for basic skills (literacy, numeracy etc.) is below the mark, the adaptation of an education system for high level cognitive skills may need a lot of resources (Joynes, Rossignoli & Amonoo-Kuofi, 2019) and work.

There are three vital questions related to process of education: what, how and why (Khan, 2017). The 'what' question encompassed the content knowledge such as Mathematics, General Science, Urdu and Social Studies whereas 'how' deals with the teaching and the preparation of new teachers. The 'why' questions are related to the rationale of educational process itself. It involves the importance of overall educational experience and of the subject, relevance of the particular subject to the other subjects, and understanding of the subject for overall education and development of students. For carrying out this critical role of teachers, universities hold a significant place for a balanced preparation of new teachers. In addition, a high level of reflection is required in initial teacher education programmes (Khan, 2017).

Teaching involves thinking and acting with the help of a thoughtful strategy to handle immediate situations within the school and the classroom. There are situations which demand quick decisions such as searching an alternative way to teach the subject matter, interacting with pupils, and dealing with classroom problems. For this purpose, teachers rely on their expertise in practice, actions and their previous experiences along with reflecting on those experiences. The crux of this explanation is that there is a knowledge in practice most helpful in immediate and important situations which a formal research has little to offer (Cochran-Smith & Lytle, 1999).

Integrating reflective thinking in teacher education can help prospective teachers to integrate the teaching beliefs into actions and make sense of the experiences (Shoffner, 2008: as cited in Eby & Yuzer, 2013,p.82). Reflection involves discussion with others or self-talk about an experience (Ramsey, 2010: as cited in Eby & Yuzer, 2013, p.82). If the reflective habit of future teachers is successfully built, it can help them to cope with daily issues in work life with a creative and a critical perspective (Lee, 2008). Practice and experience may develop reflective thinking skill among prospective teachers (Mirzaei, Phang & Kashefi, 2013).

The teaching-learning process can be made more effective both for the teachers and the teacher candidates through the practice of reflective thinking. Reflective thinking assists learners to ponder on their learning experiences, to analyze their leaning progress, to adapt their behaviour and thinking process based on their learning, and to use these lessons for other similar or related contexts. Students should be supported and guided to develop their reflective thinking skill for making a progress in their learning journey (Porntawakeel, Rasasataya & Nethanomask, 2016).

Building experiences in a profession is a gradual process for a teacher. David Boud (as cited in McClure, 2005) was of the view that reflection in the moment or after an action, helps in improving the action. A professional being learns through reflection (McClure, 2005) during his/her journey in that profession. However, reflection should be practiced in a secure environment whereby mistakes can be endured (McClure, 2005). Through reflection, the beginning teachers will continue to search for, invent and implement ideas throughout their teaching careers otherwise they will act according to their own school experiences (Eraut, 1994, p71: as cited in Brant, 2006).

One of the key principles of community of learners is reflective thinking. This principle is equally applicable to students' and teachers' learning. Refection helps to discuss unanticipated events and learn from it (Shulman, 2004). Reflection is a key to learning and development for the teachers (Shulman, 1987; Shulman & Shulman, 2004). It involves evaluating, reviewing, self-criticizing, and learning from the experience (Shulman & Shulman, 2004). Digital technologies, during last decade, have offered new ways of organizing teacher education and new opportunities for reflection (Nilsson & Karlsson, 2019).

Initial teacher education lacks the space to integrate theory with classroom practice because it helps prospective teachers to learn content and methods in a traditional classroom setting (Westbrook et al., 2013). Pedagogic approaches such as lectures, question-answers and basic group work were used by the teacher educators rather than the approaches promoted in the schools (Pryor et al., 2012: as cited in Westbrook et al., 2013). Preservice teacher education programmes should emphasize a more student-centered approach, less lectures and more individualized assignments (Beck, 2019). There is a need to design teacher education programmes for teaching and learning of the 21st century skills (Aubusson & Schuck, 2013).

The teacher education program becomes more effective when it involved the experiences with actual pedagogies which matter for it (Robertson, Curtis & Dann, 2018). Teachers learn new things if they find relevant and useful for professional practice (Timperley, Wilson, Barrar & Fung, 2008). The teacher educators and student teachers emphasized the role of university, and integration of theory and practice during initial teacher education porgrammes (Khan, 2017). Active learning helps learners to link new learning and understanding with prior learning experiences (Cambridge Assessment International Education, 2019; Cochran-Smith & Lytle, 1999) and allow them to think creatively when they grasp the main idea of a concept (Cambridge Assessment International Education, 2019).

The learning culture for students has also changed due to the integration of technological tools in the field of education. Learners spend a lot of time using technology tools every day. For a debate on the role of technology in the classroom, it is practical to accept and normalize their use (Flores, del-Arco & Silva, 2016). Information and Communication Technologies (ICT) may offer opportunities to bring innovative practices in pedagogy and rich learning materials (Westbrook, et al., 2013). Digital media can transform the learning environment and provide active learning opportunities to students

(Puntambekar & Kolodner, 2005: as cited in Schleicher, 2012, p. 43). Due to different social, cultural and economic environment, the same technology may have a different effect (Spector, Merrill, Elen & Bishop, 2014).

Technology can aid to enhance the comprehension of learning material by providing online learning materials at home as a support for students' learning. Providing opportunities to prospective teachers for working in student-centered and technology-integrated learning environment in teacher education courses, may train them to teach effectively to their students in future (Hao & Lee, 2016). However, the use of technology should be adapted according to the requirements of learners and teachers at a given time (Schleicher, 2012, p. 44).

As the access to internet resources is free of cost, teachers are practicing flipping the classroom (Huang, Spector & Yang, 2019). Online videos can be integrated in a course to teach any subject in online, face to face and hybrid class. The use of videos in a teacher education course can stimulate interest, comprehension and discussion about the topic (Riley, 2017). Students can pause or re-watch the video if required (Bergmann & Sams, 2012; Xiu, Moore, Thompson & French, 2019). It can enable the students to work with the most difficult concepts at home even when there is no teacher or peer physically available. In this regard, the idea of flipping the classroom is relatively a new one. It aimed at the use of technological resources for an effective teaching-learning process. Flipped Classroom model utilizes technology for efficient management of learning process within and outside the classroom.

Flipped Classroom Instruction consists of two essential components: in-class component involving interactive learning activities and outside classroom component involving direct computer-based instruction such as video lectures (Bishop & Verleger, 2013; Little, 2015). Flipped classroom model emphasizes a student-centered learning process for organizing knowledge and collaborative work (Flores, del-Arco, and Silva, 2016, Zainuddin, 2018). It offers a unique combination of learning theories: 'out-of-class' component involving instructional lectures founded on behaviorist theory and active problem-based activities based on constructivist learning theory for 'inside' classroom component (Bishop & Verleger, 2013).

In traditional teaching, when students work on these activities at home, they may not get immediate help for an abstract concept. In flipped classroom, students while working on the activities during class time, may get help from the teacher or peers in solving a problem. Flipping the classroom enables teachers to spend more time with students who need help from teacher, not just the ones who are more confident to ask a question as in the traditional classroom (Nwosisi, Ferreira, Rosenberg & Walsh 2016). Flipped classroom provides more time for active learning in the classroom (Xiu, Moore, Thompson & French, 2019; Zainuddin, 2018) as compared to traditional instruction because the delivery of content is covered before the class time (Xiu, Moore, Thompson & French, 2019). It also promotes self-directed learning during out-of-class time (Zainuddin, 2018).

Flipped classroom, by providing learning resources and materials to students, places a greater accountability on students to use them for learning abstract concepts and solving problems. It requires using class time for hand-on activities involving the application of concepts by the student (Arnold-Garza,2014). Students have more innovative and cooperation-based learning experiences in flipped classroom as compared to the traditional classroom (Roehl, Reddy & Shannon, 2013). Using technology for interactive learning activities to deepen students' learning and to enhance their engagement, may result in effective usage of class time (Brown, 2016). Students, in flipped classroom, also need some space to reflect on their learning processes so that they can make a connection with the course content. Therefore, the teacher must reserve some time in course schedule when students can reflect on their learning process (Roehl, Reddy & Shannon, 2013). McCarthy (2016) offered an opportunity to students, in a research study on flipped classroom, to reflect on their experiences. The prospective teachers of early childhood education were able to improve their critical reflection when they were provided guidance and appropriate tools (Beavers, Orange & Kirkwood, 2017).

As the students are provided with greater resources and more support while working in collaboration with peers and teachers in 'flipped classroom', it is predicted that 'flipped classroom' can yield higher achievement scores (Chipps, 2013) and better learning outcomes. Due to active engagement of student in course related activities, flipped classroom may lead to improved learning outcomes (Jovanovic, Gasevic, Dawson, Pardo & Mirriahi, 2017).

Teacher education programmes are crucial for promotion of quality teaching and learning. However, there must be a balance and congruency between international agenda and local culture of the country. Then, it will lead to the sustainable educational innovations (McLaughlin, 2011). The progressive education not addressing the local culture may not be effective (Guthrie, 2011, p.237). Furthermore, a training model which lacks opportunities for teachers to develop skills and assess their impact on students' learning, and to engage, understand and reflect on implications of new practices, is not sustainable

(Cordingley et al., 2015). Teacher education should emphasize the use of constructivist approaches by future and in-service teachers in their classrooms. An appropriate training and support to teachers for this purpose is very helpful (Schweisfurth, 2011). Di Biase (2015) elaborated on an experience of shifting a teacher professional development program to active learning model in Maldives where the teachers gradually took responsibility for decision-making for their learning on their own terms.

Active learning pedagogy enhance students' satisfaction and their individual/group learning processes (Hyun, Ediger & Lee, 2017). In a single group pre-experimental research design using flipped classroom strategy for fifteen days, the prospective teachers perceived an improvement in their planning, presentation, classroom management and assessment skills (Hussain, Ahmad, Saeed & Khan, 2015). However, a mixed response is seen in various studies conducted about benefits of flipped classroom in schools and universities. Some research studies found significant positive effect of flipped learning on factors such as self-efficacy and learning outcomes (Kurt, 2017) students' learning (Lape, Levy & Young, 2014), Standardized Achievement Test (SAT) skills (Diab, 2016), critical thinking and information literacy skills (Kong, 2014), improved student experiences (McLaughlin et al., 2014), student satisfaction (Day & Foley, 2006), academic achievement (Wilson, 2016) and self-efficacy beliefs while others found that it did not affect significantly the academic performance (McLaughlin et al., 2014;Saunders, 2014) and thinking skills of learners (Saunders, 2014).

Reflective teachers are required for introducing a change in the education system (Rahim & Saif, 2015). Teachers (Tariq, Ahmad & Jumani, 2017) and prospective teachers (Iqbal, 2015) use reflective activities to improve their professional learning and development. However, teacher education programmes usually do not train teachers for critical thinking and reflective thinking so, the teachers cannot incorporate it into their teaching (Khan, Fazal & Amin, 2014).

Bergmann and Sams (2012) were of the view that students who take notes while watching video at home, come up in class with some reasonable questions. Zahid and Khanam (2019), in an experimental research study, found an improvement in reflective teaching practices of prospective teachers after a training. It was reported that flipped classroom promotes learning awareness among prospective teachers of Mathematics (Umam, Nusantara, Parta, Hidayanto & Mulyono, 2019). Hsia & Hwang (2020) also found, in an experimental study, an improvement in students' reflection when they learnt in a flipped classroom. Hung (2015) reported that active learning may pave a way for students to think about what they are learning. Chen, Hwang and Chang (2019) also found a positive change in reflective thinking capacity of students when they learnt in a carefully designed flipped learning environment. Fauzi, M., Shahnaz, S., Hussain,R. & Maznah, R. (2016) found in a design-based research that flipped classroom facilitated active and reflective learners. However, the above-mentioned research work either involved one or the other aspect(s) of reflective thinking such as noticing skill, monitoring skill, awareness skill or levels of reflection proposed by Kember (2009). None of these studies involved mixed-methods research design in teacher education context for the study of the change in their reflective thinking skills (proposed by Dymoke & Harrison, 2008) as a result of Flipped Classroom Instruction.

Most of the research studies conducted to date involved exploration of student perception and used single group study design (Bishop & Verleger, 2013) or quasiexperimental designs. Further research may be required to explore the role of flipping the classroom for academic outcomes of learners in a true-experimental research design (Bishop & Verleger, 2013). The research studies have been found in different fields of education including Mathematics, Science, Nursing, Medical and Teacher Education field about the role of flipping the classroom instruction for improving the performance, skills and experiences of the learners. However, the researcher perceived a gap in research in Pakistani context to appraise the effectiveness of Flipped Classroom Instruction (FCI) for grooming the reflective thinking skills of prospective teachers.

Keeping in view this scenario, the research study was planned for assessing the effectiveness of flipped classroom instruction for nurturing the reflective thinking skills of prospective teachers as compared to traditional instruction. The proposed research study compared the reflective thinking skills of two group of prospective teachers, one group taught through flipped classroom instruction and the other group through traditional instruction. Additionally, the role of flipping the classroom for learning performance of future teachers was also determined. For flipped classroom, the teacher provided the learning material to the students in the form of videos, notes and PowerPoint presentations so that students, before coming to class, can become familiar with the learning material; then the students worked on activity or problem-based assignments to master the advanced levels of cognitive domain such as applying the learned concepts in different situations and, analyzing various problems and finding their solutions during class time (Arnold-Garza, 2014) whereas, in the traditional classroom, the teacher taught the students through lectures and give the assignments to work at home.

1.2 Statement of the Problem

Keeping in view the theory-practice gap in teacher education programs (Khan, 2017; Westbrook et al., 2013) and focus of teacher education programs on low-order cognitive skills (Joynes, Rossignoli & Amonoo-Kuofi, 2019), recommendations for teaching-learning process in teacher education programs (Aubusson & Schuck, 2013; Beck, 2019; Robertson, Curtis & Dann, 2018), the importance of reflective thinking for prospective teachers (Cochran-Smith & Lytle, 1999; Iqbal, 2015; Khan, 2017; Porntawakeel, Rasasataya & Nethanomask, 2016; Shoffner, 2008: as cited in Eby & Yuzer, 2013,p.82; Rahim & Saif, 2015; Tariq, Ahmad & Jumani, 2017), and the use of active learning strategy and higher order cognitive skills in classroom activities in flipped classroom (Arnold-Garza,2014; Bishop & Verleger, 2013; Xiu, Moore, Thompson & French, 2019; Zainuddin, 2018) and effect of flipped classroom for improved reflection (Beavers, Orange & Kirkwood, 2017; McCarthy, 2016), the researcher has conducted a mixed-methods research study to assess the effectiveness of Flipped Classroom Instruction (FCI) for nurturing the reflective thinking skills of prospective teachers.

The effect of flipped classroom on achievement scores of prospective teachers was investigated to test the claims for better learning performance in flipped classroom (Chipps, 2013; Jovanovic, Gasevic, Dawson, Pardo & Mirriahi, 2017). Flipped Classroom Instruction is relatively a new pedagogical method within Pakistani context. And a mixed response was found about results of flipped classroom in the literature as mentioned on page number 8. Therefore, it was considered important to explore the perception of members of experimental group about Flipped Classroom Instruction so that the researcher can look into the concern as pointed out by McLaughlin (2011) and Cordingley et al. (2015) about relevance of a training model in a local culture.

1.3 Rationale of the Study

1. There is a poor quality of teaching and a lack of relevant pedagogical skills in Pakistan. The use of the computer with internet technologies can provide an immediate solution to this problem. The subject matter expertise and pedagogical skills of teachers can be facilitated in a better way through innovative use of ICT in the teacher training (Ministry of Federal Education & Professional Training, 2018).
2. There is a lack of reflective thinking skill among young people which is required for working in modern times (National Education Policy, 2017). The integration of ICT in education may provide opportunities for teaching and learning at the learners' own pace, and without the restrictions on time and resources. Teachers may be trained for use of ICT for helping students to learn and think with ICT (National Education Policy, 2017). Integrating ICT tools in teacher training programmes may assist for better learning and teaching processes (National Education Policy, 20009; National Education Policy, 2017).
3. The stakeholders should play their role in designing strategies for transformational role of ICT-enabled learning in the curriculum and the teacher professional development (NACTE, 2009; NACTE, 2016; UNESCO Institute for Information Technologies in Education, 2018). ICT-related competencies are an essential part of learning for teachers and students for inclusive and quality education. There is a need to investigate new practices and competencies for the teachers and the students in 21st century classrooms by identifying, investigating and supporting its use in technology-mediated

education. Therefore, teachers, being knowledge scientists, should use ICT in classrooms for providing better learning opportunities for students (UNESCO Institute for Information Technologies in Education, 2018).

4. Successful innovations in technology-enhanced learning, e.g., flipped classroom approach, revolves around the goals to be achieved through it. These goals may be related to some affect, behaviour and cognition, for example. The emphasis on adopting technology in the classroom opens up better opportunities for the learners and the focal point is teaching-learning process. In this context, approaches for the teaching and learning are considered, and appropriate technologies are selected for this purpose (Commonwealth of Learning 2019).
5. Innovations in pedagogy are important for bringing positive changes in the teaching and learning process (Commonwealth of Learning, 2019; NACTE, 2009; NACTE, 2016). The flipped classroom instruction is the innovation brought to the field of education as a result of technological advancement.

1.4 Objectives of the Study

The objectives of this research study were to:

1. Assess the effectiveness of Flipped Classroom Instruction (FCI) for reflective thinking skills of prospective teachers of BS Ed. (Hons.).
2. Compare the effectiveness of Flipped Classroom and traditional instruction for grooming reflective thinking skills of prospective teachers after the experiment.
3. Investigate the effectiveness of Flipped Classroom Instruction (FCI) for the academic performance of prospective teachers in ‘Critical Thinking and Reflective Practice’ course.

4. Interpret the effectiveness of Flipped Classroom and traditional instruction for academic progress of prospective teachers in ‘Critical Thinking and Reflective Practice’ course.
5. To explore the lived experiences of prospective teachers of experimental group about effectiveness of flipped classroom instruction for their learning journey.

1.5 Hypotheses of the Study

H_o1 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

H_o2 There was statistically no significant difference found between mean scores on Reflective Thinking Skills Scale of prospective teachers of experimental group for gap period between two phases of the study.

H_o3 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

H_o4 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

H_o5 There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

H_o6 There was statistically no significant difference between mean scores on observation subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

H_o7 There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

H_o8 There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

H_o 9 There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

H_o 10 There was statistically no significant difference between mean scores on communication subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

H_o 11 There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

H_o12 There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

H_o13 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

H_o 14 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

H_o 15 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

H_o16 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

H_o 17 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

H_o 18 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

H_o19 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

H_o20 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

H_o21 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

H_o22 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

H_o23 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

H_o24 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

H_o25 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on Reflective Thinking Skills Scale across various periods of time during the experiment.

H_o26 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on observation subscale across various periods of time during the experiment.

H_o27 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on communication subscale across various periods of time during the experiment.

H_o28 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on judgment subscale across various periods of time during the experiment.

H_o29 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on team-working subscale across various periods of time during the experiment.

H_o30 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on decision-making subscale across various periods of time during the experiment.

H_o31 There was statistically no significant difference among pretest-1 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

H_o32 There was statistically no significant difference among posttest-1 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

H_o33 There was statistically no significant difference among pretest-2 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

H_o34 There was statistically no significant difference among posttest-2 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

H_o35 There was statistically no significant difference among pretest-1 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

H_o36 There was statistically no significant difference among posttest-1 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

H_o37 There was statistically no significant difference among pretest-2 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

H_o38 There was statistically no significant difference among posttest-2 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

H_o39 There was statistically no significant difference between academic achievement of prospective teachers of experimental and control group during first phase of the study.

H_o40 There was statistically no significant difference between academic achievement of prospective teachers of experimental and control group during second phase of the study.

H_o41 There was statistically no significant difference between academic achievement of prospective teachers of experimental and control group for the whole study duration.

H_o42 There was statistically no significant difference among academic achievement of prospective teachers of experimental group during first phase of the study.

H_o43 There was statistically no significant difference among academic achievement of prospective teachers of experimental group during second phase of the study.

H_o44 There was statistically no significant difference among academic achievement of prospective teachers of experimental group for the whole study duration.

H_o45 There was statistically no significant difference among perception of prospective teachers of achievement subgroups of experimental group about their learning experiences with Flipped Classroom Instruction (FCI).

1.6 Research Question of the Study

1. How the prospective teachers of experimental group view their learning experiences with Flipped Classroom Instruction (FCI)?

1.7 Significance of the Study

The research study is significant for the research community in the field of teacher education, curriculum developers, education community, teacher educators, managers of the teacher education institutions and the prospective teachers. The researchers may use the findings of this study to plan further research studies in same/different circumstances to get further insights on this topic. The results of this study may also be helpful for designing and improving classroom practices for the prospective teachers.

The results of the research study would add into the awareness of education and teacher training community for the role of flipping the classroom for grooming reflective thinking skills and improving academic performance of prospective teachers. Through this study, research community will also gain insight into the ways for using Flipped Classroom Instruction (FCI) in teacher education courses.

The output of the research study would also be beneficial for curriculum developers of teacher education programmes and courses in the way that they may suggest possible strategies and resources for use of Flipped Classroom Instruction (FCI) for nurturing reflective thinking skills. The teacher educators may use the findings of research study for considering Flipped Classroom Instruction (FCI) as a possible instructional strategy to groom reflective thinking and higher order thinking skills of prospective teachers. It will also sensitize them to use the content of course for organizing a variety of class activities. The findings of this research study would be significant for managers of teacher education institutes. The management team of teacher education institutes may use the findings of the study to facilitate implementation of Flipped Classroom Instruction (FCI) by arranging the required resources while keeping in view the challenges and strengths associated with it.

The prospective teachers would receive benefit from the study results in the sense that they would be facilitated in their professional development especially with reference to reflective thinking skills. It may also help them for learning to use the content material of a topic for applying it in different contexts. It would also be helpful for them to become a more mindful learner and teacher for studying the content of a course.

1.8 Delimitation of the Research Study

The research study was delimited to:

1. Female Prospective teachers enrolled in BS Ed. (Hons.) in teacher education institution, Islamabad, Pakistan.
2. One teacher education course “Critical Thinking & Reflective Practices” in BS Ed. (Hons.).
3. Assessment of reflective thinking skills only through Reflective Thinking Skills Scale (RTSS), academic performance through academic achievement test, and perception through perception scale and focus group discussion.

1.9 Research Methodology

1.9.1 Research Design

The research study involved pragmatic research paradigm and mixed-methods research design (Creswell & Creswell, 2018; Creswell, 2009). In this research design, the concurrent embedded strategy (QUAN+qual) (Creswell, 2009) was employed. An experiment was carried out with one experimental and one control group of prospective teachers, also mentioned as study groups in chapter four. The effect of independent variable on the reflective thinking skills and academic performance; qualitative and quantitative data about perception of student teachers were also collected. The members of experimental group were taught through flipped classroom instruction whereas the members of control group received traditional instruction such as lectures by teachers and assignments as homework for students.

1.9.2 Participants of the Study

The participants of the study were prospective teachers enrolled in third semester of BS Ed. (Hons.) program (session 2016-2020) in a teacher education institution in Islamabad, Pakistan. There were 47 prospective teachers in the mentioned class. They were allocated to the experimental or the control group through lottery method. The ratio of high, average and low achievers was (3:15:5) for experimental group whereas this ratio was (3:16:5) for control group. There were two, two male members in the experimental and the control group.

Participants were selected through multi-stage selection process. One teacher education institute from Islamabad was involved to conduct the study. The criteria used for selection of teacher training institute was based on the size of class (number of students enrolled in a class), permission from management of institution for conducting study, availability of computer laboratory and technology facilities in the institution required for the study, access to participants of the study, selection of subject and time period to conduct experiment and setting up timetable to get morning class for the study. The enrollment in various semesters of BS Ed. (Hons.) programme was very low i.e., less than 20 in most of the universities of Islamabad because four-years B.Ed. programme is a new programme.

1.9.4 Research Instruments

Data were collected through following instruments. All the research instruments were developed by the researcher.

- Reflective Thinking Skills Scale (RTSS) was a five-point scale to collect data about reflective thinking skills (Dymoke & Harrison, 2008): observation, communication, judgment, team-working and decision-making skills.
- Academic Achievement Test was developed using the content of the course and constructed by following six stages of cognitive domain of revised Bloom's Taxonomy.

- Perception Scale about Flipped Classroom Instruction (FCI) was used to measure the perception of prospective teachers of experimental group about their learning experiences with Flipped Classroom Instruction (FCI).
- Focus Group Discussion was arranged for prospective teachers of experimental group to collect data about their perception of their learning experiences with Flipped Classroom Instruction (FCI).

1.9.5 Validity and Reliability of the Instruments

The content validity of all the research instruments was determined by seeking experts' opinions. The construct validity of perception and reflective thinking scales were determined by factor analysis. The reliability of the scales was estimated through Cronbach's Alpha value and item-to-total correlation.

1.9.6 Experiment

The prospective teachers were randomly assigned to experimental and control group based on previous academic record. After the random assignment of the participants to both groups, a pre-assessment was carried out to assess the reflective thinking skills and academic achievement of the prospective teachers of control and experimental group. At the end of the study, same post-assessment instrument was used after reshuffling the items.

The control and experimental groups were kept under same environmental conditions to meet the requirement for the true experiment. The identical environmental conditions included semester (fall), instructor with same range of teaching experience (2-3 years), time of the day, course objectives, sequence of topics, attendance requirements, access to teacher assistance in the institution, access to the teacher during office hours, course content, pre- and post-test tools. The only difference the students experienced was the method of instruction i.e., traditional and Flipped Classroom Instruction.

1.9.7 Independent and Dependent Variables

Independent variable was the instructional method: Flipped Classroom and traditional instructional method. Dependent variable was reflective thinking skill and academic performance score of prospective teachers.

Intervening Variables were previous academic record (high achiever, average, low achiever), access to the technology tools at home and possession of an android phone. The prospective teachers were assigned either to the experimental or the control group keeping in view the previous academic scores of students. Availability of technology at home and possession of android phone did not influence negatively as all the prospective teachers of experimental group had android phones and internet available in their homes; two students who possessed android phone but no internet, were provided the learning material before the end of class (as the class had wireless internet facility) or through Bluetooth during school hours. Extraneous variables such as tiredness and fatigue were controlled by scheduling the class time in the morning. The timings of the class for this course was same for both groups. The teachers of both groups had same gender, same age, same qualification (M.Phil. Education) and same range of teaching experience (2-3 years).

1.9.8 Data Collection

The research study involved one course of preservice teacher education program i.e., BS Ed. (Hons.), for the period of four months (one semester). The quantitative data from participants of control and experimental group was collected through pretest and posttest for academic achievement (i.e., an achievement test) and Reflective Thinking Skills Scale (RTSS). A self-developed perception scale about Flipped Classroom Instruction (FCI) and focus group discussion were used for assessing learning experiences of participants of experimental group with Flipped Classroom instruction (FCI).

1.9.9 Data Analysis

The statistical techniques used for data analysis included mean, percentage, standard deviation, independent sample t-test, Wilcoxon-Signed rank test, Mann-Whitney U test and Analysis of Covariance (ANCOVA). The data from focus group discussion was analyzed through constant comparison analysis by using open, axial and selective coding, respectively.

1.10 Operational Definitions

Traditional Instruction: Traditional instruction involves delivery of lectures on a topic during class time, providing class notes and assigning homework related to that topic.

Flipped Classroom Instruction (FCI): Flipped Classroom Instruction (FCI) refers to method of instruction where electronic learning material is provided to learners before class time as homework. The format of learning material may be videos, PowerPoint presentation, notes and book/chapter reading. During class time, the learners work on class activities related to the learning material which they studied at home. The class activity may be an individual assignment, group project, web search or group discussion etc. with the teacher’s role as a facilitator in the class.

Reflective Thinking Skill: Reflective thinking skill is actively and carefully thinking about a situation while it is happening or an event/action that has occurred, and studying and analyzing it for personal learning and development. There are five main reflective thinking skills: observation, communication, judgment, decision-making and team-working. The reflective thinking skill of a prospective teacher was estimated by his/her score on Reflective Thinking Skills Scale (RTSS) i.e., a self-developed tool by the researcher.

Academic Achievement: Academic achievement refers to average of percentage score of prospective teachers in matric and intermediate board examination. A high achiever prospective has academic achievement score with the percentage 71% and above. An average prospective teacher had an academic score within the range of 60-70%. The academic achievement score of a low achiever prospective teacher falls within the range of 50-59%.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Flipped Classroom Instruction (FCI): A Basic Concept

Flipped Classroom Instruction (FCI) is the inverse of the traditional classroom teaching (Bergmann & Sams, 2012; Dickenson, 2015; Graham, McLean, Read, Suchet-Pearson & Viner, 2017; Katz, Brown & Kim, 2016; Murray, Koziniec & McGill, 2015). In flipped classroom, basic reading and understanding of the topic is completed before the class time, and what is traditionally called a homework, is completed during class time (Bergmann & Sams, 2012).

The main idea of flipping the classroom instruction is that students learn about subject concepts by watching short video-based lectures at home and work on interactive activities such as discussion, project or group activities (Dickenson, 2015; Murray, Koziniec & McGill, 2015). The class time is used for engaging and interesting problem-based activities (Katz, Brown & Kim, 2016; Graham, McLean, Read, Suchet-Pearson & Viner, 2017; Murray, Koziniec & McGill, 2015). If a student faces a difficulty then it can also be dealt with during class time (Katz, Brown & Kim, 2016; Murray, Koziniec & McGill, 2015).

Flipped classroom is one way of having active student-centered learning classroom (Katz, Brown & Kim, 2016; Murray, Koziniec & McGill, 2015) and student is an active agent of his/her own learning process (Katz, Brown & Kim, 2016). When teacher provides problem-based opportunities to maintain focus of students on self-directed learning and offer instrumental support, give regular and systematic feedback, it motivates students for learning process (Reschly & Christenson, 2012).

However, the classroom may be flipped using a number of different models (Bergmann & Sams, 2012). Despite the fact that there exists a number of different models of flipped classroom, they all share some common features. In flipped classroom, the teacher provides information to students for understanding the subject matter before class time. For this purpose, online access to audio/video-based recordings of lectures, PowerPoint presentations supplemented with audio recordings, and internet resources for reading are shared with learners to understand the subject matter (Hamdan, McKnight, McKnight & Arfstrom, 2013).

2.2 Historical Background of Flipped Classroom

The idea of flipping the classroom was found in a book *'Effective grading: A tool for learning and assessment*' by Barbara Walvoord and Virginia J. Anderson (1998). In this book, effective use of class time was emphasized by having student to get exposure to learning concepts before class time and investing class time for using that learning to work on class activities at application, analyzing, synthesizing, problem-solving and evaluating levels (Katz, Brown & Kim, 2016). Walvoord and Anderson (2010, p.82-90) discuss it with the help of examples for using class time more productively.

The term “flipped” came into trend when Jonathan Bergman and Aaron Sams recorded video-based lectures for high school Chemistry subject for their students who missed their class due to various reasons. These video-based tutorials received students' appreciation and they showed an improvement in their performance. Both teachers applied this idea of recorded lectures for entire syllabus and this practice gave rise to flipped classroom (Bergmann and Sams, 2012; as cited in Lane-Keslo, 2015).

2.3 Flipped and Inverted Classroom

Flipped classroom has some characteristics similar to some other trends in the field of education such as blended learning, inverted classroom and reversed instruction (Bergmann & Sams, 2012 p.7). Lage et. al.'s definition of inverted classroom deals with shifting the class work to homework and homework as class work has become obsolete as the current flipped classroom approach has more features rather than just shifting of in- and out-of-class components (Ho & Chan, 2016,p. 214). Inverted classroom refers to the events which were happening in classroom in traditional instruction, are set up for homework whereas the events which were considered as homework in traditional classroom, are organized for class time (Lage, Platt & Treglia, 2000, p. 32-34). Although the use of pre-class learning material is an important characteristic of flipped classroom. Flipped classroom also include continuous support from teacher for students' learning within and out-of-class (Lo, 2020).

Digital tools can offer opportunities to make inverted classroom an enriching learning experience for students. Students read about a topic before class time and come with questions if they have any. At the start of class, the instructor may devote some time (approx. 10 minutes) to answer the students' questions. In case the students have no questions then there is an experiment or lab time where the students will work on some hand-on activity related to the topic. The remaining class time is used by student to complete worksheets and attempt review questions. Students may work in small groups and present their work in front of class. The worksheets are collected and marked. The instructor devotes few minutes at the end of class time for questions of learners if they have any (Lage, Platt & Treglia, 2000, p. 32-34).

2.4 Components of Flipped Classroom

Flipped classroom (FC) provides learners the choice to cover the learning material at their own pace during out-of-class time. It gives them autonomy and control to pause, rewind and fast-forward the video lectures (Little, 2015).

Flipped Classroom Instruction (FCI) has different class routine and homework as compared to traditional classroom. The learners are shared the learning material for reading and understanding ahead of that class time. They have video or audio recordings of lectures as homework so that they comprehend the concepts of a topic. This learning material may be developed especially for a course or may be selected from Open Educational Resources (OER). They can complete this homework as self-paced and self-directed tasks i.e., they can pause and view the video/audio recordings multiple times for understanding the concepts and taking notes. During the class time, the learners work on class tasks at application or higher cognitive level related to concepts comprehended by the learners before class time. The teacher is available during class time for facilitation and guidance of learners. Unlike traditional classroom approach where there is a focus on direct instruction during class time, flipping the classroom has shifted its emphasis to student-centered approach where the students have greater autonomy and control on their learning progress in active learning and group work within a flexible class environment. Learners must have access to the technological tools and internet for it. Thus, it can be inferred that the homework and classwork of traditional classroom is reversed in flipped classroom; in the later case, students when come to class, have already understood the topic and work within class on exercises related to that topic at higher learning levels (Commonwealth of Learning 2019).

Class activities help to ensure that students can apply a concept thus increasing the chances for its transfer to their teaching practice (Dickenson, 2015). FC adopts the teacher-student and student-student communication according to learners' needs for achieving higher learning outcomes. The teacher has an irreplaceable role in the flipped classroom (Little, 2015). FC offers opportunities to teacher for providing scaffolding to each student according his/her needs because teacher is interacting and observing every student. Here the role of teacher is two-fold: one is to make an interesting, understandable and clear lecture or description of theoretical concepts for students, and second is to design class activities in such a way that it helps students to work together for application of knowledge and understanding of theoretical concepts (Dickenson, 2015). There are some basic class activities which must completed by every student whereas higher level of activities may be assigned to those who finish early in the class (Schwartz, Andridge, Sainani, Stangle & Neely, 2016).

FC also provides a lot of time to students for group work so, they collaborate, share ideas, discuss meanings, and receive feedback from peers and the instructor (Dickenson, 2015). The class time is invested for learners completing the class activity with a tailored support and more interaction with their teacher. The teacher may help them to understand a point or aspect of topic if they are facing the difficulty in it but the lecture is the minimum (Flores, del-Arco, and Silva, 2016).

For assessment, the teacher can arrange class discussions where the students are writing key points at the end and the quiz on Google forms or other survey tools. The purposes of using assessment techniques are to make students accountable for learning the subject content, and to treat their misconceptions and confusions (Dickenson, 2015).

Flores, del-Arco, and Silva (2016) listed the following characteristic of assessment in flipped classroom model:

1. Integrated i.e., it covers in-class and out-of-class tasks.
2. Responsible i.e., student is accountable for his/her performance.
3. Thoughtful i.e., it involves analysis and synthesis of information.
4. Shared i.e., it is based on co-assessed activities with the group or an independent work.
5. Competence-related i.e., it involves activities which require application of practical skills related to theoretical concepts.

(Flores, del-Arco & Silva, 2016).

2.5 Pedagogical Practices in Flipped Classroom

In a systematic review of 56 studies, Koh (2019) mentioned four pedagogical dimensions of flipped classroom for student-centered learning.

2.5.1 Personalization

Personalization refers to the idea that the learners, depending upon their needs, have access to the learning material and teacher support within/out of class time for their learning.

2.5.2 Higher-order Thinking Skills

Flipped classroom involves understanding of pre-class learning material whereas the class time is used to work on class activity at application and higher cognitive levels i.e., applying, analyzing, evaluating and creating.

2.5.3 Collaboration

Collaboration among peers and group-based learning further deepens the learning of individual students.

2.5.4 Self-direction

Self-direction is facilitated through structured processes for applying the learnt concepts and metacognitive review besides teacher's supervision.

2.6 Components of Flipped Learning

Flipped Learning Network (2014) suggested main components of flipped learning as given below, which should be ensured for learning to take place when a classroom is flipped. Each component of these four components is further comprised of various elements.

2.6.1 Flexible Environment

Flexible environment involves creating the space for self-paced learning by learners and helping them to learn when and where they learn. It includes facilitating students to learn content from multiple perspectives, establishing time and space frames, adjusting for students when and where needed.

2.6.2 Learning Culture

Flipped learning involves a learner-centered approach for instruction. Class time is used to work on class activities such as discussion, problem-solving etc. based on course topics. The students are engaged in learner-centered classroom activities. Teacher is available to help students within class through feedback (Flipped Learning Network, 2014). Flipped classroom uses active learning approach to plan and prepare a learning environment which engages students in class activities and make content meaningful for them (Dickenson, 2015).

2.6.3 Intentional Content

Flipped learning is aimed at students' understanding of concepts and procedures by exploring the topic on their own. Class time is used to adopt learner-centered approach in accordance with the level of education and nature of the course.

2.6.4 Professional Educator

Professional educator occupies a significant and responsible place in flipped classroom. During class time, the teacher observes, guides and assess students. Teacher can provide feedback to individual, group or whole class students. Ongoing formative assessment during class time can provide feedback to improve future instruction (Flipped Learning Network, 2014).

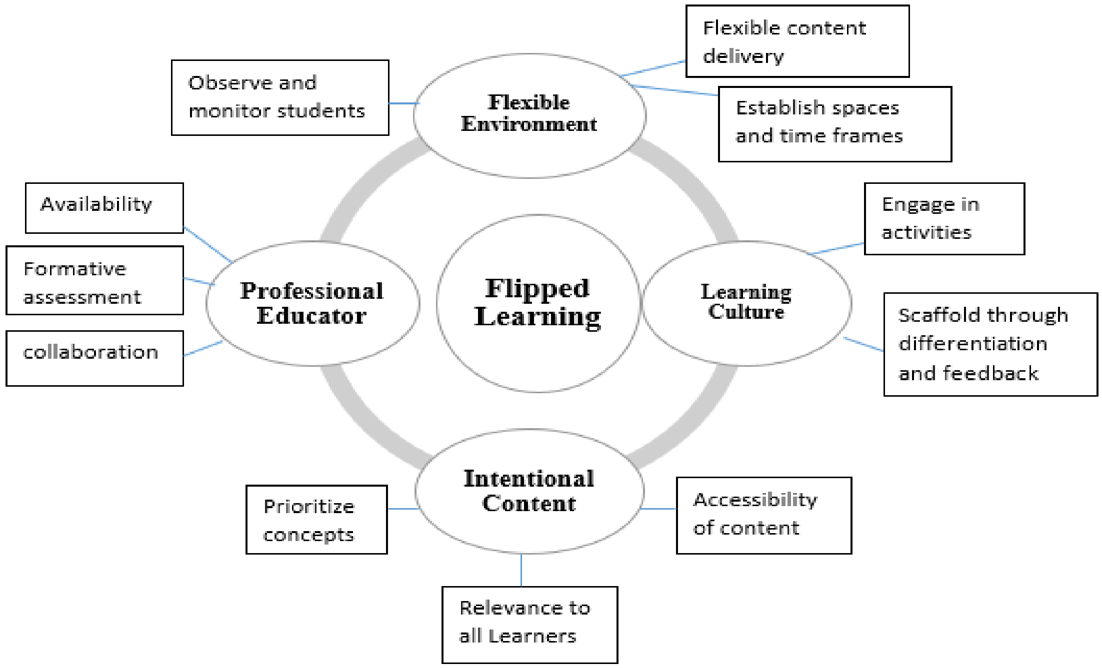


Figure 2.1 Components of Flipped Learning (Flipped Learning Network, 2014)

2.7 Types of Students' Interaction in Flipped Classroom

Zainuddin (2018), in a study of undergraduate student interaction in English language classroom using flipped classroom instructional model, elaborated on different aspects of interactions of students. It included mutual students, student-instructor, student-content, and student-technology, as shown in figure 2.2. The students interact with peers and instructor within and out of classroom using various technological platforms such as Learning Management System (LMS), Wikis, blogs and/or social media. Students get feedback from peers and instructors for sharing of knowledge and learning. The students accessed the content through various ways such as videos, presentations etc., and they were able to pause or revisit the resources if they need to do it. Based on previous three interactions, the students were using technology platforms so, it involves learner-technology interaction (Zainuddin, 2018).

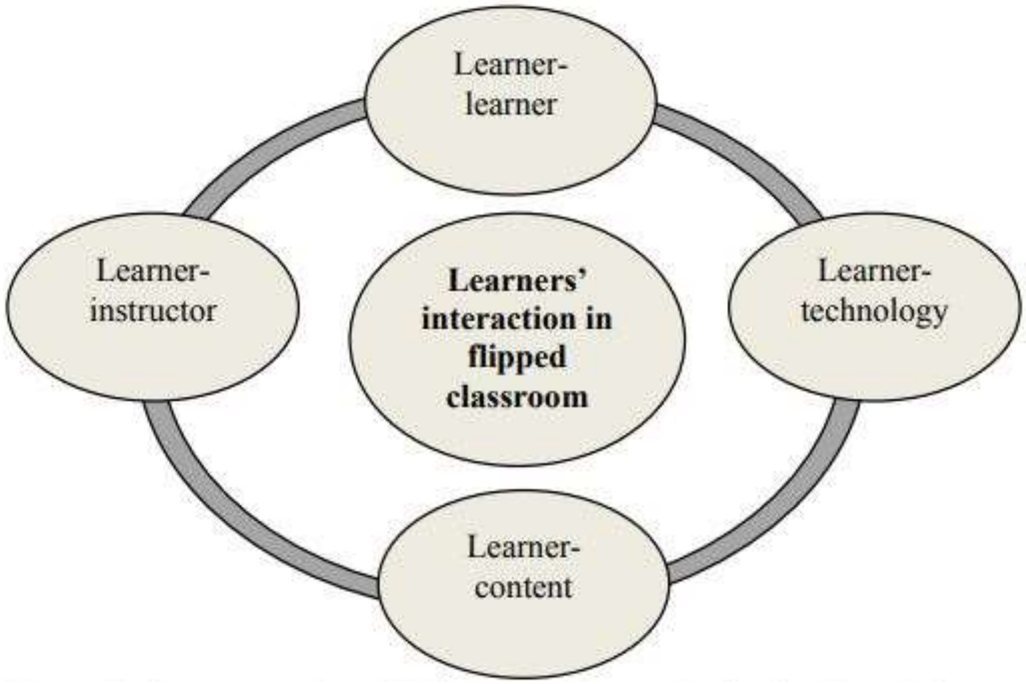


Figure 2.2 Aspects of Learners' Intercation in Flipped Classroom (Zainuddin, 2018)

2.8 Comparison of Class Routine for Traditional and Flipped Classroom

There are a number of ways for flipping the classroom; however, a comparative analysis of traditional and flipped classroom (Bergmann & Sams, 2012) is given below:

Table 2.1

Comparison of Traditional and Flipped Classroom

S#	Traditional Classroom		Flipped Classroom	
	Activity	Time	Activity	Time
1.	Warm-up Activity	05 min.	Warm-up Activity	05 min.
2.	Revising Homework of Previous day	05 min.	Question & Answer time on Video/Supporting material for Today's Lesson	05 min.
3.	Lecture on New Concept	20-25 min	Class activity (individual or group-based)	20-25 min.
4.	Guided/Independent Exercise	05 min.		

2.9 Pedagogical Practices in Teacher Education

Westbrook et al. (2013, p.39), in a literature review of research studies from developing countries, found that some of the pedagogical practices of teachers included adjusting instruction according to students' needs, homework, variety of learning materials such as MP3 along with textbook linking prior knowledge to new concepts, verbal interaction in small groups for sharing of tasks and resources, constructive feedback, encouraging questioning from students and probing responses, and lessons with variety of sequences of activities.

Westbrook et al. (2013, p.40-41) mentioned five barriers in teacher education: lack of alignment between initial teacher education and school curriculum, lack of relation between professional development programs and the promoted pedagogy such as the one promoted by constructivists, limited resources and large class size, teacher education curriculum and assessment. Sometimes, the teachers who understand and implement the promoted pedagogy, are re-trained. The teachers are trained for prescriptive teaching approach by using expository teaching methods.

Roehl, Reddy & Shannon (2013) suggested that flipped classroom can be particularly important for courses where the information is shared through lectures and students use that information to complete an assignment/task. The dynamic and interactive class environment makes the group learning to work in a flipped classroom. Teacher observes and supports the learners while they are working on class activities. The students are active learners in the classroom, and they are involved in self-learning process (Mohd Salleh, Shamsudin, Baharum, Ghazali & Mohd Raidzuan, 2020). When teachers in the higher education informed the students about the purpose and rationale of the flipped classroom, their engagement in the course increased (Betihavas, Bridgman, Kornhaber & Cross, 2016).

2.10 Challenges in Implementing Flipped Classroom

Lo, Hew & Chen (2017), in a systematic review, grouped challenges related to the implementation of flipping a course into three main themes, as given below:

2.10.1 Student-related Challenges

It encompassed challenges such as students' unfamiliarity with the flipped classroom idea, lack of preparation for working with pre-class tasks, inability to ask questions while working on out-of-class component, using video content for understanding a concept, increased work requirements for students and lack of engagement or interest with the video content (Lo, Hew & Chen, 2017). An approach is required to tackle learning needs of students, to provide quality and immediate feedback on learner's performance, and activity-based class time (Cooner, 2010).

2.10.2 Challenges Faced by Faculty Members: While flipping a course, the challenges faced by faculty members may include their lack of familiarity with the idea of flipping, significant effort in the start for flipping a course and use of ineffective videos for the topics (Lo, Hew & Chen, 2017).

2.10.3 Operational Challenges: Operational challenges were related to IT related challenges both for the students and the teachers (Lo, Hew & Chen, 2017). Roehl, Reddy and Shannon (2013) suggested that, while adopting flipped classroom instruction for a course, the teacher should keep in view about resources and competencies required to adopt this model for student's learning.

2.11 Nature and Definition of Reflection

The word 'reflection' which came from a Latin word 'reflectere' meaning thinking, pondering, contemplation and reasoning. Reflection is defined as thinking about a topic or problem by integrating the experiences with new ideas. Reflexivity is a property of structure, system or activity as a thinking process (Nuninger & Chatelet, 2020).

Thinking begins when there is *forked-road* situation. If the situation is clear and smooth, there is no call for reflection. Through reflection, we believe in something because the witness and evidence provide a stand to it. Reflection is a consecutive sequence of ideas where every idea is linked to its predecessors. Reflection is a meaning-making process. It is about logically uncovering various aspects of a situation in such a way that nothing is left to be overlooked or hidden. Data is the raw material for reflection and its lack of coherence evokes reflection (Dewey, 1910). When we are in a situation, the experiences may be out of our control but what meaning we get out of it, is in our control (Rodgers, 2002).

Reflection helps practitioners to reconsider their learning, and understand their knowledge and actions as they learn during their practice. In reflection, they reconsider about their learning. Reflection, for some people, is simply thinking about something whereas for others, it is a well-defined process with a specific meaning and actions. The nature of reflection involves identifying a problem and its structure (Lougran, 2002).

John Dewey (1933) explained reflection as the process of thoughtful and deliberate analysis of knowledge or feelings based on evidence supporting it and future implication it may lead to.

Reflection connects 'what was experienced in the past' with 'what can be done in the future' so, it can help preservice teacher to connect knowledge with daily life, and his/her professional development. The prospective teachers in the teacher education institutes may interpret their practice and teaching skills in a better way when they learn to reflect through reflective activities. It also facilitates the development of their skills to deal unclear and perplexing situations in the classroom. It also makes them aware about benefits of reflection for improving their professional practice in future. Teacher educators must start teaching and guiding to prospective teachers about the use and process of reflection because it needs a lot of practice and time for a prospective teacher to use reflection skillfully (Information Resources Management Association, 2019).

Reflection implies a belief or a disbelief in something because of evidence supporting it (Yost, Sentner & Forlenza-Bailey, 2000). Reflection helps to question our practices and how can we conduct our practice in future (Cappell, 2007). For prospective teachers, reflective thinking is about learning to ask questions and evaluate one's own teaching-learning approach and thought processes, and to think about solving a problem because of this process of asking questions and evaluation (Yilmaz & Keser, 2016).

Reflection involves improving self-expression, learning and cooperation. It promotes self- and social awareness (Eby, 2000; as cited in Finlay, 2008). Reflective thinking skill provides an individualistic view of learning in a profession (Dymoke & Harrison, 2008).

Teachers in their daily routine, are working to solve wide variety of ill-structured, and unclear problems. The problems are not clearly identified, have multiple facets and do not have ideal solutions. Therefore, the professional education programmes should focus on developing the students' reflective skills so they can be able to deal with unclear situations (Schon, 1987: as cited in Kember, et. al. 2009).

Boud, Keogh and Walker (1985) elaborated that reflection encompasses cognitive and affective activities where an individual explore their experiences for understandings and appreciations. Positive feelings can support it. According to Barnett (1992: as cited in Nuninger & Chatelet, 2020), students should be enabled to think as reflective practitioner. They should engage in a critical dialogue with themselves about what they think and do hence, it is a reflexive process. It is important in a changing and unpredictable world to learn and relearn things with relatively an open mind.

2.12 Process of Reflection

There are six phases of reflection (Dewey, 1933: as cited in Rodgers, 2002) as given below:

1. Identifying an experience
2. Interpreting the meaning of experience at the moment
3. Noticing the details of problem and asking questions about that experience
4. Searching and thinking about possible answers to the posed questions related to experience
5. Generating hypotheses for possible explanation obtained in the previous step
6. Hypotheses testing

Kolb (1984) proposed a cycle of experiential learning, as shown in figure 2.1. It consisted of four different levels, as given below:

1. During first stage 'concrete experience', a person experiences an actual event.
2. Reflective observation links previous experiences and knowledge to present experience and analyze emotions.
3. At abstract conceptualization stage, an individual reappraises the experience and adapt their thinking for it in the light of current literature of theories and discussion with colleagues.

4. Active experimentation involves the testing and observing the implications of new solution/theory or approach in a similar or related situation close what was experienced in the concrete experience stage.

(Paterson & Chapman, 2013)

This cycle showed that learning process required both understanding of an experience and some transformation of that understanding. It can be possible through comprehension of experience and then transformation through intention, through apprehension and transformation through intention, comprehension of experience and then transformation through extension and/or through apprehension and transformation through extension (Kolb, 2015).

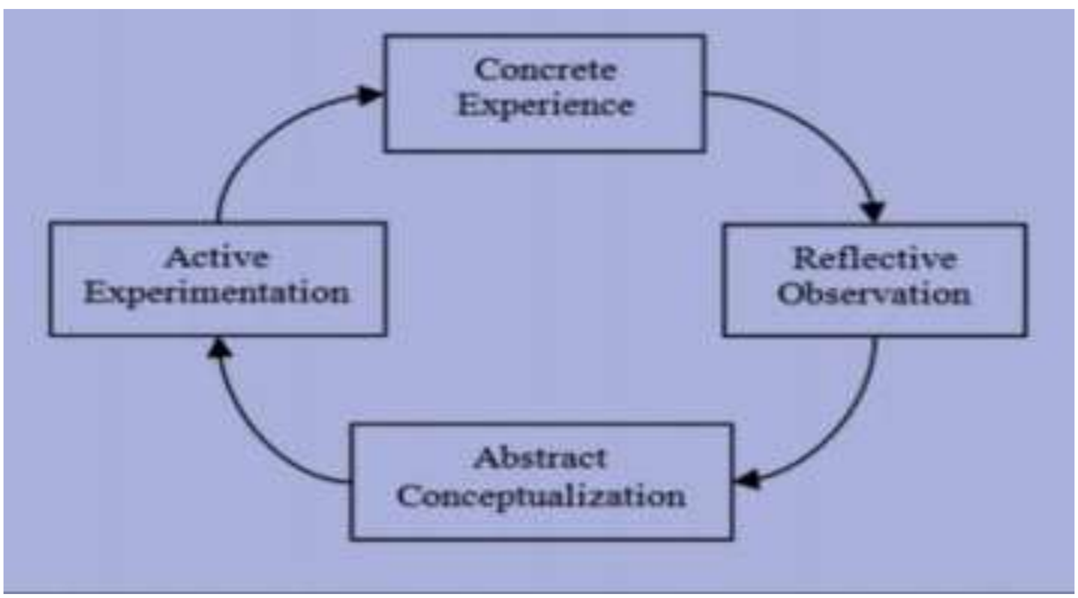


Figure 2.3 Kolb's (1984) Cycle of Experiential Learning (Paterson & Chapman, 2013)

Gibbs' reflective cycle (1988), based on Kolb's cycle, elaborated various stages of process for reflection (Paterson & Chapman, 2013):

1. Description: It involves simply stating the detailed description of an experience.
2. Feelings: Feelings and thoughts of the person about that experience are explored at this stage.
3. Experience: An analysis is carried out of the good and unfavourable things about the event.
4. Analysis: This stage involves the keen consideration of various aspects of the event and its impact on the professional practice of the person who experienced this event.
5. Conclusion: At this stage, a conclusion is drawn about the event and its implication after consulting the relevant literature and colleagues so that it is comprehended in a better way and suggestions for an improvement are drawn.
6. Action Plan: Actin plan involves charting out alternative approaches for similar or this situation in future.

According to McClure (2005), the key stages of reflective process involve an awareness of feelings and thoughts about a situation, critical analysis of thoughts and feelings, and developing a new perspective about that situation.

2.13 Types of Reflection

Reflective thinking can help to craft our teaching. It may involve reflecting after an action has occurred named as 'reflection-on-action' and reflecting during an incident for making decisions and adapting the practice according to situation named as 'reflection-in-action' (Schon 1983: as cited in Cosh, 1999), and creative reflection (i.e., reflection on our beliefs and values in the light of theory and practice available) (Calderhead and Gates 1993: Cosh, 1999). Observation helps a teacher, in this process, to not only judge others' practice based on our own assumptions but also assess those assumptions on the base of others' practice (Cosh, 1999).

Reflection-in-action (making decision and asking adjustments during a process) and reflection on action (looking back on how our decision contributed to produce certain results) are terms, coined by Schon (1987). Knowing-in-action refers to the daily routine which practitioners are performing without much thinking with consciousness and with the help of implicit knowledge. Practitioner employs reflection-in-action while s/he is involved in an action. In this case, the practitioner thinks about the action, its outcomes and implicit knowledge. Practitioners get involved in reflection-on-action after a situation or a project is finished. In reflection-on-action, the practitioner can criticize the implicit knowledge and try to get meaning out of the uncertain situation at hand. It helps to develop new strategies to deal with a situation (Nuninger & Chatelet, 2020).

Mezirow (1991) put forth four types of action. He separated the reflective action form non-reflective actions. It included 'habitual action', 'thoughtful action' and 'introspection'. The reflective actions occurred at two levels with lower level of reflection divided into two types: content and process reflection (Kember et al., 2000).

Critical reflection may help a teacher to raise question at status quo, commonly held practice, beliefs, and assumptions. It may give rise to direct conflict with authorities. However, if an educator does not engage in critical reflection, s/he may keep holding unexamined beliefs assumptions and practice (Chappell, 2007).

2.14 Pre-requisites for Reflection

Ruth-Sahd (2003) suggested that, for reflective practice, a person should be willing to reflect, his/her memory should serve well, and the positive outcomes are obtained from the reflection. Boud, Keogh and Walker (1985,p.11) elaborated three requirements of reflection. Firstly, only the learner can reflect on his/her experience and can learn from his/her experience. Teacher can provide guidance to the learner in this process, but it is the learner who can make meaning out of the experience. Secondly, reflection is goal-directed activity, not a daydreaming. A period of meditation can help in this process, but it is different from reflection. In the reflective process, cognition and emotions are inter-related and interactive. The negative feelings may hinder the learning process from the interpretation of experience. The positive feelings can keep the learner on task and enhance the learning process.

Openness, honesty, self-awareness, questioning of attitude, values and beliefs (McClure, 2005), a commitment to self-inquiry and changing practice (Gillings, 2000: as cited in McClure, 2005) are necessary for reflective practice. The skills where scaffolding to prospective teacher for reflection is required, consists of writing skill, skill to identify a problem, relating tasks to one's own practice and the questioning skill (Bean & Stevens, 2002: as cited in Arrastia, Rawls, Brinkerhoff & Roehrig, 2014)

2.15 Reflection and the Thinking Process

Teacher education should adopt a reflective approach to preservice and in-service training programs (Dewey, 1933; Schon, 1987). Its purpose is to groom logical skills of teachers about using certain pedagogical strategies and improving their teaching to optimize students’ learning.

Dewey (1910) explained the role of thought processes in the reflection process. He said that reflection is an intellectual and intentional activity. A reflective coach, as suggested by Schön (1988), may help, support and evoke a practitioner for reflecting on his/her own practice. The reflective coach can explicitly explain the various actions and steps while performing the reflection for the guidance of teacher.

Reflection and the depth of thinking process involved can be better understood by Lee's framework (2006). Lee (2005: as cited in Lee, 2008) identified three levels of depth. The first level is recall level involving description and recall of an issue/experience based one's own perception. The second level is rationalization level where a person searches for connection between different pieces of experiences, interpret them and may get some general perspective about it. The third level is reflectivity level where a person thinks about his/her experiences with an intention to improve it in future, considers alternative perspectives for analysis of experiences and their effect on one's approach to understand the issue.

While comparing the three levels of Lee's framework with each other, it can be observed that highest level differed from lowest level due to reflection involved in the highest level. In the highest level, a person asks why and so what types of questions so that s/he can improve his/her performance and analyze the effect of various perspectives affecting this process.

Hatton and Smith (1995: as cited in Lee,2008) found four different levels of reflectivity: first one is 'descriptive writing', second is 'descriptive reflection', third level is 'dialogic reflection' with 'critical reflection' as fourth level. The first level 'descriptive writing' is about noting down the details of an experience/situation/issue. Descriptive reflection is providing the reasons for event/issue/experiences based on personal interpretation and/or readings done by prospective teachers. Dialogic reflection involves thinking about wider perspective and multiple possible reasons for an event/issue. in critical reflection, in addition to looking at possible reasons, there is an emphasis to look at socio-political and historical context of reasoning. These levels bear a similarity with the Lee's framework although different terms have been used in both models.

Van Manen (1977: as cited in Lee, 2008) put forth different stages of reflection. At first stage, the reflection is carried out at technical level i.e., application of knowledge and understanding into a situation. At the second stage, the reflection entails thinking about assumptions about a phenomenon/process and its consequences on various aspects of the process. At the third stage, moral and ethical perspectives of the technicalities of a process are reflected upon. If we look at three frameworks, the higher level of reflection gradually involves more complexity and depth as compared to lower levels.

2.16 Reflection and Teacher Education

Many teacher educators and prospective teachers agreed that theory and its implementation must go hand in hand. Teacher educators and prospective teachers asserted that reflection was best taught and understood during practice. However, removal or minimal provision of theory may result in superficial understanding of role of teacher and education process. and prospective teachers will take reflection as a subjective and implicit process rather than a rational process of inquiry. As a result, they will conform instead of critical approach towards theory and practice. (Khan, 2017). The explicit instruction about reflective process and practice positively affects the reflective thinking capacity of preservice teachers (Weber, 2013).

In a study involving online and written reflective journals of prospective and working teachers, Bean and Stevens (2002) found that the provision of scaffolding to participants helped them to articulate their belief systems but it does not provide assistance to discuss and challenge larger teaching-learning discourses.

The repeated use of reflection during teacher preparation time, can help preservice teacher for their professional development and performance (Rodman, 2010). With the help of some guidance and insight, a teacher can become a reflective practitioner. During teaching practicum, a preservice teacher is involved in teaching observations and lesson presentations under the supervision of cooperating teacher and university faculty. The preservice teachers can use reflection-in-action for observing a class session and reflection-on-action while working on lesson presentations. Two factors, overcrowded classroom and limited class time, may affect the depth and amount of reflection by preservice teachers (Bener & Yildiz, 2019).

The prospective teachers can practice reflection without guidance or reflection but there are certain skills which needs to be scaffolded for solving problems. Further, ill-structured problems may not lead to deep reflection (Gelfuso & Dennis, 2014: as cited in Arrastia, Rawls, Brinkerhoff & Roehrig, 2014). The skills where scaffolding is required, consists of writing skills, locating a problem, relating tasks to one's own practice and the questioning skill (Bean & Stevens, 2002: as cited in Arrastia, Rawls, Brinkerhoff & Roehrig, 2014).

In order to promote reflection by preservice teachers, teacher educators should provide clear instructions on reflective thinking to identify a problem and solve a problem (Bean & Stevens, 2002: as cited in Arrastia, Rawls, Brinkerhoff & Roehrig, 2014). However, teacher educators do not always explicitly teach reflection to preservice teachers. Therefore, Robichaux and Guarino (2012) suggested that teacher educators should provide training to prospective teachers on how to reflection on their teaching. There is a need to explore the way the teacher educators assess and scaffold reflection (Arrastia, Rawls, Brinkerhoff & Roehrig, 2014).

The beliefs of preservice teachers guide their intentions and actions. Teacher educators may facilitate teacher candidates to appreciate their own beliefs. They may also facilitate preservice teachers for the experiences to challenge their thoughts and see multiple perspectives (Yost, Sentner & Forlenza-Bailey, 2000). The teacher candidates can understand effective pedagogical practices and value of teaching mathematics through process of reflection (Goodell, 2000).

2.17 Various Tools and Techniques of Reflection

Reflective journal and discussion groups (Dervent,2015; Dymoke & Harrison,2008; Rieger, Radcliffe & Doepker, 2013), portfolio, lesson-planning and collaborative inquiry (Dymoke & Harrison,2008) contributes to grooming skills for reflective thinking of practitioners. Lee (2005) found a positive effect of use of journal writing, clinical interview, dialogues, narrative inquiry, observational learning and reflective teaching on change in reflective thinking skills of preservice teachers.

2.17.1 Dialogue

Dialogue can be helpful to shift the focus from transmission of knowledge to challenging the thinking in teacher education classrooms. Teacher trainers should explicitly demonstrate the connection of theory with practice. They can act as mentors when the prospective teachers in collaborative problem-solving and inquiry. However, to ensure the achievement of objective of dialogue, it must address some problem or issue so that it may challenge the thinking of prospective teachers. They can question and challenge the points of view. Dialogue may be conducted as a seminar, dyads for a critical thinking dialogue, group collaboration and structural dialogue for guidance**.** Scaffolding may be helpful for a preservice teacher for interacting with a more skilled peer for one's maximum development (Yost, Sentner & Forlenza-Bailey, 2000).

2.17.2 Action Research

Action research uses inquiry approach for reflecting on one's own experiences to improve his/her teaching. It may also contribute to bring the school reform. Action research helps to link previous information of teacher with new information, ask questions and systematically search for answers to those questions (Yost, Sentner & Forlenza-Bailey, 2000). Other names for action research in literature are 'teacher's research', 'practitioner's research', 'collaborative or participatory action research' and 'classroom research' (Djoub, 2018).

2.17.3 Writing Experiences

Writing experiences can be used for grooming reflective ability of prospective teachers in teacher education courses (Yost, Sentner & Forlenza-Bailey, 2000). Langer and Colton (1994: as cited in Yost, Sentner & Forlenza-Bailey, 2000) mentioned writing personal biography, journals and case analysis for reflective decision-making.

Through writing journals, the teacher candidates may forget a learning lesson. Through reflecting and writing about it, they would be able to reconsider their experiences, ask questions and making decisions about issues observed (Lee,2008). Lee (2008) found some students being more reflective in the second semester when they experienced writing journals. Through writing exercises, the teacher candidates can communicate and get feedback from their instructor after class time (2008).

For writing experiences during and after reflection, Goh and Matthews (2011) suggested some guiding questions:

i. What to reflect on? (the subject of reflection may be a whole situation or certain aspects of it e.g., a lesson, learning environment, students)

ii. What was the issue(s) and concern(s)? who was involved? When this event happened?

iii. What does the event, the available evidence and your experience try to convey about the impact of the activity?

2.17.4 Portfolio

Reflective journal records daily events whereas portfolio contains a broader perspective of beliefs and teaching (Michalic, Timmons and Siddle, 1997: as cited in Yost, Sentner & Forlenza-Bailey, 2000).

2.18 Reflective Thinking for Higher Education Students

Developing reflective thinking of university students is an important target of learners' development and transforming higher education. The main reason for increasing interest in reflective thinking is that it facilitates learners for reflecting on their experiences to make meaning out of it (Choy, Lee & Sedhu, 2019). For this purpose, understanding and getting more insight into reflective thinking is very important for adult learners in order to fill the theory-practice gap (Ryan 2012).

2.19 Reflective Thinking Skills

Reflection, self-awareness and open-mindedness to different processes pave the way for genuine development of teachers. The observation of the environment and self can prevent a teacher from becoming routine-oriented and isolated person. For example, observing peers during teaching. It has been found by Lortie (1975: as cited in Cosh, 1999) that observing the teaching session of another teacher has more effect on practice of teachers than training.

The primary purpose of the observation should be for observers to become self-aware and reflective about their own practice. Therefore, the teachers should be provided good examples of practice for observation. A discussion or written form such as discussion points, pre- and post-discussion sessions, seminars and/or feedback forms, should be used for reflecting on the practice after observation and clarifying insights. For observing a teacher's practice, the emphasis should be on what observers has learnt or some pre-decided points to think about. Through questioning, reflection and awareness, it may help in experimenting the implementation of new techniques for which a prospective teacher was facing difficulty (Cosh, 1999).

It is important for preservice teachers and teacher educators to think about their personal backgrounds. Through thinking about their backgrounds, they know themselves in a better way thus they challenge themselves and their teaching (Lee, 2005).

Action-oriented learning involves learners in the teaching-learning process and reflect back on their experiences and their personal evolution. Use of a mix of traditional and performance-based assessment can help educators to know about students' transformation and their progress in their capacity in critical inquiry (Leicht, Heiss and Byun, 2018).

Dymoke and Harrison (2008) enlisted five skills, as given below, which helps in the process of reflection.

1. Observation Skill. The observation skill involves noticing one’s own feelings and behaviors. It also includes noting, identifying and keeping a record of something to differentiate it from other things in the surroundings. For observation, brief vivid details are required to recognize a thing or a situation. It can be done through noting it down in diary, making its diagram, capturing its photograph and/or recording its audio or video of an experience/activity/object (Dymoke & Harrison, 2008).

   Mindfulness refers to focusing on being in the moment. It helps to see the interconnectedness among different phenomena (Hoyt, 2016; Swanson, 2014). An ordered working environment such as employees feeling more powerful would support a person to be mindful (Denton, 2011). Feeling more responsible for acting in a situation can help a person to be mindful in that situation. Mindfulness is searching for causes behind an event then believing those reasons. It does not involve believing what just is being heard from anyone (Hoyt, 2016).

Empathetic observation is observing in a nonjudgmental way and seeing through multiple perspectives of a phenomenon or event (it will help to extend your observation beyond personal experiences and book-based information to get an awareness of personal, emotional and social contexts which can affect teachers' decisions. Empathetic observation assists a teacher to adopt a flexible approach for his/her teaching and effective instructional strategies. It also helps a person to become self-reliant because as you observe relevant things in greater detail, it will enhance your personal confidence and enthusiasm (Borich, 2016).

2. Communication Skill. Communication skill involves conveying the message through verbal and nonverbal sources. Communication skill for reflective practice is developed by writing reflective journals, preparing formal portfolio, or tutorial with a mentor. A series of open-ended questions can be written down about a particular incident such as: what have I been doing? What has happened? What is reason for this happening? (Dymoke & Harrison, 2008). Communication also involves being sensitive to professional feedback and other people needs. A prospective teacher has the ability to adapt the communication style and dialogue according to a

situation (Klassen, Durksen, Rowett & Patterson, 2014). Effective communication practice can help to build a democratic work environment (Gillip, 2007: as cited in Swanson, 2014) which may lead to a mindful observation (Swanson 2014).

3. Judgment Skill. Judgment involves analyzing a classroom, event or a situation along with a justification, value judgment, a criticism and/or additional explanation (Dymoke & Harrison, 2008). Judgment refers to weighing up available alternatives regrading an important issue and choose a logical decision (Sweeney & Bournisaw, 2013). Shermis (1999) mentioned analyzing, synthesizing, judgment and decision-making skills involved in reflective thought.

Judgement incorporates a value dimension to decision making process. It must be based on reasoning. Judgement helps where ethical dilemma, competing agenda and values exist or there is insufficient/contradictory information or multiple solutions but no definite answer (Hays, 2014).

Values guide our behavior and choices. Values are subjective in nature. Whenever there is a conflict among a set of values, the teacher weighs competing set of values against one another (Larrivee, 2000) and select the most plausible option available. However, it must be noted that it is a conscious process, rather than a reflexive action or automatic response. It is a circular process, called reflexive loop by Argyris (1990: as cited in Larrivee, 2000). This process has six steps as given below:

1. Select data

2. Add personal meaning to the data
3. Interpret the data
4. Draw conclusion based on previous step
5. Make beliefs based on existing circumstances
6. Act accordingly (Argyris, 1990: as cited in Larrivee, 2000)

A reflective practitioner who faces and exposes deeply rooted attitude and values, is the one who has explicit and integrated perspective on an issue. He/she faces and exposes his/her deeply rooted beliefs and attitudes, challenge them and improves continuously his/her perspective to see the things through for effectively meeting the demands of that situation (Larrivee, 2000).

4. Decision-making skill. Decision-making skill involves use of various reflective strategies such as analyzing strengths and weaknesses of an event (Dymoke & Harrison, 2008) to reach to a desired goal. It is important to see the relationship between various parts of a situation; it leads to integrated decision-making (Becker Professional Education, 2017). For this purpose, a stepwise strategy (Mettas, 2011), as given below, may be helpful:

- Identify the problem.
- Set the criteria for solution of problem according to various needs and factors of problem in mind.
- Weigh the various components of the criteria keeping in mind the needs related to the problem.
- List out the possible solutions for the problem.

- Rate each solution against the criteria.
- Select the solution with highest score against the criteria.

Reflective practitioners think critically about using the skills of observation, analysis, interpretation and decision making. Reflection involves examining one's understanding of an event, making connections with prior knowledge and/or skills, reconstructing the experience and making decision about how to apply knowledge of reconstructed experience in new situation (Cooper, 2013).

A reason-based reflective decision is based on a detailed information processing about the consequences. A decision which is taken quickly in a less time, may lead to less-effort heuristics or stereotype-based decision. Reflection identifies related information and characteristics of an event; therefore, it helps in justifying a decision. An experienced teacher takes a deliberate thoughtful strategy to take a decision whereas a prospective teacher usually uses heuristic strategy for this purpose (Zlatkin, Kuhn, Bruckner & Leighton, 2019).

5. **Team Working Skill:** Team working skill is the ability to work in different teams during professional career curriculum team, co-teaching, collaborative inquiry and action research. A teacher needs to be flexible to adapt to these varied roles (Dymoke & Harrison, 2008). Mindfulness can help in developing interpersonal relationships (Swanson, 2014).

2.20 Importance of Reflective Thinking Skills

Freire (as cited in Leicht, Heiss and Byun, 2018) was of the view that education can develop among students the personal and collective reflection capacity so that they can assess the world and change it. Leicht, Heiss and Byun (2018) suggested that the transformation of system is necessary to train learners so that they may consider sustainability of their life choices. For transformation of education system, teachers who are critical reflective practitioners, are needed. It requires the teachers to assist the students for reflecting on their relationship with their environment, their behaviour and their way of responding to their surroundings.

As a result of reflecting on past experiences, the behaviour and thinking of an individual for future are shaped. For past few years, there is a growing emphasis on developing reflective thinking skills of preservice teachers. Through reflective and systematic thinking, teachers think about their professional and instructional activities. In this way, they may realize their improvement areas, search for various strategies to solve a problem and try to implement innovative ideas in their profession. A teacher can implement an innovative technique in the classroom, develop classroom activities based on the students' feedback and make an effort to continuously improve themselves. Reflective thinking helps a teacher to evaluate innovations and improve themselves thus contributing in his/her success as a teacher (Tican & Taspinar, 2015).

To deal with the 21st century challenges, reflective thinking is a required future competency to ponder, adapt and respond to demands of various situations (Syamsuddin, Juniati & Eko Siswono, 2016). Syamsuddin, Juniati and Eko Siswono (2016) found that reflective thinking helped students to work on their improvement areas, to acquire precision and concentration to solve the problem at hand, and to get right and logical answer. Reflective thinking helps in solving complex problems by identifying the facts, theories and formulas (King & Kitchener, 1999; Syamsuddin, Juniati & Eko Siswono, 2020).

One of the significant attributes of reflective thinking is the ability to modify thinking and action for the current or upcoming problem. For this purpose, it is most important to encourage prospective teachers for solving a problem and setting a problem-solving strategy for this purpose (Syamsuddin, Juniati & Eko Siswono, 2020). King and Kitchener (1999) suggested that most of the undergraduate students are functioning to evaluate evidence in an idiosyncratic way. However, they may be able to progress towards an optimal level of reflective judgment i.e., more plausible reasons can be differentiated from less plausible ones, when they are provided opportunities for practice and given feedback about their performance.

2.21 History of Reflective Thinking

The concept of reflection can be found in Aristotle's writing about practical judgment and moral action in '*Ethics*' (Grundy, 1982: as cited in Boud, Keogh and Walker, 1985, p.11). John Dewey (1933) mentioned two types of teachers: one learning through trial-and-error learning, and others learning through reflection by continuously looking at experience and inferring the meaning (Boud, Keogh and Walker, 1985, p.12). Kolb's (1984) experiential learning cycle was another major contribution in the field of education.

Reflective practice has been readily accepted since late 1980s. Schon (1983) gave the concept of reflection in-action which involves reflecting on action during the process and reflection on-action which deals with reflecting on an action after its completion (Eby & Yuzer, 2013; Munby, n.d.). The notion of reflection gradually changed across time from a thought or opinion to a form of thinking. The levels of reflection by Mezirow (1991) also explained about non-reflective action differentiating it from reflective actions (Lee, 2005).

2.22 Reflective Thinking and Teachers' Professional Development

There are different types of knowledge which assist teachers to develop professionally as a practitioner. The conception of 'knowledge of practice' is that teachers inquire about various factors related to teaching, learning, curriculum, content, school, learners and the learning environment. The goal is to understand and introduce changes in practice and social relationships in classrooms, schools, programmes and professional organizations. So, in 'knowledge of practice', teacher learns by identifying problems, challenging their own assumptions, noticing salient features of practice, constructing/reconstructing curriculum, and lead the efforts to transform classrooms, schools, curriculum and programs. Throughout a teaching lifespan from novice to an experienced status, the teachers critically analyze their own and others' knowledge and practice. It encompasses immediate classroom practices and beyond it. It may include curriculum adaptations, social activist, theory contribution, classroom and school leadership. At preservice level, this knowledge is reflected when prospective teachers are prompted to think critically about their life events and practice.

The conception of 'knowledge for practice' carries the main idea that the practitioners have formal knowledge base from university-based research. The teachers constantly update their knowledge and adapt the models/demonstrations of others to solve problems and make decisions in their professional activities.

The idea of knowledge-in-practice is that the expert teacher makes explicit the knowledge which was implicit in different intelligent actions and make it visible for a less experienced or novice teacher. The novice teacher observes and learns from the effective practices of the experienced/more accomplished teachers. The knowledge-in-practice emphasize the mentoring or coaching where the novice teachers participate in the learning process by having an interaction with more experienced teachers for a puzzling problem or action. So, the novice teachers learn the knowledge which is already held tacitly by another more accomplished teacher about subject content and teaching strategies. Further, the novice teacher also thinks about his/her own assumptions, actions and decisions in a given classroom situation. The knowledge-in-practice involves the beliefs of a teacher, his/her actions in classroom, his/her strategy to deal with problems which cannot be solved in straightforward way and reconsidering their assumptions and reasoning process. So, the idea of reflection-in-practice is close to inquiry and reflecting during the action/after an action has occurred, as advocated by Dewey and Schon.

The more accomplished teacher due to his/her extensive expertise in the field, is a source of knowledge-in practice. The novice teacher, as in teaching practicum, is placed with more accomplished teachers where s/he observed the examples of decision-making and actions in daily classroom life. So, the experiences teachers are expert, not only, in subject matter and teaching strategies but also in reflecting on their practice and participating in learning situations e.g., inquiry group, mentoring, reflective practitioner (Cochran-Smith & Lytle, 1999).

Singh, Rowan & Allen (2019) have shown the conceptions of knowledge-for, -in and -of practice (as given by Cochran-Smith and Lytle, 1999) for teachers' work and opportunities to change in figure 2.4 in the form of a quadrant.

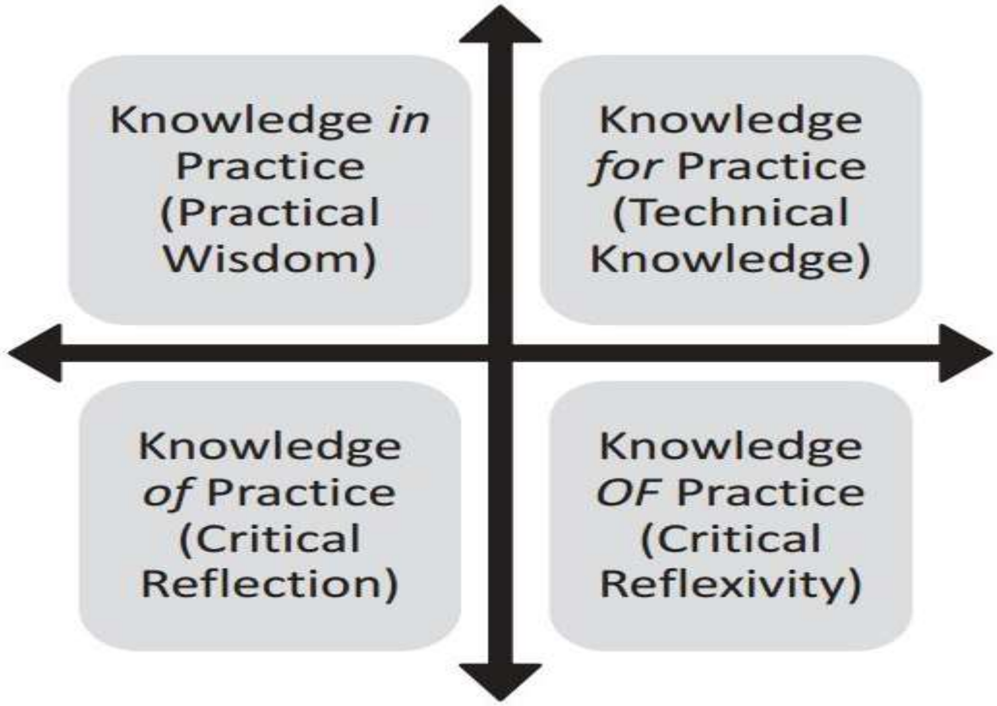


Figure 2.4 Forms of Teaching Reflection (Singh, Rowan & Allen, 2019)

As shown in figure 2.4, the vertical axis depicts a change at the level of individual at the top of the quadrant and change in group-based learning in the lower half of the quadrant. The horizontal axis in figure 2.4, displays a continuum of knowledge base with emphasis on teacher practical knowledge and inquiry skills on left side, and an emphasis on codified knowledge as provided by latest research work on right side of the quadrant. So, looking at the quadrant in the anti-clockwise direction, the teacher uses the knowledge produced by the latest research to improve his/her own practice. The knowledge from latest research work adds up into an improved teaching practice of a teacher. The knowledge-in-practice is not formulae- or fact-based knowledge but it is the craft and embodied knowledge articulated in practice, not in written form. In day-to-day classroom practice, teacher invent knowledge-in-practice and it becomes explicit through discussion and observation to others.

Knowledge-of-practice suggests that the teachers must adopt an enquiry stance, and the questioning strategy is used to explore knowledge base and knowledge use in a given situation. For example, what does it mean for adding up to knowledge, who suggested it, to whom this is valuable, and how it can be used in a particular context? So, the knowledge-of-practice asks teachers and researchers to question the implications of research for generating the practices of teaching rather than just describing or adopting those practices (Singh, Rowan & Allen, 2019).

Kember (2009) asserted that teachers, most of the time, deal with the ill-structured and messy problems. These problems are multi-faceted, lack clear identification and ideal solutions. So, Schon (1987: as cited in Kember, 2009) suggested that the teachers are required to be equipped with knowledge and practice of reflection in order to deal with ill-structured problems. However, the professional education and curriculum are not assessed for whether they are contributing to develop reflective thinking of teachers (Kember, 2009).

McGarr and McCormack (2015) described reflective thinking as a cognitive activity so it can be affected by biases held in the mind. Therefore, reflection by student teachers should be scaffolded to progress from knee-jerk response to critically reflect on the incident.

Some of the factors causing difficulty in implementation of reflection highlighted in a research on one-year teacher education programmes, included lack of resources, time and work for practicing reflection (Khan, 2015), emphasis on practical rather than conceptual part of reflection and too much focus on school-related tasks during teaching practicum (Khan, 2014, 2015). Further, effective practice of reflection by student teachers is affected by their individual characteristics, skills and their experiences in classroom (Khan, 2014). A teacher with a higher degree was more aware of the need of reflection (Marzban & Ashraafi, 2016). Further, in the developing countries, teachers were less frequent about the use of reflective thinking as compared to the developed countries (Khan, Fazal & Amin, 2014; Marzban & Ashraafi, 2016).

2.23 Technology Tools and Reflective Thinking

In a research study, Khan (2017) found that the teacher educators and prospective teachers asserted for effective teaching of reflection through practice instead of teaching it as a theoretical concept.

In an e-learning context when students are provided opportunities for reflection and reflective activities, they may become more aware of their cognitive processes and develop individual responsibility for their learning (Yilmaz & Keser, 2016). Cooner (2010), in a study involving technology-enhanced blended learning design, found that online lectures, a diary for journaling and a short video of a case-study followed by a small group classroom activity can encourage students for reflecting to evaluate the impact of their knowledge, belief and values on their professional practice.

Chang and Lin (2014), based on the research study on undergraduate English language learners, concluded that students experiencing web-based teaching and reflective e-journals, performed better than the control group. Students perceived that reflective journals were helpful to improve their writing and organizing skills, and review of course for the examination.

Bener and Yildiz (2019) analyzed 457 blog entries of preservice teachers over a period of six weeks and concluded that 61% blogs used medium to high level of reflection for writing whereas 12% blogs were written with a high level of reflection. It can be stated that, on average, blog entries facilitated high level of reflection among preservice teachers. It was concluded at the end that blog entries encouraged preservice teachers for academic participation. It also promoted reflectivity among preservice teachers when they have been provided the opportunity to engage in deeper reflection for most part of their participation (Bener & Yildiz, 2019).

Blogging software improved the performance and quality of writing of university students (Novakovich, 2015). Roberts, Maor and Herrington (2016) found that preservice teachers improved their reflective thinking when they were trained in a class environment supplemented with e-portfolio. However, in order to get maximum benefit, the researchers recommended to use some strong pedagogy which engages students in class tasks at a complex level and require multiple layers of scaffolding to be implemented (Roberts, Maor, & Herrington, 2016). Reflection can be developed through scaffolding (Rieger, Radcliffe & Doepker, 2013).

2.24 Research Work Related to Reflective Thinking Skills of Teachers

Lew and Schmidt (2011) carried out a research study on reflective journal writing of applied science students. The students, in reflective journals, focused on the process and content of their learning, past learning experiences and their learning strategies. In this correlational study, they found that there was weak to moderate relationship between reflective entries and academic achievement. Lew and Schmidt (2011) found that a student's reflection on what and how s/he has learnt, causes an increase in her/his academic performance. The use of podcasts and reflective activities can also enhance the academic performance of students (Yilmaz & Keser (2016).

Reflective thinking activities may cause an improvement in reflective thinking of preservice teachers (Arrastia, Rawls, Brinkerhoff & Roehrig, 2014; Hagevik, Aydeniz, & Rowell, 2012; Tican & Taspinar, 2015; Weber, 2013). Technology tools such as blog (Bener & Yildiz, 2019), vlogging (El-Garawany, 2017) and e-portfolio (Roberts, Maor, & Herrington, 2016) were found to have a positive effect on reflective thinking (Bener & Yildiz, 2019; Roberts, Maor, & Herrington, 2016) and quality of writing of students (Novakovich, 2015). Video-based training improved noticing skill (Kaendler, Wiedmann, Leuders, Rummel & Spada, 2016) and virtual practicum affected reflective thinking of student teachers positively (Citraningrum and Sudargo, 2019). The positive change in reflective thinking skills of prospective was also found by Kaendler, Wiedmann, Leuders, Rummel and Spada (2016), Tsingos-Lucas, Bosnic-Anticevich, Schneider and Smith (2016). However, the impact of flipped classroom can be seen after considerable time of its implementation (Zhu & Xie, 2018) because they become used to of the new method (Tufail, 2019).

Zahid and Khanam (2019) found, in an experimental research study with 20 prospective teachers in control and 20 in experimental group, an improvement in reflective teaching practices i.e., reading, writing, critical thinking, reflective listening, content related knowledge and classroom management, of prospective teachers after a training. It was reported that flipped classroom promotes learning awareness among prospective teachers of Mathematics (Umam, Nusantara, Parta, Hidayanto & Mulyono, 2019). Hsia & Hwang (2020) also found, in an experimental study, an improvement in students' reflection when they learnt in a flipped classroom. They students with higher self-efficacy tend to obtain more benefit from flipped classroom as compared to students with low self-efficacy. Hung (2015) reported that active learning may pave a way for students to think about what they are learning. Chen, Hwang and Chang (2019) also found a positive change in reflective thinking capacity of students when they learnt in a carefully designed flipped learning environment. Fauzi, M., Shahnaz, S., Hussain,R. & Maznah, R. (2016) found in a design-based research that flipped classroom facilitated active and reflective learners. However, the reflective thinking covered in above mentioned research work either involved one or the other aspect(s) of reflective thinking such as noticing skill, monitoring skill, awareness skill or levels of reflection proposed by Kember (2009). Sage and Patti (2015) after conducting a mixed methods study with a survey tool and focus group discussion, reported an increase in student engagement and participation in class discussion after reading reflective journals in the flipped classroom.

2.25 Flipped Classroom Instruction (FCI) & Academic Achievement of Undergraduate Students

Galindo-Domínguez and Bezanilla (2019) were of the view that flipped classroom was more or at least equally effective like traditional methodology at university level. However, if the students' out-of-class preparation, planned classroom activities and teachers' guidance are not carefully executed, then the positive result of flipped classroom may not be observed as it was expected. Therefore, if the students have clearly understood the subject concepts during out-of-class time, the teacher is required to come to class prepared with a planned class activity. The students can be involved in higher order explorations if the class activity is carefully planned and executed under the guidance of the instructor.

The learning progress of students in non-flipped and flipped classroom adopting an active learning approach did not differ significantly (Jensen, Kummer & Godoy, 2015;Leatherman & Cleveland, 2019). So, they concluded that it is too early to conclusively claim about grade improvement because of Flipped model. However, a flipped classroom with active learning approach is a better option if traditional classroom lacks its use for this purpose (Jensen, Kummer & Godoy, 2015).

The flipped classroom positively affected academic performance at university level (Davies, Dean & Ball, 2013; Flores, del-Arco, and Silva, 2016; Graham, 2015; Hung, 2015; Kazanidis, Pellas, Fotaris & Tsinakos, 2018; Koh, 2019; Little, 2015; Sun & Wu, 2016; Turan & Goktas, 2016; Yough, Merzdorf, Fedesco & Cho, 2017; Zhu & Xie, 2018).

The academic achievement of students also improved at school level when they were taught by flipped classroom (Palmer, Osborn and Strelan, 2020). The students when taught through flipped classroom, reported that they experienced lower level of cognitive load as compared to traditional classroom (Turan & Goktas, 2016). The students studying in flipped classroom showed an improvement in academic performance as compared to MOOCs and traditional classroom settings (Mellati & Khademi, 2019). Flipped classroom with self-explanation and practice method can bring a positive change in academic performance of students (Talley & Scherer, 2013).

2.26 Perception of Students about Flipped Classroom Instruction (FCI)

Jensen, Kummer and Godoy (2015) found that the features of FC helped students to learn in an effective way. The responses of perception students were related to assignments and class activities contributing to students' learning, group work, timely interaction with teacher and peers within class and through digital when they were at home. An important finding from Jensen, Kummer and Godoy (2015) was that the presence of instructor during the class was more important for students to learn as compared to class activity itself.

Mellati, M. & Khademi, M. (2019) has sought the perception of students and teachers about FC in a language classroom. Their responses were related to attitude towards FC, challenges associated with programs using FC, and participating in a class environment using FC. They found that the students and teachers consider FC as promoting active engagement with the course material. However, they also consider it a more demanding on the part of students because they have to study the learning material on their own. Mellati and Khademi (2019) highlighted the importance of technology literacy for teachers and students otherwise they would experience the stress and anxiety which may hamper the learning process.

Content material should accompany objectives, expectations, quiz, assignment and due dates. It helps the learners to get along with the course. A timely and positive feedback from teacher motivate students to learn the content. However, improving student-student interaction at university level needs to be explored in future research (Nwankwo, 2015).

2.27 Research Work related to Perception of Students about Flipped Classroom Instruction (FCI)

Interaction among peers is important for enhancing the flipping skills of students. In addition, the synergy between students and teachers for continuous encouragement and guidance from teacher, leads to successful flipping the classroom. Flipped classroom provides opportunities to students for engaging in class activities and participating in the classroom (Shih & Tsai, 2017). Dickenson (2015), in an experimental study, found that self-efficacy beliefs towards teaching of prospective teacher showed more improvement in flipped classroom than those in a traditional classroom.

Shih and Tsai (2017) found that students were reluctant to prepare the topic during pre-class time because the provided content was too much and varied. Therefore, it may be inferred that excessive learning material for pre-class preparation may lead to cognitive load for students (Shih & Tsai, 2017).

The contributing successful factors as perceived by students during online and flipped classroom, included course experience contributing to their learning (Butt, 2014), self-paced and deeper learning of subject concepts (Nwosisi, Ferreira, Rosenberg & Walsh, 2016), integration of subject concepts (Flores, del-Arco & Silva, 2016), active engagement (Green & Schlairet, 2017) for understanding the subject concepts before and attending class activity during class time (Mellati & Khademi, 2019), improved (Nwankwo, 2015) and quality (Murray, Koziniec & McGill, 2015) interaction with subject content and teacher, peers' and teacher's support as per need of the student(s) through technology tools (Jensen, Kummer & Godoy, 2015), encouragement and support from teacher, and peer interaction (Shih & Tsai, 2017), online availability (Zainuddin, 2018) of instructional videos (Nguyen, Yu, Japutra & Chen, 2016) to be helpful for self-paced learning by students (Dickenson, 2015), instructional videos to be less time-consuming for learning a concept (Murray, Koziniec & McGill, 2015), self-paced and self-directed learning of students (Nguyen, Yu, Japutra & Chen, 2016), class activities for better learning experiences (Graham, McLean, Read, Suchet-Pearson & Viner, 2017; Kummer & Godoy, 2015), equally useful for students with different academic achievement levels (Lage, Platt & Treglia, 2000), improved self-efficacy of prospective teachers for implementing flipped classroom instruction their own classroom (Hao & Lee, 2016).

2.28 Researcher's Perspective

Teaching profession involves problems and challenges on daily basis therefore, the teachers especially the novice teachers struggled to fulfill their professional responsibilities. Kember (2009) asserted that teachers, most of the time, dealing with the ill-structured and messy problems. These problems are multi-faceted, lack clear identification and ideal solutions. Dealing successfully with these problems requires particular knowledge and skills of the situation and goals of desired action. Schon (1987: as cited in Kember, 2009) suggested that the practitioners should be trained for using reflective process for handling ill-structured problems and unclear situations. However, the professional education and curriculum are not assessed for whether they are contributing to develop reflective thinking of teachers (Kember, 2009). The teachers should be equipped with information and skills for reflection so that they can their professional responsibilities at a desirable level. Experience in the field of a profession may give a teacher the skill to at least handle a perplexing situation but the novice teacher may face difficulties to deal the situation as expected.

Westbrook et al. (2013) mentioned that initial teacher education programs and pedagogy lack the linkage between theory and practice. There is a need for adopting a more student-centered and less lecture-based approach with individual support (Beck, 2019) for every teacher candidate. It will help teachers to learn and teach 21st century skills (Aubusson & Schuck, 2013) in their classrooms.

The need-based and strategic use of technology in classroom assists a teacher to facilitate learning process in a more efficient way. Flipped classroom is one way of implementing active student-centered learning (Katz, Brown & Kim, 2016; Murray, Koziniec & McGill, 2015). The student is an active agent of his/her own learning (Katz, Brown & Kim, 2016) in flipped classroom. And the students have to work at application, analysis and synthesis levels for completing class activity during class time; students are working on the class activity in a self-directed fashion and the teacher may provide facilitation, support, feedback and motivate them for success on various components of activity (Reschly & Christenson, 2012). Besides providing opportunities for self-directed, student-centered activities and teacher's ongoing support, flipped classroom also gives autonomy and choice to every student to understand a concept or complete an activity at his/her own pace (Little, 2015).

Khan (2017) found that the teacher educators and prospective teachers asserted for a practice-based teaching of reflection rather than a theoretical concept. In e-learning context when students are provided opportunities for reflection and reflective activities, they may become more aware of their cognitive processes and develop individual responsibility for their learning (Yilmaz & Keser, 2016). Cooner (2010), in a study involving technology-enhanced blended learning design, found that online lectures, journaling and online video-based case studies can help students to reflect for evaluating the impact of their knowledge, beliefs and values on their professional practice. There was positive effect of use of technology tools on reflective thinking of students (Bener & Yildiz, 2019; Roberts, Maor & Herrington, 2016).

Reflection is an intellectual and affective process (Dewey, 1910) with the individual as an instrument for his/her learning from the experience. Flipped classroom may provide prospective teachers for active and self-directed opportunities for practicing reflective thinking skills. Being aware of the problems related to teacher training programs and positive aspects of flipped classroom for active learning, it was researcher's stance that flipped classroom may play a role for bringing a change in reflective thinking skills of teacher candidates.

2.29 Theoretical Framework of the Study

2.29.1 Flipped Classroom Instruction

Flipped classroom instruction is a pedagogical model with two components: direct computer-based pedagogy before the face-to-face session of that course and individual or group-based class activity in face-to-face course session (Bishop & Verleger, 2013). In flipped classroom, the learners watch a pre-recorded video (5-15 min)/material while the in-class time is devoted for applying the concepts learnt from the videos (Norman & Wills, 2015). In the flipped classroom instruction, the classroom session involves student centered activities facilitated by the instructor (Willis, 2014) such as peer tutoring, group discussion and gaming (Zhonggen & Guifang, 2016).

Traditional instruction involves delivery of content through lecture/direct instruction during class time and assigning homework related to the lecture (Saunders, 2014). In traditional classroom, the teacher has the main responsibility for delivery of instructional material along with suitable examples for students with different learning abilities and styles. Homework, if applicable, is assigned to students depending on the topic of lecture (Brown, 2016).

2.29.1.1 *Active Learning*

Active Learning is based on theories of constructivism proposed (Jean Piaget 1896-1980) and social constructivism (Lev Vygotsky 1896-1934). It provides learners opportunities for replacing or adapting their schema and may progress from lower order to higher order thinking levels (Cambridge Assessment International Education, 2019).

In active learning, the learners work on student-centered inquiry, problem and discovery-based learning activities to build their knowledge and understanding. They may work on individual, pair and group-based activities. The role of teacher is activator when providing direct instruction or providing guidelines for a class activity and facilitator when the learners are working on the task. The assessment and feedback are very crucial in active learning to ensure the progress of all learners (Cambridge Assessment International Education, 2019). The constructivist approach to teacher development underlies the active learning where prospective teachers keep track of their own learning (Cochran-Smith & Lytle, 2001: as cited in Lee, 2008). There are many models, theories and elements of reflective practice exit, the recommended practice is to use the multiple and varied opportunities with scaffolding for preservice teachers (Etscheidt, Curran & Sawyer, 2011).

2.29.1.2 *Vygotsky's Sociocultural Theory*

According to Vygotsky, a child learns by interacting with his environment, adults and peers. Communication produces the need for checking and confirming thoughts (Vygotsky, 1978). Vygotsky's theory supported the study by providing a focus on cultural tools for a student in home and educational institution, providing access to expert adult/peers during the learning process and supporting the learning in his zone of proximal development. In flipped classroom pedagogical model, the communication with teacher and peers is enhanced and encouraged. Access to a number of technology resources such as pedagogical videos, websites, online discussion forums and emails provides various communication sources to interact with experts, and peers in the environment (Strohmyer, 2016). The theory proposes that the student must be assisted during the learning process in his/her proximal development zone i.e., tasks which a learner may not accomplish on his/her own but can execute it when provided with guidance or collaboration from an adult or more experienced peer (Vygotsky, 1978).

The theory supports for continuous instructor's facilitation to learner for the course topics, and increased interaction with teacher and peers during learning. The students work on complex class activity during face-to-face session time to improve their thinking skills (Diab, 2016). In flipped classroom, scaffolding is provided to a student in his/her zone of proximal development at higher cognitive level i.e., metacognitive level as compared to traditional instruction where such support is provided at customary level (Suh, 2010: as cited in Saunders, 2014). In flipped classroom, the interaction among teacher and students is enhanced (Alvarez, 2012).

The theory supports the research study by advocating increased peer-peer and teacher-student interaction during classroom activities in flipped classroom instruction. The teacher and students are engaged at a lower cognitive level i.e., knowledge and understanding level in a traditional classroom, so scaffolding provided may/may not be according individual needs of a student.

2.29.1.3 *Anderson's Schema Theory*

Human mind consists of a number of specialized components which interact to function coherently. Information is stored in mind in the form of schema. New information can easily be comprehended when its connection is made with the prior knowledge which exist in schema (Anderson, Bothel, Byrne, Douglass, Lebiere & Qin, 2004). For Kant (1929), a scheme mediated or stood between the external world and internal mental structure; a scheme shapes and is shaped by experience.

Schema was also a key mediating structure in Jean Piaget's theory of cognitive development (McVee, Dunsmore & Gavelek, 2005).

Anderson's theory supports the study by providing a framework for acquiring new information and retrieving the information for application. In flipped classroom instruction, the students are facilitated in their learning process by exposing them to a variety of resources. When using particular technological resources or an activity in the classroom, the teacher must bear in mind that it will contribute to add in schema of the student for subject matter and strategies to apply that knowledge. As the students learn to acquire and apply information in their schema through a technological tool or learning activity, they will be more likely to use a similar technological tool or a learning activity to develop knowledge and understanding in future (Strohmyer, 2016).

2.29.1.4 *Cognitive Load Theory*

The process of learning takes place through working memory of a person. The cognitive load theory elaborates the way cognitive load may affect the working memory thus influencing the learning process. The cognitive load on working memory can hinder or slow down the learning progress. If the cognitive load on working memory is put, then it affects the pace and accuracy of completing the assigned task.

Cognitive load experienced by working memory, is of two types. The *intrinsic cognitive load* is experienced due to the inherent structure of information a learner is required to master for a specific learning outcome whereas the pedagogical method does not take part in it. The *extraneous cognitive load* is experienced due to way of presenting information or learning activity for attending by students. Both intrinsic and extraneous cognitive load contribute to put a cognitive load on working memory (Sweller, Ayres & Kalyuga, 2011).

The information and learning tasks should be presented in a way that it tends to keep the extraneous cognitive load to a minimum and intrinsic cognitive to a manageable extent because the intrinsic cognitive load may challenge learners for putting more effort and work at higher cognitive level into the assigned task (Sweller, Ayres & Kalyuga, 2011). Germane cognitive load is the mental effort the students apply to solve a problem or learn something (Gillmor, Poggio & Embretson, 2015). German cognitive load is exerted in response to intrinsic cognitive load (Sweller, Ayres & Kalyuga, 2011).

Cognitive load puts pressure on working memory so it occupies a space in the working memory which should be used for learning. The extraneous cognitive load can be dealt by the way a class task is presented to the student or use of various suitable pedagogical strategies without altering the structure or nature of task (Sweller, Ayres & Kalyuga, 2011) and without compromising the learning goals of that task. It will free the working memory from unnecessary workload and helps the learners for an improved quality of learning the task due to assimilation and accommodation of schema (Sweller, Ayres & Kalyuga, 2011).

Although face-to-face traditional teaching can be a good approach to transmit information to students (Bligh, 2000; as cited in Abeysekera & Dawson, 2014), flipped classroom approach can manage cognitive load in a better way (Abeysekera & Dawson, 2014) due to utilizing more variety of resources for learning and an active approach to learning. Learners can rewind, pause or skip any part of the lecture video/PowerPoint/notes (Abeysekera & Dawson, 2014) based on their choice and need. Karaca and Ocak (2017) found that the flipped learning had less cognitive load on students as compared to traditional face to face training.

Cognitive load theory supports the research study by helping to efficiently organize the class time for richer learning opportunities. Working memory is finite. The students are helped to master basic concepts before the class time so that they can understand more difficult concepts within the classroom. Use of variety of styles and formats such as PowerPoint presentation, videos, pictures etc. as practiced in flipped classroom instruction can help to minimize the cognitive load due to the presentation of learning tasks. Flipped classroom instruction helps to create and strengthen students' schema by linking the information with their prior knowledge through face-to-face interaction and technological resources.

Flipped classroom instruction provide for differentiated instruction to deal with individual differences within a classroom. The students can stop, rewind and revisit a PowerPoint presentation/video/images etc. Further, the flipped classroom instruction helps students to get prior knowledge about a topic outside of class, it, thus, reduces the cognitive load for the learners (Willis, 2014). Strayer (2012) found a positive influence of inverted classroom on student cooperation with peers and openness to innovative teaching methods. However, students were found to be unsettled because of change from traditional to flipped learning. This feeling of unsettlement can be better coped with the support from Vygotsky sociocultural theory and cognitive load theory for facilitating the students.

2.29.2 Reflective Thinking Skills

There are five reflective thinking skills, as given below, for teachers, as proposed by Dymoke and Harrison (2008).

1. Observation Skill. The observation skill involves noticing one's own feelings and behaviors with respect to a particular experience or event. It also includes finding out, noting down and keeping the audio or videorecording or picture of something in such a way that it can be differentiated from other elements in the environment. For observation, brief vivid details are required to recognize a thing or a situation (Dymoke & Harrison, 2008).

2. Communication Skill. Communication skill involves conveying the message through verbal and nonverbal sources. Communication skill for reflective practice can be developed through reflective journaling, developing a process/product portfolio, or tutorial with a mentor. A series of

open-ended questions can be written down about a particular incident such as: what have I been doing? What has happened? What is reason for this happening? (Dymoke & Harrison, 2008).

3. Judgment Skill. Judgment involves analyzing a classroom, event or a situation along with a justification, value judgment, a criticism and/or additional explanation (Dymoke & Harrison, 2008).

4. Decision Making Skill. Decision making skill refers to choosing an option from a list of available choices for achieving a goal about certain process or object. The process of selecting an option entails certain reflective steps such as analyzing strengths and weaknesses of an event (Dymoke & Harrison, 2008).

5. Team Working Skill. Team working skill is the ability to work in different teams during professional career curriculum team, co-teaching, collaborative inquiry and action research. A teacher needs to be flexible to adapt to these varied roles (Dymoke & Harrison, 2008).

2.29.3 Instructional Design

Technological, Pedagogical and Content knowledge (TPACK) model was utilized to develop lesson plan for the course. This model aimed at complex role and interaction among content, technology, and pedagogy (Mishra & Koehler, 2006). Three major knowledge components form the foundation of TPACK framework:

1.Content Knowledge (CK) is the subject matter of a course which a teacher is expected to teach in the classroom.

2.Pedagogical Knowledge (PK) is the know-how of different teaching techniques, methods, tactics and strategies which a teacher uses to deliver the content of a course. Selection of a suitable pedagogical practice is very important to encourage learning progress of students.

3.Technology Knowledge (TK) is the awareness about technology tools and techniques which can be used by teacher for various tasks related to teaching-learning process and curriculum in order perform it in an efficient way.

Content, pedagogical and technological knowledge of TPACK can be integrated with each other into four different ways for teaching-learning process.

4.Pedagogical Content Knowledge (PCK) includes the ways a particular topic can be organized and presented to teach the subject matter and serve the varied learning needs of learners (Shulman, 1986: as cited in Koehler, Mishra, Kereluik, Shin & Graham, 2014).

5.Technological Content Knowledge (TCK) explains mutual relation between technological tools and subject matter. The content of a course can be presented and defined through the use of technology (Koehler, Mishra, Kereluik, Shin & Graham, 2014). Technology tools selected, affects the way the subject matter is presented (Mishra & Koehler, 2006).

6.Technological Pedagogical Knowledge (TPK) involves the possible ways for integrating technological applications for various types of instructional strategies and methods.

7.Technological Pedagogical Content Knowledge (TPCK) uses the technological, pedagogical and content knowledge simultaneously for particular circumstances (Koehler, Mishra, Kereluik, Shin & Graham, 2014; Mishra & Koehler, 2006) to ensure the achievement of learning objectives by the instructional process in the best possible ways.

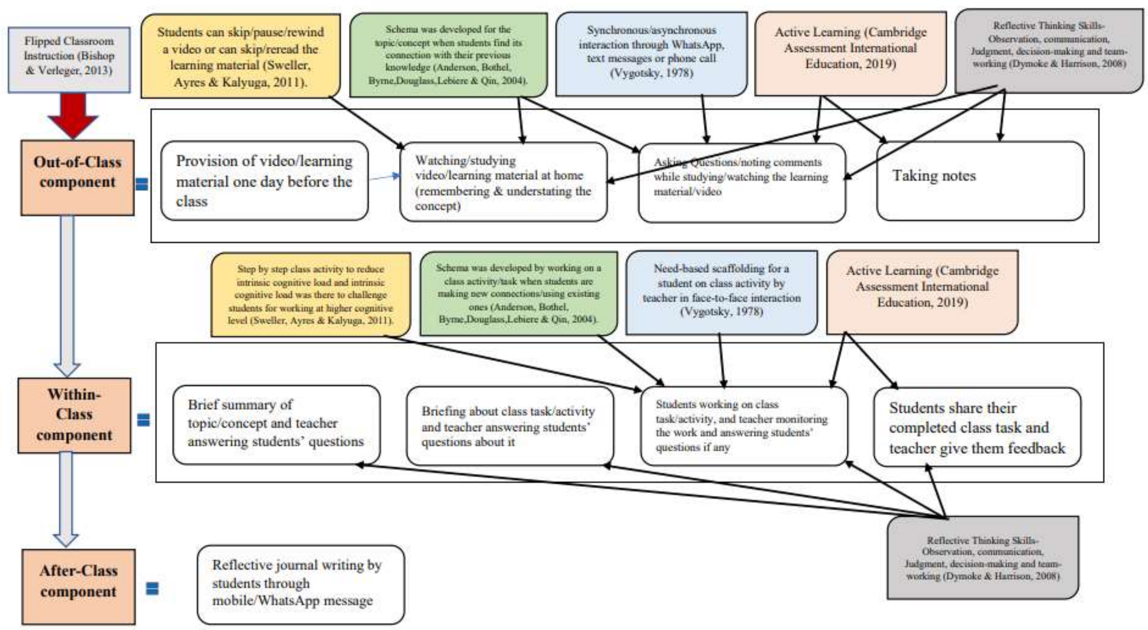


Figure 2.5 Conceptual Framework of the Study

2.30 Summary of Literature Review

Flipped Classroom gradually evolved as a result of efforts for making teaching-learning process more effective and efficient through using technology (Bergmann & Sams, 2012). Commonwealth of Learning (2019) realized that the technology tools are essential for successful implementation of flipped classroom. It focused on devoting the class time for active learning of students (Dickenson, 2015; Murray, Koziniec & McGill, 2015). Commonwealth of Learning (2019) elaborated the various components of routine of flipped classroom for out-of-class and within-class time for a topic. Zainnuddin (2018) highlighted various types of interactions taking place in a flipped classroom. Flexible working environment, learning tradition, content for flipping the course and professional teacher can facilitate the learning process in a flipped classroom (Flipped Learning Network, 2014). Lo, Hew and Chen (2017) pointed out challenges faced by students, teachers and operational challenges related to flipped classroom.

Keeping in view the ideas of Dewey (1933), Schon (1987) and Kolb (1984) that learning through experience involves reflection to get meaning out of that particular experience. Further, Dewey's (1933) process and Gibbs' cycle for reflection elaborated the various components of process of reflection. Van Manen (1977), Lee (2006) and Hatton and Smith (1995) highlighted the stages/levels at which the reflection is practiced. Further, Schon's practice of reflection during and after an experience helped practitioners for digging deep into this area. Mezirow (1991) explained the reflective and non-reflective actions. Lee (2005), Dymoke and Harrison (2008), Rieger, Radcliffe and Doepker (2013) and Dervent (2015) mentioned various tools of reflection such as portfolio, lesson-planning and collaborative inquiry. To achieve transformative learning of students in higher education, they should be trained as reflective practitioners (Leicht, Heiss & Byun, 2018). Further, Reflective thinking is an active process (Dewey, 1933) to solve problems by identifying the facts and theories (King & Kitchener, 1999; Syamsuddin, Juniati & Eko Siswono, 2020). Singh, Rowan and Allen (2019) showed various forms of teachers' learning in which they learn to solve preplexing problems by following the reflective process for ill-structured and unclear problems.

CHAPTER 03

RESEARCH METHODOLOGY

3.1 Research Design

The research study involved pragmatic research paradigm and mixed-methods research design (Creswell & Creswell, 2018; Creswell, 2009). In this research design, the concurrent embedded strategy (QUAN+qual) (Creswell, 2009) was employed. An experiment was carried out to assess the effectiveness of instruction (traditional/flipped classroom instruction) for nurturing reflective thinking skills of prospective teachers. Qualitative data was collected (Creswell, 2009) to explore the experiences of participants of the treatment group. Qualitative data may be added to the experiment in order to explore how the participants have experienced the treatment and which barriers they faced during the treatment and which factors can affect the implementation of the treatment. It aims at providing feedback of the participants on the intervention and explaining variations in their responses (Cresswell & Cresswell, 2018). Research design involved the qualitative data collection to fulfill the purpose of the study i.e., to make meaning of study results keeping in view the perspective of the participants of treatment group, and to provide the context for how the intervention worked. The fifth research objective leads to the research question for the qualitative data collection.

In this study, an experiment was planned and carried out with one control and one experimental group. The quantitative data about the dependent variable was obtained during first and second phase of the study from prospective teachers of both groups, as shown in figure 3.1. The quantitative and qualitative data about the experiences of the members of experimental group were collected during the same phase of the study (Fetters

& Molina-Azorin, 2020). The qualitative data helped to understand and explain the learning experiences of participants about the flipped classroom. The qualitative data may also help to interpret the results obtained from the quantitative data (Creswell & Creswell, 2018).

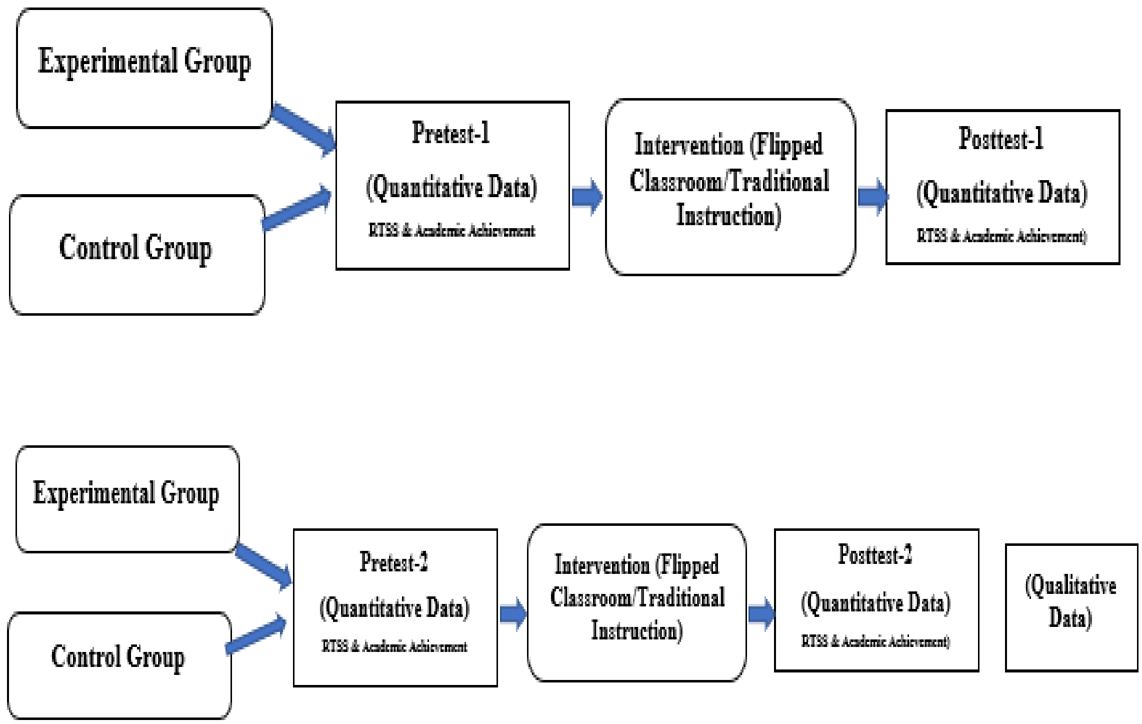


Figure 3.1 Procedure of the Study

The primary independent variable was the method of instruction i.e., traditional and Flipped Classroom Instruction (FCI). The independent variable i.e., traditional and Flipped Classroom Instruction (FCI), was manipulated whereas the primary dependent variable was reflective thinking skills of student teachers. The prospective teachers were randomly assigned to one experimental and one control group (also mentioned as study groups in chapter four) based on their previous academic achievement.

3.2 Participants of the Study

The participants selected for this study were the prospective teachers enrolled in third semester (2nd year) of BS Ed. (Hons.) program (session 2016-2020) in the teacher education institution in Islamabad, Pakistan. There were 47 prospective teachers in the class. They were allocated either to control or experimental group through lottery method. both the groups had two, two male student teachers. The high, average and low achievers was represented in the proportion (3:15:5) for experimental group, respectively whereas the ratio was (3:16:5) for control group.

3.3 Selection of Study Participants

Multi-stage selection process was used for this study. Firstly, one teacher education institute was selected for conducting the research study. The criteria used for selection of teacher training institute was based on the size of class (number of students enrolled in selected class), permission from management of institution for conducting study, availability of computer laboratory and technology facilities in the institution required for the study, access to participants of the study, selection of subject and time period to conduct experiment and setting up of timetable to get morning class for the study. The enrollment in various semesters of B.Ed. (04 year) was very low i.e., less than 20 in most of the universities of Rawalpindi and Islamabad because of new programme and uncertain future implications of four-years B.Ed. programme.

In the second stage, the programme and the class of BS Ed. (Hons.) was selected. During the permitted time period for the study, the third semester of BS Ed. (Hons.) had the largest class size among the available classes in various semesters of the mentioned programme. The class of third semester of BS Ed. (Hons.) was selected. All the prospective teachers in third semester were included in the study. There were 47 students in the selected class.

In the third stage, the class was divided into two groups of prospective teachers i.e., one group was experimental group while other one was control group. Previous academic achievement (percentage of marks in SSC+ percentage of marks in F.Sc./2) of prospective teachers was used to divide the class into two groups. Lottery method was used to allocate high, average and low achievers to the experimental and control group. Matching and random assignment of students to either control or experimental group was done for each of three levels of academic achievement (high, average and low achievers). In the first step, the average of the percentage marks of SSC and F.Sc. (percentage of marks in SSC+ percentage of marks in F.Sc./2) for each student was calculated to obtain the average academic achievement of students. In the second step, the class was divided into three groups: high achievers (71% and above), average (60-70%) and low achievers (50-59%). There were 06 students in high achiever group, 31 students in average group and 10 students in low achiever group. Three students from high achiever group were randomly assigned through lottery method to the control group and three to the experimental group. Out of 31 students in average group, 16 students were assigned to control group and 15 to experimental group through lottery method. Similar procedure was adopted for assigning students in low achiever group to control and experimental group. The detail of control and experimental group was provided in table 3.10. The process for selection of participants is shown in figure 3.2.

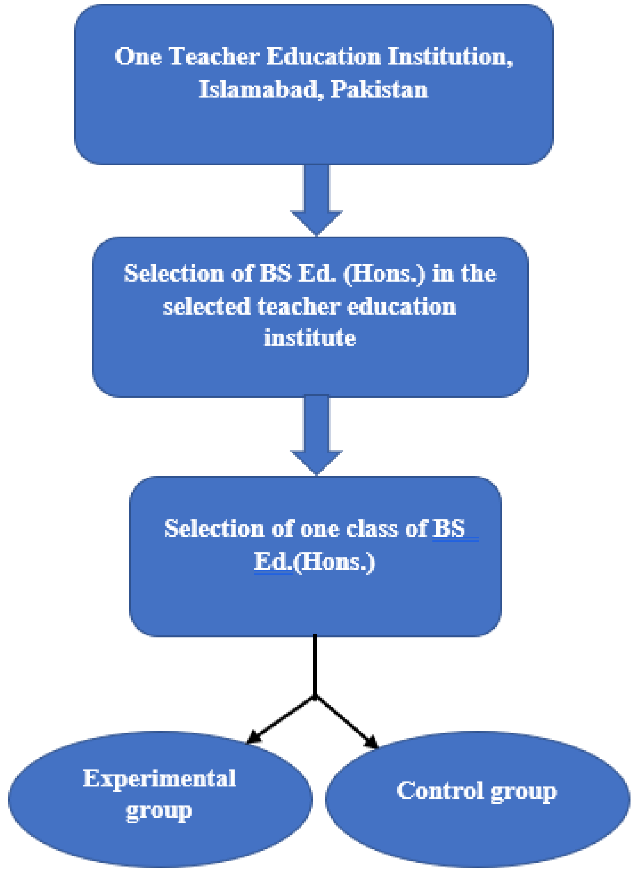


Figure 3.2 Process of Selecting the Participants of the Study

3.5 Research Instruments for the Study

The research study used following research tools for data collection:

3.5.1 Reflective Thinking Skills Scale (RTSS)

Reflective Thinking Skills Scale (RTSS), a five-point scale was used to measure reflective thinking skills of prospective teachers before and after teaching them through tradition and Flipped Classroom Instruction (FCI). Resources from literature as mentioned in chapter 02 under reflective thinking skills, were used to develop the test items. The purpose was to examine the change in responses of prospective teachers towards various reflective thinking skills due to the instructional method employed. There were five subscales of this scale: observation, communication, judgment, team-working and decision-making, as shown in table 3.1 (See appendix C for details). Each subscale has sub-constructs. There were five possible options for each statement: always, frequently, sometimes, rarely and not at all. The maximum score for this scale was 250 (55×5); the maximum score for subscales was for observation (12×5=60), communication (10×5=50), for judgment (9×5=45), for team-working (10×5=50) and for decision-making (10×5=50) (See appendix A). RTSS is provided in appendix B in the format it was presented to respondents of the study. The same instrument was used as pretest and posttest to assess the reflective thinking of prospective teachers.

Table 3.1

Constructs and Sub-constructs of Reflective Thinking Skills Scale (RTSS)

S#	Construct	Sub-construct	No. of items
1.	Observation (12 items)	1.1 Self-awareness	06
		1.2 Empathetic observation	03
		1.3 Mindfulness	03
2.	Communication (10 items)	2.1 Active listening	03
		2.2 Sharing information	03
		2.3 Knowing self and others	04
3.	Judgment (09 items)	3.1 Knowledge of experience	02
		3.2 Seeking criteria for judgment	02
		3.3 Evaluating evidence for judgment	05
4.	Teamworking (10 items)	4.1 Flexibility	02
		4.2 Collaboration	02
		4.3 Action research	06
5.	Decision-making (09 items)	5.1 Problem identification	05
		5.2 Selecting course of action	02
		5.3 Integrated thinking	02
	Total		50

3.5.2 Academic Achievement Test

Academic achievement Test, as shown in table 3.2, was developed for measuring academic achievement of prospective teachers on questions related to course content before and after teaching them through traditional and Flipped Classroom Instruction (FCI) (See appendix G for details). The test was developed from the content of the course which were taught to the participants for this research study. The purpose was to determine the change in test scores of prospective teachers due to the method of instruction employed.

Table 3.2

Marks Distribution for Each Item at Various Levels of Bloom Taxonomy

Item type → / Cognitive domain ↓	Multiple choice questions	Short answer questions		Restricted response items			Total marks
		Interpretation	Organization	Interpretation	Organization	Elaboration	
Knowing	2 items (2×1=2 Marks)	6 items (6×2=12 Marks)	6 items (6×2=12 Marks)	1 item (Q12) 03 marks	1 item (Q12) 03 marks	1 item (Q12) 03 marks	35
Understanding	2 items (2×1=2 Marks)	1 item (2 Marks)	1 item (2 Marks)	2 items (Q12+Q13) (3+3=6 Marks)	2 items (Q12+Q13) (3+3=6 Marks)	2 items (Q12+Q13) (3+3=6 Marks)	24
Applying	5 items (5×1=5 Marks)	1 item (2 Marks)	1 item (2 Marks)	2 items (Q13+Q14) (3+3=6 Marks)	2 items (Q13+Q14) (3+3=6 Marks)	2 items (Q13+Q14) (3+3=6 Marks)	27
Analyzing	0	3 items (3×2=6 Marks)	3 items (3×2=6 Marks)	2 items (Q14+Q15) (3+3=6 Marks)	2 items (Q14+Q15) (3+3=6 Marks)	2 items (Q14+Q15) (3+3=6 Marks)	30
Evaluating	0	4 items (4×2=8 Marks)	4 items (4×2=8 Marks)	1 item (Q15) 03 marks	1 item (Q15) 03 marks	1 item (Q15) 03 marks	25
Synthesizing	0	4 items (4×2=8 Marks)	4 items (4×2=8 Marks)	1 item (Q15) 03 marks	1 item (Q15) 03 marks	1 item(Q15) 03 marks	25
Total marks	9	38	38	27	27	27	166

3.5.3 Perception Scale about Flipped Classroom Instruction

After careful review of various aspects covered in literature about students' perception about FCI at post-college (above 12 years of education) level, seven-point scale for assessing the perception of prospective teachers towards Flipped Classroom Instruction (FCI) was developed, as given in table 3.3 (appendix D).

Table 3.3
Constructs and Sub-constructs of Perception Scale About Flipped Classroom Instruction (FCI)

S#	Constructs of perception scale	Sub-constructs	No. of items	Questions of focus group discussion
1	Instruction of subject concepts	1.1 Understanding subject concepts	2,3,10, 12	Questions 1, 2, 3, 11
		1.2 Lesson structure	25, 27,28	
2	Access and use of technology resources	2.1 Access to technology resources	4, 15, 20	Questions 4 & 6
		2.2 Use of technology resources	22, 29	
3	Classroom environment	3.1Learning environment	1,5, 8, 13, 30,33	Questions 9, 10 & 12
		3.2 Effort for learning	11, 19	
4	Social interaction	4.1 Access to teacher/peers	6, 16, 26	Questions 5, 7 & 8
		4.2Interactive activities	9, 14, 17, 18, 23	
5	Preference for instructional method	-	31, 34, 35, 36, 37	Questions 13 & 14

3.5.4 Focus Group Discussion

A detailed review of research studies about perception of students about FCI at post-college (after 12 years of education) level was carried out for developing questions for focus group discussion. Focus group discussion was arranged for the experimental group to collect data about the perception of their learning experiences. Focus group discussion can provide unexpected or thought-provoking responses to the original questions. It may add more variety and depth in the data (Wilkinson & Birmingham,2003) of perception of prospective teachers about Flipped Classroom Instruction (FCI). The questions of focus group discussion helped to obtain in-depth information on various constructs of perception scale about FCI (see table 3.3; for question statements see appendix E).

3.6 Validity of Research Tools

The careful consideration of relevant literature was carried out for development of research tools. The validity of research instruments i.e., academic achievement test, Reflective Thinking Skills Scale (RTSS), perception about Flipped Classroom Instruction scale and questions for focus group discussion, was determined by seeking experts' opinion (Appendix K). The minor corrections about the use of simple/understandable terms and the sentence structure were recommended, at this stage, for research instruments. The content and face validity were ensured through carefully construction of the items and experts' opinion. The opinion of experts and the research supervisor was sought for these research tools. Suggested changes were incorporated to improve the statements of the instruments. They were satisfied with the research instruments. The construct validity was determined side by side along with the reliability of the research tools. Therefore, the details of number of items deleted are mentioned in the next section.

3.7 Reliability of Research Instruments

The Cronbach's Alpha value and item-to-total correlation value were used for reliability estimates of scales. The value of Cronbach's alpha for a reliable scale is .6 or more (Hair et. al, 1998). According to George and Mallery (3002), the value of Cronbach's alpha may be interpreted as *x*>.9 =Excellent; *x* >.8 =Good; *x* > .7 = Acceptable; *x* > .6 = Questionable; *x* >.5=Poor; *x* < .5 = Unacceptable (p. 231) (Gliem & Gliem, 2003).

For construct validity of these instruments, factor analysis was carried. The reliability of these instruments was calculated by Cronbach alpha value.

The perception scale consisted of 37 statements on 7-point scale. The statements of perception scale dealt with various aspects of Flipped Classroom Instruction (FCI) (Arano-Ocuaman, 2010; Strayer, 2007). The possible options for each of 37 items were: definitely true=7; true=6; somewhat true=5; slightly true=4; somewhat untrue=3; untrue=2; definitely untrue=1. In addition, eight items related to various aspects of FCI were used to collect nominal data. The overall Cronbach alpha value was .899 for perception scale. The values for five constructs (having 37 items) of perception scale and overall scale are given below:

Table 3.4
Cronbach's Alpha Value for Sub-constructs of Perception Scale About Flipped Classroom Instruction (FCI)

S#	Constructs of perception scale	Sub-constructs	No. of items	Reliability (Cronbach alpha value)	No. of items removed for improving Cronbach's alpha value	Questions of focus group discussion (FGD)
1	Instruction of subject concepts (07 items)	Understanding subject concepts	2,3,10, 12	.720	01 item	Q1, 2, 3, 11
		Lesson structure	25, 27,28			
2	Access and use of technology resources (05 items)	Access to technology resources	4, 15, 20	.704	01 item	Q 4 & 6
		Use of technology resources	22, 29			
3	Classroom environment (08 items)	Learning environment	1,5, 8, 13, 30,33	.717	01 item	Q 9, 10 & 12
		Effort for learning	11, 19			
4	Social interaction (08 items)	Access to teacher/peers	6, 16, 26	.70	01 item	Q5, 7 & 8
		Interactive activities	9, 14, 17, 18, 23			
5	Preference for instructional method (05 items)		31, 34, 35, 36, 37	.766	0 item	Q 13 & 14

The reflective thinking skills scale (RTSS) was a five-point rating scale, self-developed by the researcher-based set of reflective thinking skills given by Dymoke and

Harrison (2008). Each item has five possible options: always, mostly, frequently, sometimes and not at all.

Table 3.5
Cronbach's Alpha Value for Sub-constructs of Reflective Thinking Skills Scale

Constructs of scale	No. of items	Reliability (Cronbach alpha value)	No. of items removed for improving Cronbach's alpha value
Observation (12 items)	1,4,5,6,7,10,11, 13,15,17, 20,23	.753	02 items (#2, #3)
Communication (10 items)	8,9,12,16,21,22, 27, 35, 40, 42	.718	01 item (#46)
Judgment (09 items)	14, 18, 24, 26, 28, 29, 30, 32, 44	.738	03 items (#36, #38, #41)
Team-working (10 items)	25, 33, 37, 39, 43, 48, 49, 50, 51, 57	.721	01 item (#52)
Decision-making (09 items)	31, 34, 45, 47, 54, 56, 59, 61, 62,	.70	05 items (#19, #53, #55, #58, #60)

3.7.1 Academic Achievement Test

In accordance with Wilson (2004, 2009 & 2018), construct map and outcome space for academic achievement test were described below in detail.

3.7.1.1 *Marking guidelines for academic achievement test*

Two types of items were used in the academic achievement test: short answer questions and restricted response items; the detail of test item type is given in table 3.6. The short answer questions at remembering, understanding and applying level were developed using course content. The short answer questions at analyzing, evaluating and synthesizing level were independent of content of the course; each item of these items involved a situation and asked the prospective teachers about their response and reason for the particular response. Each short answer question carries 03 marks for interpretation and 03 marks for organization. Each of the short answer questions was provided with a small space for a written response. There were total four restricted response items: each item dealt with two or more levels of Bloom's taxonomy. For one restricted response item, there were three criteria for marking for each respective level of taxonomy: interpretation (03 marks), organization (03 marks) and elaboration (03 marks). In this way, question 12 is dealing with two levels "knowing" and "understanding", so there were three levels of marking criteria for knowing and three for understanding level (detail is given in the section 3.3.1.4).

Table 3.6

Items at Various Levels of Bloom Taxonomy

Item type	Short answer questions		Restricted response items			Total items
Cognitive domain	Interpretation	Organization	Interpretation	Organization	Elaboration	
Knowing	6	6	1 (Q12)	1 (Q12)	1 (Q12)	17
Understanding	1	1	2 (Q12+Q13)	2 (Q12+Q13)	2 (Q12+Q13)	10
Applying	1	1	2 (Q13+Q14)	2 (Q13+Q14)	2 (Q13+Q14)	13
Analyzing	3	3	2 (Q14+Q15)	2 (Q14+Q15)	2 (Q14+Q15)	12
Evaluating	4	4	1 (Q15)	1 (Q15)	1 (Q15)	11
Synthesizing	4	4	1 (Q15)	1 (Q15)	1 (Q15)	11
Total Items	19	19	9	9	9	74

3.7.1.2 *Outcome space for open-ended questions*

Outcome space is defined as outcome categories to categorize the students' responses to a question or task. These categories are defined to study students' responses with respect to a particular question/task, but the number of qualitatively different categories are defined on the basis of students' responses. These categories are context specific, ordered (some categories for low levels and some for high levels of construct), research-based and finite (only a finite number of categories but there is a category for every response). Phenomenography was used for constructing outcome space for open ended and short question answers.

Phonomyography refers to the study of qualitatively different ways in which various phenomena and its aspects are experienced, comprehended and expressed such as in written accounts by students and put it into qualitative categories of limited number (Marton, 1986, p.31: as cited in Wilson, 2005, p.71). For this purpose, a detailed analysis of students' responses for each question was carried out to categorize them in few categories based on the construct being measured. After collecting pool of responses of all students, these responses were categorized in hierarchically ordered categories which depicted students' understanding for a particular question.

Procedure of Categorization: In order to remove bias due to researcher's involvement in the categories of description of marking criteria, it was important to state the relation of researcher with the study and member checking so that the findings of the study could be drawn with authentication from the data (Jones, Torres, Arminio, 2006; Merriam, 2002). In this research study, the researcher formulated the categories of description after reading all the responses of participants for scoring rubric. Then the scoring rubric was used to mark the responses of prospective teachers.

3.7.1.3 *Construct Map for Academic Achievement Test*

The number of items of academic achievement test, marks and their level on cognitive domain of revised Bloom's taxonomy is given in the table below. Each level was separately compared for pre- and post-test performance of students.

Table 3.7

Marks Distribution for Each Item at Various Levels of Bloom Taxonomy

Item type →	Short answer questions		Restricted response items			Total marks
Cognitive domain ↓	Interpretation	Organization	Interpretation	Organization	Elaboration	
Knowing	6 items (6×2=12 Marks)	6 items (6×2=12 Marks)	1 item (Q12) 03 marks	1 item (Q12) 03 marks	1 item (Q12) 03 marks	35
Understanding	1 item (2 Marks)	1 item (2 Marks)	2 items (Q12+Q13) (3+3=6 Marks)	2 items (Q12+Q13) (3+3=6 Marks)	2 items (Q12+Q13) (3+3=6 Marks)	24
Applying	1 item (2 Marks)	1 item (2 Marks)	2 items (Q13+Q14) (3+3=6 Marks)	2 items (Q13+Q14) (3+3=6 Marks)	2 items (Q13+Q14) (3+3=6 Marks)	27
Analyzing	3 items (3×2=6 Marks)	3 items (3×2=6 Marks)	2 items (Q14+Q15) (3+3=6 Marks)	2 items (Q14+Q15) (3+3=6 Marks)	2 items (Q14+Q15) (3+3=6 Marks)	30
Evaluating	4 items (4×2=8 Marks)	4 items (4×2=8 Marks)	1 item (Q15) 03 marks	1 item (Q15) 03 marks	1 item (Q15) 03 marks	25
Synthesizing	4 items (4×2=8 Marks)	4 items (4×2=8 Marks)	1 item (Q15) 03 marks	1 item (Q15) 03 marks	1 item(Q15) 03 marks	25
Total marks	38	38	27	27	27	166

The construct map of achievement test score for short answer questions and constructed response items inferred from Wilson (2005, p. 27 & 31) was as given below:

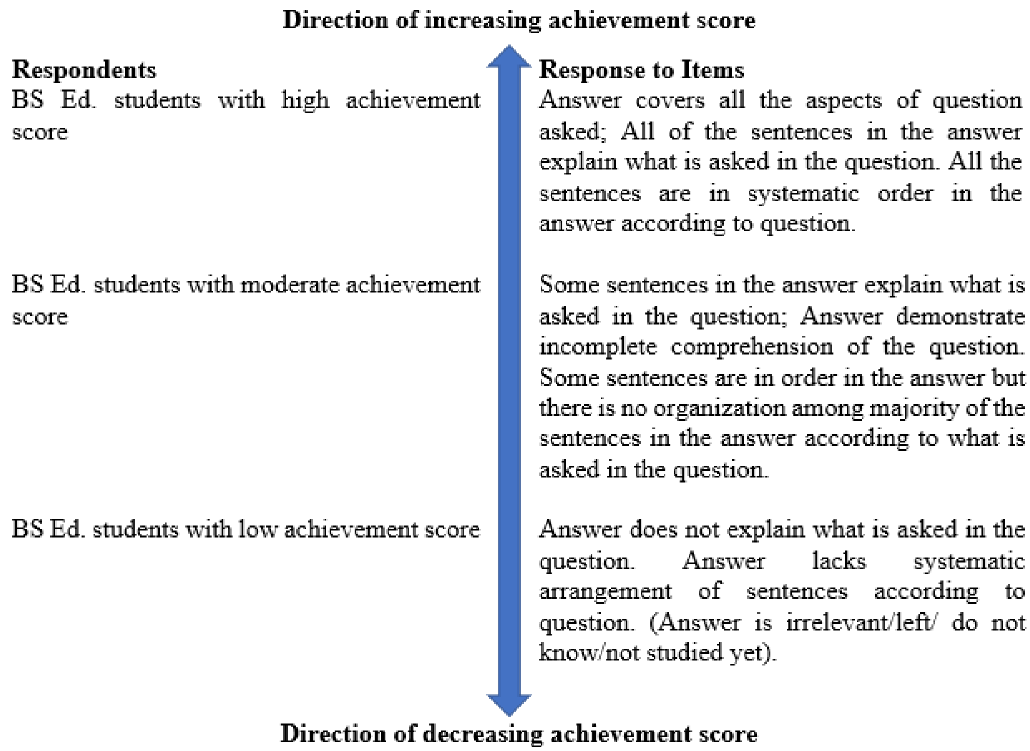


Figure 3.3 Construct map for Short Answer Question in Academic Achievment Test

Direction of increasing achievement score

Respondents	**Response to Items**
BS Ed. students with high achievement score	Answer covers all the aspects of question asked; All of the sentences in the answer explain what is asked in the question. All the sentences are in systematic order in the answer according to question. Well-written and fully elaborated answer with all required general and specific details.
BS Ed. students with moderate achievement score	Most of the sentences in the answer explain what is asked in the question. Sentences are in systematic order in the answer but organization among sentences needs to be strengthened according to question. Well written answer; most of the general and specific details required for answer are provided in it.
	Some sentences in the answer explain what is asked in the question; Answer demonstrate incomplete comprehension of the question. Some sentences are in order in the answer but there is no organization among majority of the sentences in the answer according to question. General points for answering the question are discussed; but specific details are missing from the answer.
BS Ed. students with low achievement score	Answer does not explain what is asked in the question. Answer lacks systematic arrangement of sentences according to question. Answer is with little or no specific details

Direction of decreasing achievement score

Figure 3.4 Construct map for Restricted Response Items in Academic Achievment Test

3.7.1.4 *Marking guidelines for academic achievement test*

Two type of items were used in academic achievement test: short answer questions and restricted response items. Rubrics were developed for short answer question and restricted response items. Short answer question involved two-level criteria for marking i.e., interpretation (explain the answer) and organization (systematic arrangement of sentences).

There were six situations given in achievement test which led to situation-based questions. Each question involved a situation and it asked for the response of students. Some questions had two or three sub-questions (question 01 asked for one response at synthesis level; question 02 had two sub-questions, one at synthesis and one at evaluation level; question 03 asked for one response at evaluation level; question 04 had two sub-questions, one at analysis and one at synthesis level; question 05 asked for one response involving analysis and evaluation skill; question 06 has three sub-questions, one at analysis, second at synthesis and third one at evaluation level). The purpose of these situation-based short answer questions was to understand the variations in the responses of students to a given situation. The outcome space for these questions were developed through the systematic procedure i.e., reading the responses of all students and categorize these responses in a hierarchically ordered categories depicting students' performance at a particular cognitive level. The marking criteria developed for short answer questions was used for scoring of responses for these questions; the marks for short answer questions ranged from 0 to 2 as shown in table 3.8.

Three-category criteria i.e., interpretation (explain the answer), organization (systematic arrangement of paragraphs), and elaboration (provide detail in the answer) each with four levels, were used for marking of restricted response items (the details are given in table 3.9).

Table 3.8

Marking Guidelines for Short Answer Question Items of Achievement Test

S#	Category for short answer question	Beginning (0)	Developing (1)	Accomplished (2)
1.	Interpretation (Explaining the answer)	Answer does not explain what is asked in the question (Answer is irrelevant/left/ don’t know/not studied yet)	Some sentences in the answer explain what is asked in the question; Answer demonstrate incomplete comprehension of the question.	Answer covers all the aspects of question asked; All of the sentences in the answer explain what is asked in the question.
2.	Organization (Systematically arrange paragraphs of answer)	Answer lacks systematic arrangement of sentences according to question. (Answer lacks sequence/left/don’t know/not studied yet)	Some sentences are in order in the answer but there is no organization among majority of the sentences in the answer according to what is asked in the question.	All the sentences are in systematic order in the answer according to question.

Table 3.9

Marking Guidelines for Restricted Response Items of Achievement Test

S#	Category for extended response items	Beginning (0)	Developing (1)	Accomplished (2)	Exemplary (3)
1.	Interpretation (Explaining the answer)	Answer does not explain what is asked in the question.	Some sentences in the answer explain what is asked in the question; Answer demonstrate incomplete comprehension of the question.	Most of the sentences in the answer explain what is asked in the question.	Answer covers all the aspects of question asked; All of the sentences in the answer explain what is asked in the question.
2.	Organization (Systematically arrange paragraphs of answer)	Answer lacks systematic arrangement of sentences according to question.	Some sentences are in order in the answer but there is no organization among majority of the sentences in the answer according to question.	Sentences are in systematic order in the answer but organization among sentences needs to be strengthened according to question.	All the sentences are in systematic order in the answer according to question.
3.	Elaboration (Detail in the answer)	answer with little or no specific details	General points for answering the question are discussed; but specific details are missing from the answer	Well written answer; most of the general and specific details required for answer are provided in it.	Well written and fully elaborated answer with all required general and specific details.

The intra-rater reliability of a test is not a major concern if a rater uses a rubric to mark a test (Jonsson & Svingby, 2007).

3.8 Procedure of the Study

There were 47 students in selected class of B.S. Ed. (3^{rd} semester) so, the control group had 24 student teachers whereas the experimental group had 23 student teachers. Both of the groups had high, average and low achievers. All the members of both groups had no previous experience with blended or flipped classroom instruction. The prospective teachers with various academic achievement subgroups were present in both groups as given in table 3.10.

Table 3.10

Representation of Various Academic Achievment Subgroups in Study Groups

S#	Level of academic achievement	Control group	Experimental group
1.	High achievers (71% or above)	03	03
2.	Average (60-70%)	16	15
3.	Low achievers (50-59%)	05	05
	Total	24	23

The instrument 'academic achievement test' was developed by the researcher after consulting the contents of course selected for this research study. Reflective Thinking Skills Scale (RTSS), perception about Flipped Classroom Instruction scale and questions for focus group discussion were self-developed by the researcher after consulting the related literature.

The experimental group was taught through Flipped Classroom Instruction (FCI) whereas the traditional instruction i.e., lecture method, was used to teach control group. Two teachers with equal educational qualification (i.e., MS-Education completed and Ph.D. scholar) and same range of professional experience (2-3 years) were involved to teach control and experimental group.

After the random assignment of the participants to both groups based on their previous academic record, the participants of the experimental and control group have gone through the orientation session. Orientation sessions were arranged before the start of experiment time period. The members of both groups attempted a pretest in the same environment. The pre-tests included assessing the performance on academic achievement test and reflective thinking skills of the participants. At the end of the experiment, a posttest of academic achievement and reflective thinking skills was conducted for both groups in the same environment. After the experiment period, the participants of experimental group were asked to rate their perception of learning experiences after studying in Flipped Classroom Instruction, on a seven-point scale. After attempting the scale, five focus group discussions were conducted by dividing the members of experimental group into five groups. There was one moderator for each group to get detailed qualitative data about their learning experiences of Flipped Classroom Instruction (FCI).

Both study groups, the control and experimental, were kept under same environmental conditions to meet the requirement of the experiment. The identical environmental conditions include semester (fall), time of the class, course objectives, sequence of topics, attendance requirements, teacher with same qualification and teaching experience, access to teaching services at the institution, access to teacher during office hours, same learning material, same pre- and posttests. The student teachers of control and experimental group had experienced different method of instruction i.e., traditional and Flipped Classroom Instruction (FCI). The course had requirement of one major assignment, one presentation, midterm and final term examination. The experimental and control groups successfully accomplished these requirements for the course.

3.9 Experiment

The study involved an experiment for four months (one semester). For the course selected for this research study, three classes were scheduled in two days per week. There was a one-hour class on one day (Wednesday) and two consecutive classes (double class) on the other day (Thursday) allocated for this course.

3.9.1 Experimental Group

The experimental group were taught through Flipped Classroom Instruction (FCI) method. Flipped Classroom Instruction (FCI), for this research study, involved sharing of learning material of next topic before class time and then working on classroom activity related to that topic within class time. The researcher used technology tools such as personal computer (PC), android phone, headphones, multimedia projector, speakers and internet devices used for this study. The researcher used technology applications such as Google Classroom, YouTube, WhatsApp, text messages, MS PowerPoint, MS word, Prezi Desktop, Gmail and Google Forms in this study. These technologies were selected keeping in view students experience in these technologies.

Modules for selected course 'Critical thinking and Reflective Practice' were developed for experimental group (Appendix A). Each module was divided into lessons i.e., capsules, one capsule for one class. One classroom assessment technique (CAT) in the feedback form was used in each lesson to make prospective teacher reflect on the lesson (Lucas & Tan, 2006). The lesson structure of a topic for experimental group was different from that for control group because of the method of instruction. For a topic, students of experimental group watched the recorded video/PowerPoint presentation on their android phone before class time. If they had any question or confusion, they asked about it in WhatsApp group/text message from their teacher and the teacher explained about it. When students came in the class, the teacher presented a short summary of topic in five minutes; students also asked question(s) if they had any, related to the topic of the day. After the topic summary by the teacher, a short (5-10 minutes) quiz through Google forms (Edutopia, 2014) was administered to check whether the student has clearly understood the concepts provided in video/presentation format. The short quiz helped to ensure that the students carefully watched the video/read the learning material and understood its content. The quiz consisted of multiple-choice questions (MCQs) or true/false items; as soon as the students submitted the quiz, the score was displayed on their desktop/phone screen. The quiz was auto-checked because the correct answers were stored in it at the time of developing the quiz. If the marks of quiz were below 80%, the student was provided two options: either to re-attempt the quiz or revise the concept and then attempt the quiz. The student chose one option depending upon his/her need in that situation; a few students preferred to study the material again before reattempting the quiz. Hard copy of PowerPoint presentation/notes were also provided to the student teachers besides the pages of suggested book reading for three topics.

After the video-watching phase, the class time was devoted for interactive classroom exercises. The students were involved in either interactive group (5-6 members) discussion, pair (02 members) activity or individual assignment such as a Web Search. In case of group discussion/pair activity, the group members were asked for a one-minute presentation after the activity to share the results of group activity with the teacher. In case of a group discussion, the group members recorded group discussion for submission to their teacher in private message on WhatsApp. The teacher listened to the recording of group discussion after class, provided feedback to students on it through WhatsApp private message and if required, gave the same activity to few students to master the required level. In case of an individual activity, the written responses of each student on that activity were collected and the teacher provided them feedback on their performance for that activity at the end. For a classroom activity, question(s)/topic(s) were shared with each student on paper, the students had to write short 1-2 lines answer after thinking/discussion/Web search and returned it back to the teacher.

During the classroom activity, the teacher was present and available to guide the students if they had any question or difficulty. At times, when there were no questions from students' side, the teacher was just randomly moving in class from one student/group to another for monitoring the progress of the activity. The students who finished the activity earlier, were provided feedback on their performance for that activity; then they were either asked to fill in the feedback form or guide their fellow student(s) if they needed any kind of help.

After the class time, the prospective teachers of experimental group filled a feedback form (appendix F) consisting of a reflective journal, one-minute paper and suggestion box (Haugen, 1999) for that class. The feedback form was shared with them in phone text message after the class.

The student teachers of experimental group were provided, before starting the study, 03 days training for signing up for email account and effectively using technology tools for this course. The students were taught to watch and interact with video, to take notes while attending the video and asking questions on the basis of the content of the video.

In the beginning two-weeks of the experiment, the researcher observed that the students of experimental group required considerably longer time duration to complete quiz or activity, then they gradually become used to it and consumed less time for completing a task. In the starting days of the experiment, the researcher had to send more than one reminder to participants of experimental group for feedback form (appendix F). After almost two-months, students were used to this routine then only one reminder was required to receive feedback form (reflective journal, one-minute paper and suggestion box) from them. After two months, only two to three students shared their feedback form without any reminder; rest of the students of experimental group required at least one reminder to fill the feedback form (reflective journal, one-minute paper and suggestion box).

Some problems related to internet speed, load-shedding of electricity and hardware problem of personal computers (PCs) were faced during the start of experimental study. However, this problem was tackled using various strategies. First of all, twelve internet devices (PTCL Evos) were working in the classroom. If there was signal/package issue with one or two devices, the computer or mobile phone was connected to another available device. It was noticed in the start of experiment that there was a scheduled load-shedding of half an hour in a class once a week. For that time period, some class activity such as a brainstorming session or some verbal instructions for class activity/assignment/examination/presentation were discussed with the participants of the class. When there was some issue with personal computers, the student used her android phone to access leaning material or attempt the quiz. Another solution adopted for internet/hardware problem was sharing of devices. When a student was working on a class activity after finishing quiz, then another student used the free computers to access the learning material or attempt the quiz.

In the start of the experiment, the researcher realized that it was not possible to finish all the components of a difficult topic in one-hour class; so, the remaining part of first lesson was covered in the next day class with two-hours duration and the learning material for next lesson was also shared with them. It was noticed by the researcher that the double class (two-hours duration) was most suitable to cover all the planned steps of a lesson for experimental group. Therefore, for the experiment period, the researcher scheduled the difficult topics for the double class whereas the easier or less difficult topics were scheduled for one-hour class. If there was a difficult topic, then it was divided into two or three lessons to make it implementable in one-hour and two-hour class because the researcher had to ensure the sequence and coverage of all the course topics. In this way, this four-months experimental study was completed. The control and experimental group completed the course topics in the same sequence.

3.9.2 Control Group

Control group experienced traditional method of instruction i.e., lecture method using whiteboard in the classroom with detailed notes provided for preparation of midterm/final exam. The course outline and teacher's notes were used during classroom for teaching control group. The researcher made sure that both the control and experimental group were taught same learning material for a topic; however, both groups experienced two different instructional methods for the same course content. The course had requirement of one major assignment and presentation, midterm and final term examination. Just like experimental group, the control group had successfully completed these tasks.

3.10 Independent and Dependent Variables

This study involved the method of instruction i.e., Flipped Classroom Instruction (FCI) and traditional method of instruction, as the independent variable. Dependent variables were reflective thinking skills and academic performance of the student teachers.

Table 3.11 gives a detailed account of various variables controlled and uncontrolled during the experimental study. Intervening Variables were previous academic record (high achiever/average/low achiever), availability of internet at home and possession of an android phone. The groups were made keeping in view the previous academic record of the student teachers. Both the control and experimental group had high, average and low achievers (as shown in table 3.10). Availability of internet at home and possession of android phone have not affected the study as all the participants of experimental group had android phone and mobile data at home. Due to absence of high-speed internet at home of some students, video or learning material for next class was provided to them within class. Out of twenty-three students, six students had no access to high-speed internet at their home so, they received the learning material/video of topic for upcoming class one day before within the class or through Bluetooth from their class fellows. The researcher used fourteen PTCL Evos as internet source in the class so, there was a continuous availability of internet within the classroom. If there was certain issue with one Evo in the class, the students who had successfully downloaded the video, shared it with their fellow student(s) through Bluetooth. In this way, it was ensured before leaving the class that all the students had learning material/video for next topic. All the students had mobile data activated on their android phones in their home so, they were able to communicate with their teacher and fellow students on WhatsApp group whenever they had any question or difficulty in understanding a concept.

Extraneous variables such as tiredness and fatigue were avoided by scheduling the class in the morning; both the groups had class at the same time for this research study (as shown in table 3.11).

History and maturation variables were controlled by having the control group in the study and administering the pretest and posttest twice during the experimental study. First time, the pretest was conducted at the start of experiment and the posttest was conducted at the end of two months duration of experiment. It was called first phase of the experiment; the pretest and posttest for phase-1 of experiment were referred as pretest-1 and posttest-1. After this phase 1, the students had 14 days break for this class including 09 days vacations preplanned in college official schedule. After break, the duration of study was two months i.e., phase-2 of experiment, and the students had pretest-2 and posttest-2 for this phase of the experiment. The time period for each study phase was two-months duration. In this way, the duration of whole experiment was four months. Both phases of the study had same research instruments for data collection by the shuffling the order of test items.

Table 3.11

Controlled and Uncontrollable Variables During the Experiment

S#	Controlled variables	Uncontrolled variables
1	Tiredness of students & teachers (morning period was arranged for both groups)	Gender (there were two, two males in both groups; girls in control group were 22 and their number was 21 in experimental group) because we had enrollment ratios in this proportion.
2	Time variations for class (both groups had class at the same time by two different teachers)	Students' previous educational background
3	Teachers' Qualification (Both teachers were Ph.D. scholar)	Personality characteristics of teachers & students
4	Teachers' professional Experience (Both teachers had 2-3 years professional experience of teaching)	Family history of students
5	Learning material (same learning material was provided to both group; only teaching method was different)	Educational background of students' parents

6	Previous knowledge of subject 'Critical Thinking & Reflective Practices' (pretest & posttest were administered, and test statistics were used to analyze posttest results keeping in view the pretest results of the prospective teachers)	Interest in subject
7	Previous Academic Record (Students were included in experimental & control group on the basis of sustained academic achievement; average of percentage of marks in SSC and Intermediate were used to divide equal no. of high, average & low achiever students in experimental and control groups)	Social (Home/hostel) environment of student
8	Age group/maturity of students/teachers (Students were of same age group & teachers were also of same age group)	Learning Experiences in other courses
9	Language of instruction (bilingual- mix of English & Urdu language) instruction in class for both groups; however, students of both groups attempted test/assignment/presentation in English because English was the medium of instruction for BS Ed. (04 year) degree programme	IQ of Students
10	Time consuming for learning a concept (all the topics were taught in same order however, a few topics took more time in experiment and a few took more time in control group)	Effort by students for learning
11	Classroom environment (research study time period was in winter season, so the facility of temperature maintenance was there in both classrooms)	One model of FCI (videorecording & showing it to students, later on, for reflection) was not used

12	Internet/PC problems (few students lived in hostel did not have high speed internet and PC facility, but all students of experimental group had android phone and free WhatsApp facility; so, the researcher provided the video/presentation of next topic within classroom so they can download it in their phones; communication for out-of-class announcements and assistance, free "WhatsApp group" and phone text messages were used.)

3.11 Internal and External Validity Threats to Experiment

The major threats to internal validity of this experimental study (Cresswell & Cresswell, 2018; Gay, 1997) and the way these threats were dealt in this study, were described below.

3.11.1 History

History refers to the events which are happening outside the experiment and affect the outcomes the experiment in addition to independent variable. The control group was used in this study to control this threat.

3.11.2 Maturation

The participants of the study may mature or change during the study. This maturity may affect their performance on dependent variable in addition to the treatment. Therefore, the participants from same age group were taken to control this threat.

3.11.3 Mortality

Mortality occurs when the participants drop out from the experiment. During this study, no participants dropped out from the study. In this way, this study did not face this threat.

3.11.4 Diffusion of Treatment (Cross Contamination of Groups)

When the future teachers of both study groups communicate with other, this type of diffusion occurs. For this purpose, a number of strategies were used. First of all, both the group had notes for each topic with the same detailed learning material. Secondly, the researcher briefed the members of control and experimental group multiple times before and during the study about the importance of not communicating about the course taught for this study. As the participants, first time ever, participated in an experimental study, so they were also motivated and concerned about following the provided instructions. However, the researcher does not claim about complete absence of this threat in the study.

3.11.5 Compensatory/Resentful Demoralization

Resentful demoralization occurs when only experimental group receives the treatment. It was ensured during this study that control group are instructed in a traditional way but not deprived of any assistance or learning opportunity for keeping them motivated for learning. The teacher gave the participants of control group one assignment, midterm, one presentation, oral quiz and final term examination. The teacher of control group guided and challenged them for learning.

3.11.6 Compensatory Rivalry: Sometimes, the participants of control group in an experimental study consider themselves as devalued. So, to control this threat, the researcher briefed the participants of both groups about the objective of this research study and importance of their role in it. Additionally, the researcher ensured to maintain a natural classroom environment for control group so that they do not feel devalued. They were given class tasks and learning material just as they received it in other classes.

3.11.7 Testing: Testing occurs as a threat when the participants of the study become familiar with the tool used for dependent variable and remembers responses for responding when tested after the experiment. To control this threat, there was two months gap between pretest and posttest during first and second study phases. There was 14 days break between posttest-1 and pretest-2. The researcher also changed the sequence of the items for every administration in order to make participants of the study to read it carefully every time.

3.11.8 Instrumentation: When different instruments are used for pretest and posttest measurement of dependent variable, it may affect the performance of participants of the study on the instrument. To control this threat, same instruments after shuffling the items was used for pretest and posttest.

3.11.9 Differential Selection of Subjects: There were high, average and low achievers in the class involved in this experimental study. To control differential selection of subjects, the control and experimental groups both had equal number of high and low achievers; there were 15 average student teachers in the experimental group and 16 average student teachers in the control group.

The external validity threats for this experimental study and the way these threats were dealt, are given below.

3.11.10 To control interaction of selection and treatment threat, interaction of setting and treatment, and interaction of history and treatment, the generalizability implications of this study were provided in chapter 05.

3.11.11 Multiple Treatments Interference: The participants were first time ever involved in an experimental study, so there was no carry over effect of multiple treatment threat.

3.11.12 Reactive arrangements: For Hawthorne, John Henry, placebo and novelty effect, the environmental conditions for control and experimental group were kept as similar as possible. There was temperature maintenance for both classrooms and the same learning material was provided to participants of both groups. Additionally, there was four months involved in this study so already sufficient time period was provided to minimize the effect of novelty and special effort on the part of participants of experimental group.

3.12 Data Collection

A major part of the data was collected by the researcher. Before data collection, the researcher provided the instructions to members of control and experimental group for attempting research tools. The participants of both groups attempted pretests and posttests in the same environment. The pretests and posttests were an achievement test for selected course and one scale for reflective thinking skills. There was a seven-point scale for measuring perception of experimental group about their learning experiences of "Flipped Classroom instruction (FCI)".

All the research tools were administered at different times to minimize cognitive load on students. For this purpose, academic achievement test was administered in the first period, the participants took almost 35 minutes to complete it. Then they had 15 minutes break. After break, they attempted scale for reflective thinking skills. They finished it in almost 35 minutes.

The focus group discussion and scale for assessing perception of experimental group about their learning experiences of "Flipped Classroom instruction (FCI)" was arranged for data collection on the next day. There were total five groups of participants for focus group discussion (four groups with five participants in each group and one group with three participants; total number of participants were 23). The average duration of focus group discussion was 32 minutes. One group was moderated by the researcher. The researcher involved four research assistants having M.Phil. degree qualification, each for moderating rest of the four focus group discussions (FGD). The tape recordings and memos were used for collecting the data during focus group discussion. After FGD, the participants had a refreshment break of 15 minutes then they attempted perception scale about "Flipped Classroom instruction (FCI)".

3.13 Data Analysis

The quantitative data analysis included mean, standard deviation, percentage, independent sample t-test, paired sample t-test, Mann-Whitney U-test, Wilcoxon signed-rank test, Kruskal-Wallis test and repeated measures of Analysis of Variance (ANOVA).

The data from focus group discussions were tape-recorded, transcribed and analyzed by coding.

Phenomenology served as a guide for dealing with qualitative data. Phenomenology, a method of qualitative inquiry, describes the lived experiences of participants about a phenomenon. This description reflects the essence of lived experiences of several individuals who have lived through that phenomenon (Creswell & Creswell, 2018). The data of focus group discussion were used to add more in-depth description to the quantitative data obtained through 7-point scale from participants of experimental group. For analyzing the data from focus groups, constant comparison analysis (Strauss & Corbin, 1998: as cited as Leech & Onwuegbuzie, 2008) was used. It consisted of three stages: open coding (attaching description to smaller chunks of data), axial coding (grouping the codes into categories on the basis of similarity of information involved in) and selective coding (creating a theory out of data by integrating and refining the information in the codes for generating themes). Each focus group discussion was audio-taped with the consent of participants; memos recorded by the moderator were also used in the data analysis. The analysis of focus group discussion was done in Urdu language for each group in the first step. Then the group wise analysis was combined to find themes and subthemes for the qualitative data. After separately analyzing the qualitative and quantitative data about learning experiences of prospective teachers with flipped classroom instruction, the data results were integrated keeping in view the constructs of the instrument: instruction of subject concepts, access and use of technology resources, classroom environment, social interaction and preference for instructional method.

CHAPTER 04

ANALYSIS AND INTERPRETATION OF DATA

This research study involved four data collection tools for achieving the research objectives. It included reflective thinking skills scale (RTSS), academic achievement test, perception scale about Flipped Classroom Instruction (FCI) and focus group discussion on learning experiences of prospective teachers related to Flipped Classroom Instruction (FCI). The response on reflective thinking skills scale and academic achievement scale were taken from control and experimental group. However, perception scale about Flipped Classroom Instruction (FCI) and focus group discussion on learning experiences related to Flipped Classroom Instruction (FCI) involved all participants of experimental group. This chapter presented the analysis of all the four research tools in the order mentioned below.

4.1 Reflective thinking skills scale (RTSS)

4.2 Academic achievement test

4.3 Perception scale about Flipped Classroom Instruction (FCI)

4.4 Focus group discussion on learning experiences related to Flipped Classroom Instruction (FCI)

4.1 Analysis of Reflective Thinking Skills Scale (RTSS)

There were five constructs in Reflective Thinking Skills Scale (RTSS) (Dymoke & Harrison, 2008): observation, communication, judgment, team-working and decision-making. There were three sub-constructs for each of the five constructs.

There were twelve items in observation construct (sub-scale), ten items in communication construct (sub-scale), nine items in judgment construct (sub-scale), ten items in team-working construct (sub-scale) and nine items in decision-making construct (sub-scale). The analyses of responses of control and experimental group on constructs and sub-constructs of reflective thinking skills scale (RTSS) were performed separately and given in the section ahead.

4.1.1 Descriptive Statistical Analysis of Data for Reflective Thinking Skills Scale (RTSS)

4.1.1.1 *Comparison of Pretest-Posttest Scores of Control and Experimental Group on Overall Reflective Thinking Skills Scale (RTSS)*

First item in Reflective Thinking Skills Scale (RTSS) was the tools used by participants of control and experimental group for recording information about their surroundings. The pretest and posttest scores of experimental and control group for information recording tools is provided table 4.1.

Table 4.1

Pretest-1 Frequency of use of Various Tools by Participants for Obtaining Information About Their Surroundings

S#	Tools	Control group		Experimental group		%age difference
		N	%age (N)	N	%age (N)	(Cntrl-Exp)[6]
1.	SIM[1]	22	91.6	21	91.3	0.3
2.	WD[2]	15	62.5	11	47.8	14.7
3.	TP[3]	19	79.2	15	65.2	14
4.	MAR[4]	5	20.8	3	13	7.8
5	RSV[5]	5	20.8	3	13	7.8

[1]SIM= Save in Memory; [2]WD= Write it in the dairy; [3]TP= Take its photograph; [4]MAR= Make an audio recording; [5]RSV= Record short video; [6](Cntrl-Exp)=(Control-experimental)

Table 4.1 showed the pretest frequency of use of various tools for collecting information about surroundings by the student teachers of control and experimental group. In the pretest, the control group had a higher score than experimental group for the various tools for information. The largest difference in terms of percentage between both groups was for 'write it in the dairy' and 'take its photograph' as shown in table 4.1. In the second place, there was a difference of 7.8% for use of 'make an audio recording' and 'record short video' with high score for members of control group as compared to those of experimental group. For 'save in memory', the percentage score of use of this tool was only 0.3% high for control group as compared to experimental group.

Table 4.2

Posttest-2 Frequency of use of Various Tools by Participants for Obtaining Information About Surroundings

S#	Tools	Control group		Experimental group		%age difference
		N	%age (n)	N	%age (n)	(Cntrl-Exp)[6]
1.	SIM[1]	21	87.5	16	69.6	17.9
2.	WD[2]	10	41.7	9	39.1	2.6
3.	TP[3]	14	58.3	10	43.5	14.8
4.	MAR[4]	6	25	5	21.7	3.3
5	RSV[5]	4	16.7	4	17.4	-0.7

[1]SIM= Save in Memory; [2]WD= Write it in the dairy; [3]TP= Take its photograph; [4]MAR= Make an audio recording; [5]RSV= Record short video; (Cntrl-Exp)[6]=(Control-experimental)

Table 4.2 showed the posttest-2 frequency result of control and experimental group for use of various tools for obtaining information about their surroundings. The control-experimental group difference was greater for posttest-2 score as compared to pretest-1 score for 'save in memory'; the members of experimental group tend to rely more on some diary, audio or video recording as compared to 'save in memory' in posttest-2. The experimental group improved its use (in percentage) for 'write it in diary' in posttest-2 so, the control-experimental group difference was less for this tool in posttest-2 as compared to pretest-1. For 'take its photograph', the difference between members of experimental and control group was same in posttest-2 as it was in pretest-1. However, there was a decrease in the use of this tool in posttest-2 for both groups; the possible reason behind it may be that the photograph, sometimes, may not give a complete context and sufficient details of an event. The difference between control and experimental group was lesser for posttest-2 score as compared to pretest-1 score for 'make an audio recording'; the experimental group improved its frequency of use of audio recording in posttest-2 more than control group when compared to its pretest-1. The control and experimental group difference for 'record short video' was least in posttest-2 when compared to other tools; the experimental group improved its percentage of use of video recording in posttest-2 as compared to its pretest-1 frequency of use.

Table 4.3
Descriptive Analysis for Responses of Control & Experimental Group on Pretest-1 and Posttest-1 for Overall RTSS

S#	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
		Mean	[1]SD	Mean	[1]SD	
1.	Pretest-1	204.25	10.36	196.65	14.67	7.6
2.	Posttest-1	199.96	19.16	192.22	20.42	7.74

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.3 showed the pretest-1 and posttest-1 score of control and experimental group. The pretest-1 mean score of control and control group on Reflective Thinking Skills Scale (RTSS) were different by 7.6 points. However, for posttest-1, the control and experimental group scores were different by 7.74 points. The mean scores of experimental and control group decreased in posttest-1 as compared to their pretest-1 scores. This decrease in scores may be due to the reason that the selected course titled 'Critical Thinking and Reflective Practices' was a new course for them and they have never attended a course like this so, it was a difficult course for them. The informal communication with the participants of this study also helped to find this reason.

Table 4.4
Descriptive Analysis for Responses of Control & Experimental Group on Pretest-2 and Posttest-2 for Overall RTSS

S#	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
		Mean	[1]SD	Mean	[1]SD	
1.	Pretest-2	196.33	20.65	189.74	24.68	6.59
2.	Posttest-2	202.25	14.84	203.78	15.34	-1.53

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp) = Mean Difference (Control-experimental)

Table 4.4 showed the pretest-2 and posttest-2 mean scores of control and experimental group for Reflective Thinking Skills Scale (RTSS). The pretest-2 mean score of experimental group was lower than that of control group by 6.59 points. The posttest-2 mean score of experimental group was higher than that of control group by 1.53 points.

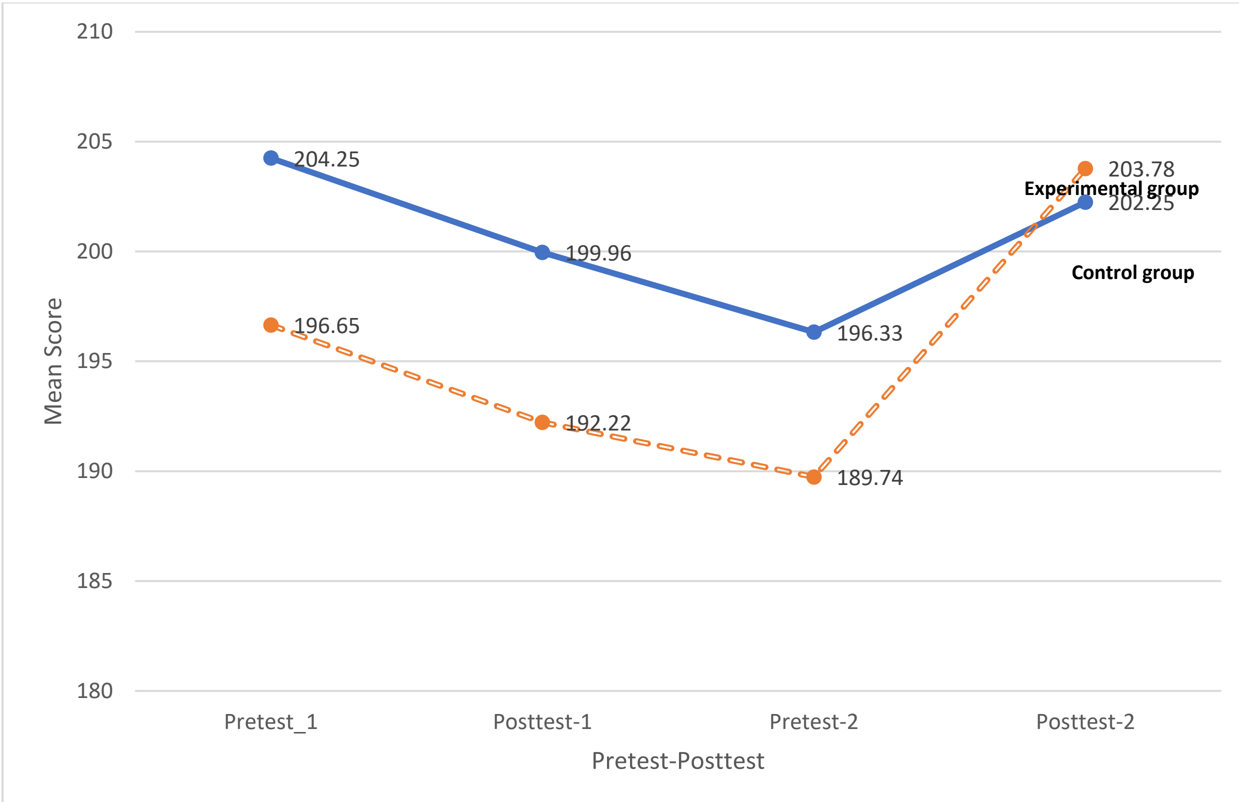


Figure 4.1 Comparison of Pretests and Posttests Ratings of Experimental and Control Group on Reflective Thinking Skills Scale (RTSS)

4.1.1.2 Comparison of Pretest-Posttest Scores of Control and Experimental Group on Five Subscales of RTSS

Table 4.5

Descriptive Analysis for Responses of Study Groups on Pretest-1 & Posttest-1 for Sub-scales of RTSS

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Observation	Pretest-1	48.42	5.67	47.74	5.29	0.68
		Posttest-1	46.29	5.38	46.48	5.55	-0.19
2.	Communication	Pretest-1	42.88	3.23	41.17	3.54	1.71
		Posttest-1	42	5.01	40.52	5.21	1.48
3.	Judgment	Pretest-1	35.58	2.65	33.87	4.54	-0.29
		Posttest-1	35	4.63	33.52	4.71	1.48
4.	Team-working	Pretest-1	39.96	3.13	38.78	4.17	1.18
		Posttest-1	40.17	4.30	37.39	5.16	2.78
5.	Decision-making	Pretest-1	37.42	3.49	35.09	4.56	2.33
		Posttest-1	36.5	3.79	34.30	4.93	2.2

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.5 showed the comparison of mean score for pretest-1 and posttest-1 of experimental and control group on five sub-scales of Reflective Thinking Skills Scale (RTSS). For pretest-1 mean score on observation sub-scale, the control group scored higher than experimental group by 0.68 points. For posttest-1 mean score on observation sub-scale, the experimental group scored higher than control group by 0.19 points. A graphical representation of pretests and posttests data of experimental and control group on observation sub-scale is displayed in figure 4.2.

As shown in table 4.5, for pretest-1 mean score on communication sub-scale, the control group scored higher than experimental group by 1.71 points whereas for posttest-1 mean score, the difference between experimental and control group lowered by 1.48 points with the high mean score for control group. The pattern of scores on pretests and posttests of control and experimental group for communication sub-scale is shown in figure 4.3.

As shown in table 4.5, for pretest-1 mean score on judgment sub-scale, the control group scored lower than experimental group by 0.29 points whereas the posttest-1 mean score of experimental group was lower than control group by 1.48 points. Figure 4.4 showed the trend of change in pretest-1 and posttest-1score of both groups on judgment sub-scale for.

As shown in table 4.5, for pretest-1 mean score on team-working sub-scale, the control group scored higher by 1.18 points than experimental group whereas for posttest-2 mean score, the control group scored higher than experimental group by 2.78 points. A graphical representation of pre- and posttest scores of both groups on team-working scale is shown in figure 4.5.

As shown in table 4.5, for pretest-1 mean score on decision-making subscale, the control group scored higher than experimental group by 2.33 points; the control group had higher posttest-1 mean scores by 2.2 points than experimental group. A graphical representation of mean score of both groups on decision-making sub-scale for two phases of the study is shown in figure 4.5.

Table 4.6
Descriptive Analysis for Responses of Study Groups on Pretest-2 and Posttest-2 for Sub-scales of RTSS

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Observation	Pretest-2	46.20	5.09	45.35	7.19	0.85
		Posttest-2	49.04	4.35	49.78	4.08	-0.74
2.	Communication	Pretest-2	41.17	4.94	39.69	5.51	1.48
		Posttest-2	42.04	4.85	41.69	3.71	0.35
3.	Judgment	Pretest-2	35	4.19	33.56	4.81	1.44
		Posttest-2	35.83	3.34	35.91	4.37	-0.08
4.	Team-working	Pretest-2	38.67	5.31	37.48	5.95	1.19
		Posttest-2	39.75	3.47	40.35	3.72	-0.6
5.	Decision-making	Pretest-2	35.29	4.61	33.65	5.56	1.64
		Posttest-2	35.58	3.67	36.04	3.57	-0.46

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.6 showed the mean scores for pretest-2 and posttest-2 of control and experimental groups on five sub-scales of Reflective Thinking Skills Scale (RTSS). For pretest-2 mean scores on observation sub-scale, the control group scored higher than experimental group by 0.85 points. For pottest-2 mean score on observation sub-scale, the experimental group scored higher by 0.74 points than control group. A graphical representation of pretests and posttests data of both groups on observation sub-scale is displayed in figure 4.2.

As shown in table 4.6, for pretest-2 mean score on communication sub-scale, the control group earned higher than that experimental group by 1.48 points whereas the control group had higher posttest-2 mean score than experimental group by 0.35 points.

The pattern of pretests and posttests' mean scores of both groups on communication sub-scale is shown in figure 4.3.

As shown in table 4.6, for pretest-2 mean score on judgment sub-scale, the control group scored higher than experimental group by 1.44 points whereas the posttest-2 mean score of experimental group was higher than that of control group by 0.08 points. Figure 4.4 showed the trend of mean scores of control and experimental group on judgment sub-scale for pretest-1 and posttest-1.

As shown in table 4.6, for pretest-2 mean scores on team-working sub-scale, the control group scored higher than experimental group by 1.19 points whereas the experimental had higher posttest-2 mean score than control group by 0.6 points. A graphical representation of change in mean scores of both groups on team-working scale is shown in figure 4.5.

As shown in table 4.6, the control group scored higher than experimental group by 1.64 points for pretest-1 mean scores on decision-making sub-scale; the posttest-1 mean scores of experimental and control group differed by 0.46 points with higher mean score of experimental group. A graphical representation of mean scores of both groups on decision-making sub-scale for two phases of the study is shown in figure 4.6.

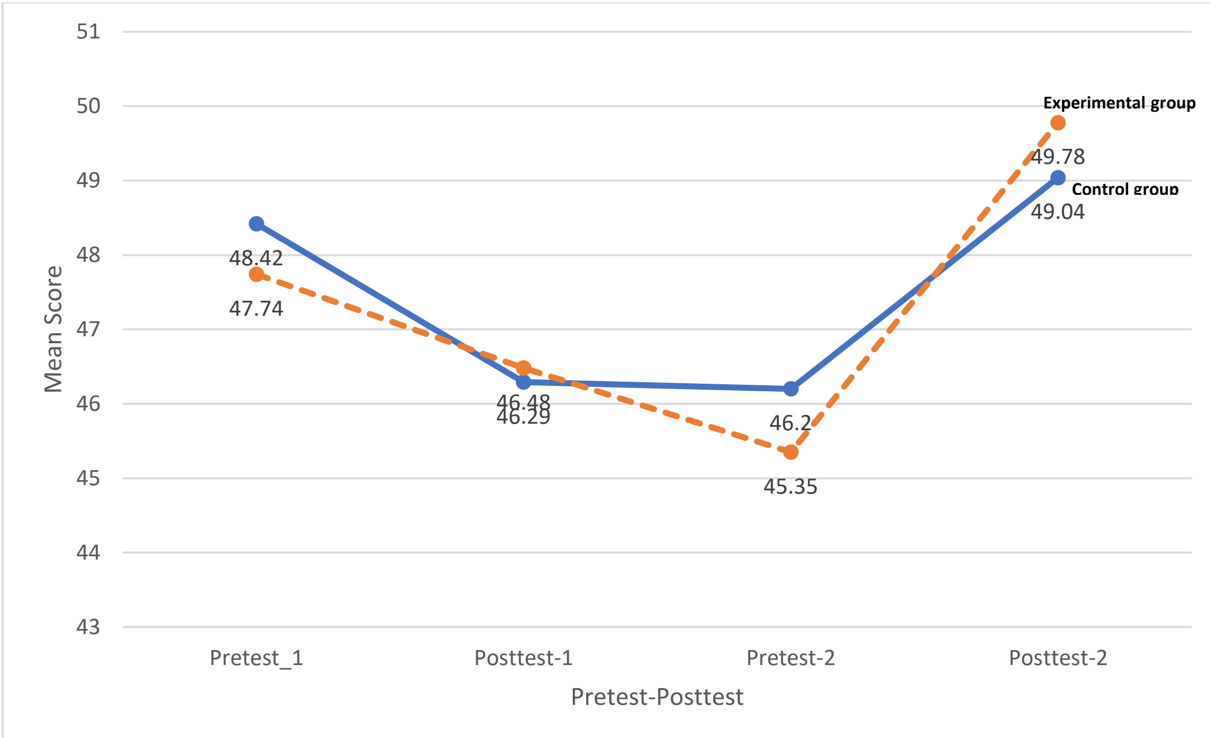


Figure 4.2 Mean Scores of Study Scores Groups for Observation (Construct of RTSS)

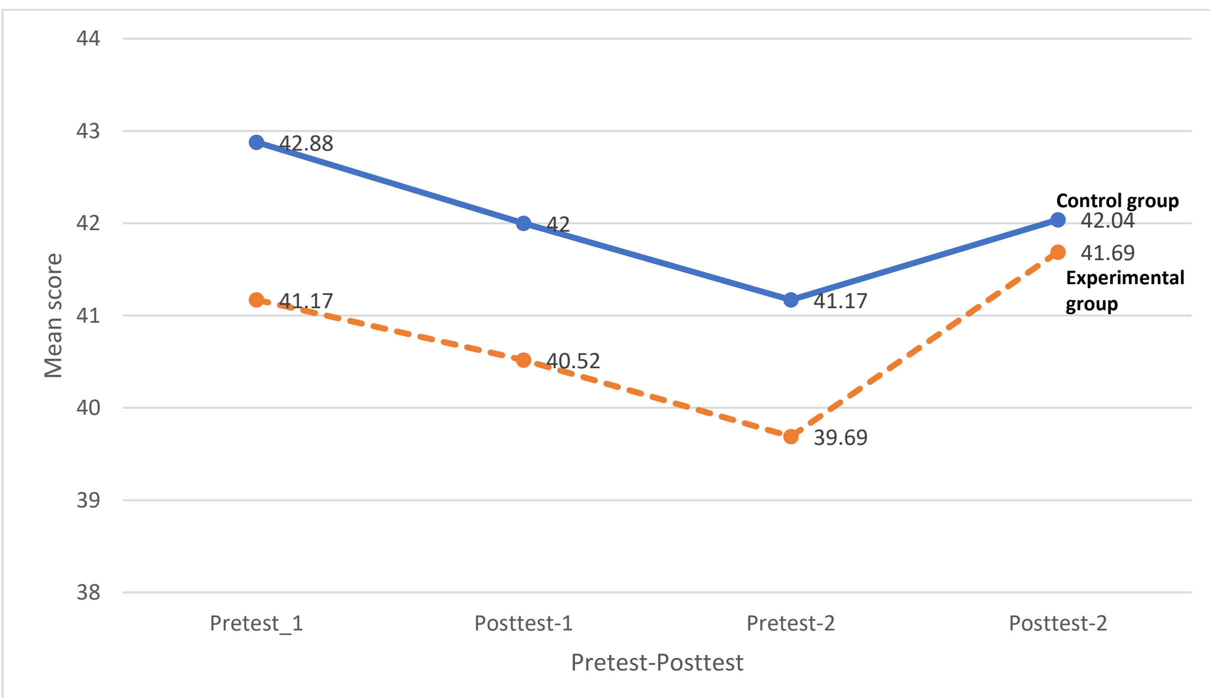


Figure 4.3 Mean Scores of Study Groups for Communication (Construct of RTSS)

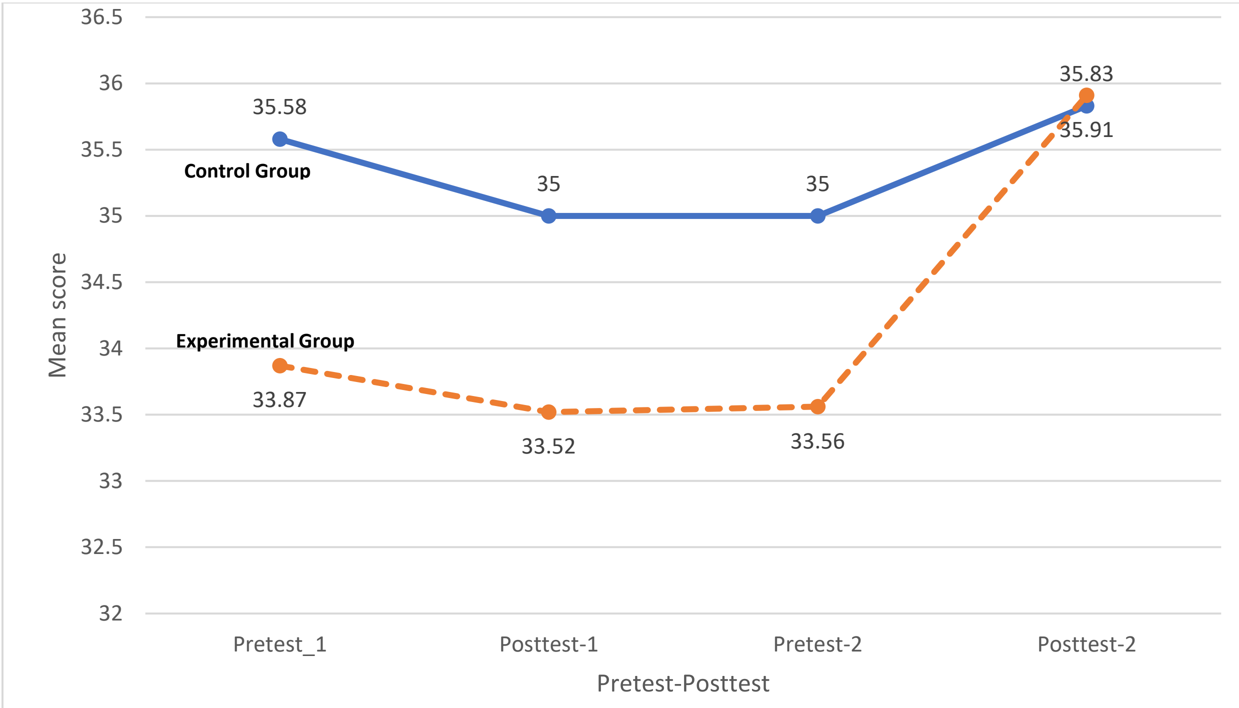


Figure 4.4 Mean Scores of Study Groups for Judgment (Construct of RTSS)

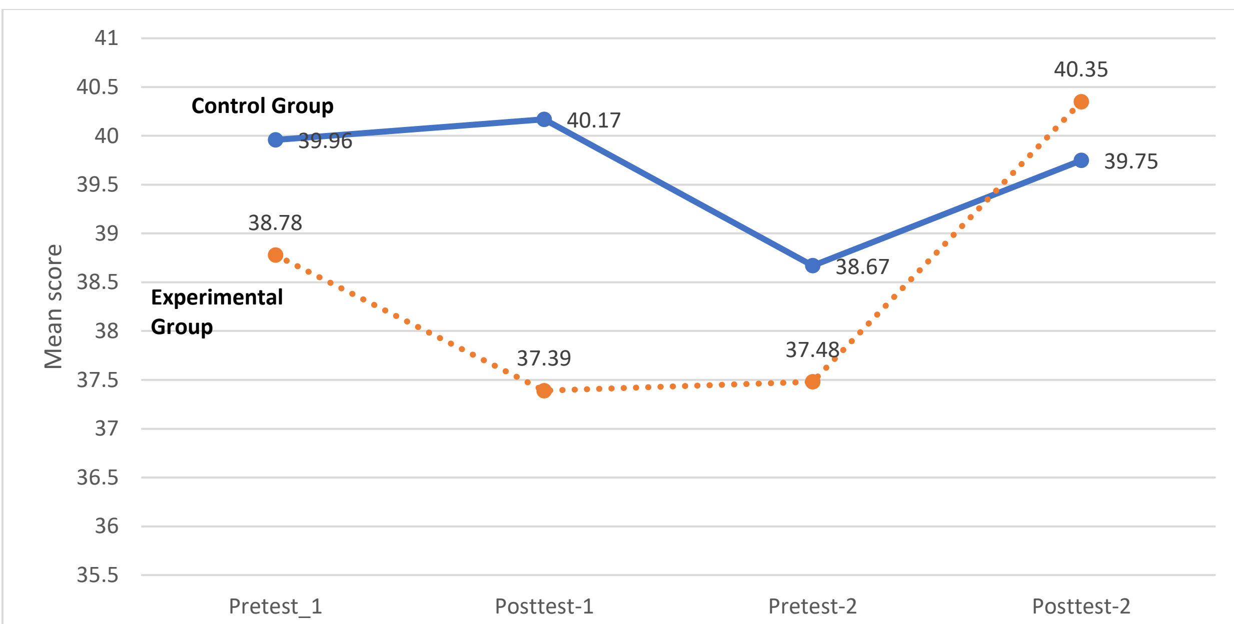


Figure 4.5 Mean Scores of Study Groups for Team-working (Construct of RTSS)

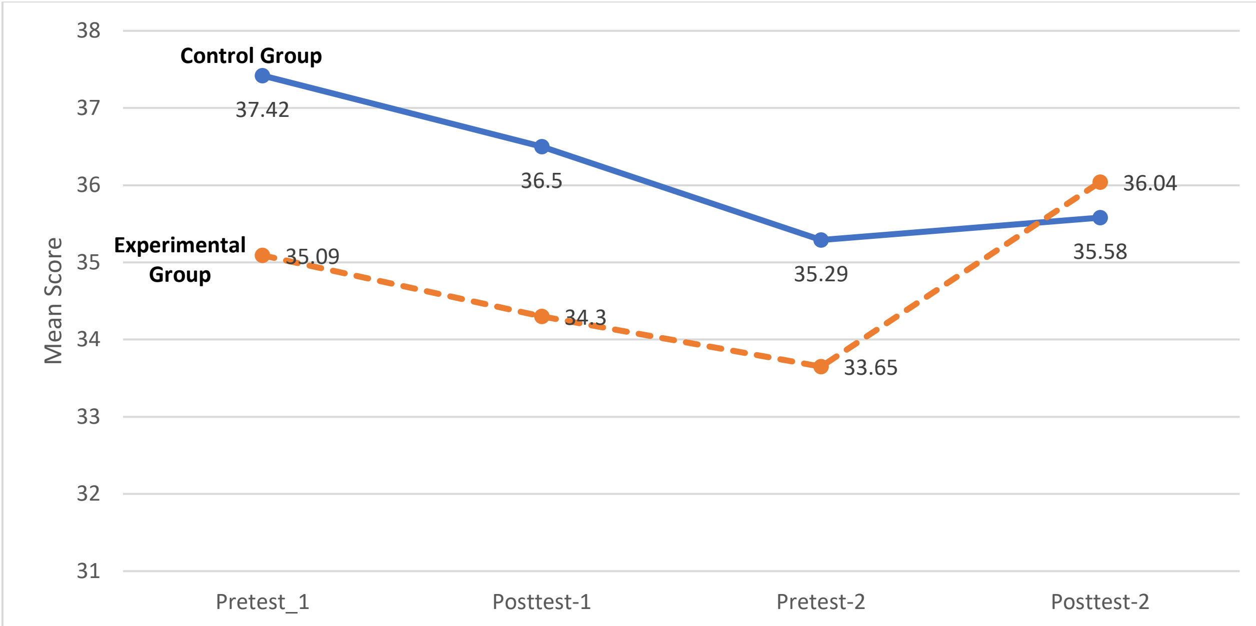


Figure 4.6 Mean Scores of Study Groups for Decision-making (Construct of RTSS)

4.1.1.3 Comparison of Pretest-Posttest Scores of Control and Experimental Group on Subconstructs of each of Five Subscales of Reflective Thinking Skills Scale (RTSS)

Table 4.7

Descriptive Analysis of Pretest-1 & Posttest-1 Scores of Study Groups for Sub-constructs of Observation Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Self-awareness	Pretest-1	24.79	2.86	24.26	2.94	0.53
		Posttest-1	23.50	3.36	23.56	3.55	-0.06
2.	Empathetic observation	Pretest-1	11.42	1.58	11.00	2.26	0.42
		Posttest-1	10.50	1.69	10.65	1.69	-0.15
3.	Mindfulness	Pretest-1	12.20	2.45	12.48	1.90	-0.28
		Posttest-1	12.29	1.68	12.26	2.43	0.03

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.7 showed the difference in mean scores for pretest-1 and posttest-1 of control and experimental groups on sub-constructs of observation subscale of Reflective

Thinking Skills Scale (RTSS). For self-awareness sub-construct, the control group had higher pretest-1 mean scores than experimental group by 0.53 points. For posttest-1 mean score on self-awareness sub-construct, the experimental group score higher than control group by 0.06 points.

As shown in table 4.7, for pretest-1 mean score on empathetic observation sub-construct, the control group scored higher than experimental group by 0.42 points whereas the experimental group had higher posttest-1 mean score than control group by 0.15 points. For mindfulness sub-construct, the control group earned lower pretest-1 mean scores than experimental group by 0.28 points. For posttest-1 mean score on mindfulness sub-construct, the score of experimental group was lower by 0.03 than control group.

Table 4.8

Descriptive Analysis of Pretest-2 & Posttest-2 Mean Scores of Study Groups on Sub-constructs of Observation Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Self-awareness	Pretest-2	23.29	3.15	22.39	3.20	0.9
		Posttest-2	24.50	2.93	24.87	2.44	-0.37
2.	Empathetic observation	Pretest-2	11.08	1.50	11.35	2.69	-0.27
		Posttest-2	11.96	1.27	12.22	1.28	-0.26
3.	Mindfulness	Pretest-2	11.83	1.80	11.60	2.54	0.23
		Posttest-2	12.58	1.77	12.69	1.58	-0.11

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.8 showed the difference in mean scores for pretest-2 and posttest-2 of study groups on sub-constructs of observation subscale of Reflective Thinking Skills Scale (RTSS). For pretest-2 mean scores on self-awareness sub-construct, the control group scored higher than experimental group by 0.9 points. For posttest-1 mean score on self-awareness sub-construct, the experimental group scored higher than control group by 0.37 points.

As given in table 4.8, for pretest-2 mean score on empathetic observation sub-construct, the experimental group scored higher than control group by 0.27 points whereas the experimental group had higher posttest-2 mean score than control group by 0.26 points. For pretest-2 mean scores on 'mindfulness' sub-construct, the control group scored higher than experimental group by 0.23 points. For posttest-2 mean score on mindfulness sub-construct, the experimental group scored higher by 0.11 points than control group.

Table 4.9
Descriptive Analysis of Pretest-1 & Posttest-1 Mean Scores of Study Groups on Sub-constructs of Communication Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Sharing information	Pretest-1	13.04	2.18	11.91	2.35	1.13
		Posttest-1	12.46	2.22	12.30	2.03	0.16
2.	Active listening	Pretest-1	12.29	1.43	11.87	1.74	0.42
		Posttest-1	12.29	2.48	12.26	2.16	0.03
3.	Knowing self & others	Pretest-1	17.54	1.72	17.39	1.88	0.15
		Posttest-1	17.25	1.39	15.96	2.88	1.29

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.9 showed the comparison of mean scores of control and experimental groups on pretest-1 and posttest-1 for sub-constructs of communication subscale of Reflective Thinking Skills Scale (RTSS). For pretest-1 mean scores on 'sharing information' sub-construct, the control group scored higher than experimental group by 1.13 points. For posttest-1 mean score on 'sharing information' sub-construct, the control group scored higher than experimental group by 0.16 points.

As shown in table 4.9, for pretest-1 mean score on 'active listening' sub-construct, the control group scored higher than experimental group by 0.42 points whereas the control group had higher posttest-1 mean score than experimental group by 0.03 points. For pretest-1 mean scores on 'knowing self and others' sub-construct, the control group scored higher than experimental group by 0.15 points. For posttest-1 mean score on 'knowing self and others' sub-construct, the score of experimental group was lower by 1.29 points than control group.

Table 4.10
Descriptive Analysis of Pretest-2 & Posttest-2 Mean Scores of Study Groups on Sub-constructs of Communication Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Sharing information	Pretest-2	12.46	1.98	11.78	1.88	0.68
		Posttest-2	12.62	1.79	12.48	1.88	0.14
2.	Active listening	Pretest-2	12.12	2.13	11.87	1.98	0.25
		Posttest-2	12.58	2.12	12	1.68	0.58
3.	Knowing self & others	Pretest-2	16.58	1.74	16.04	2.88	0.54
		Posttest-2	16.83	2.47	17.22	1.78	-0.39

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.10 showed the comparison of mean scores for pretest-2 and posttest-2 of control and experimental groups on sub-constructs of communication subscale of Reflective Thinking Skills Scale (RTSS). For pretest-2 mean score on 'sharing information' sub-construct, the control group scored higher than that experimental group by 0.68 points. For posttest-2 mean score on 'sharing information' sub-construct, the control group scored higher than experimental group by 0.14 points.

As shown in table 4.10, for pretest-2 mean score on 'active listening' sub-construct, the control group scored higher than experimental group by 0.25 points whereas the control group had higher posttest-2 mean score than experimental group by 0.58 points. For pretest-2 mean scores on 'knowing self and others' sub-construct, the control group scored higher than experimental group by 0.54 points. For posttest-2 mean score on 'knowing self and others' sub-construct, the experimental group scored higher by 0.39 points than control group.

Table 4.11
Descriptive Analysis of Pretest-1 & Posttest-1 Mean Scores of Study Groups on Sub-constructs of Judgment Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Knowledge of experience	Pretest-1	7.79	1.38	8.13	1.25	-0.34
		Posttest-1	7.67	1.52	7.43	1.59	0.24
2.	Criteria for judgment	Pretest-1	7.42	1.25	6.56	1.72	0.86
		Posttest-1	7.54	1.47	6.74	1.86	0.8
3.	Evaluating evidence for judgment	Pretest-1	20.38	2.24	19.17	2.89	1.21
		Posttest-1	19.79	3.18	19.35	2.62	0.44

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.11 showed the difference in mean scores for pretest-1 and posttest-1 of control and experimental groups on sub-constructs of judgment subscale of Reflective Thinking Skills Scale (RTSS). For pretest-1 mean scores on 'knowledge of experience' sub-construct, the control group scored lower than experimental group by 0.34 points. For posttest-1 mean score on 'knowledge of experience' sub-construct, the control group scored higher than experimental group by 0.24 points.

As shown in table 4.11, for pretest-1 mean score on 'criteria for judgment' sub-construct, the control group scored higher than experimental group by 0.86 points whereas the control group scored higher for posttest-1 mean score than experimental group by 0.8

points. For pretest-1 mean scores on 'evaluating evidence for judgment' sub-construct, the control group scored higher than experimental group by 1.21 points. For posttest-1 mean score on 'evaluating evidence for judgment' sub-construct, the score of experimental group was lower by 0.44 points than control group.

Table 4.12
Descriptive Analysis of Pretest-2 & Posttest-2 Mean Scores of Study Groups on Sub-constructs of Judgment Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Knowledge of experience	Pretest-2	7.50	1.47	7.09	1.31	0.41
		Posttest-2	7.96	1.33	7.91	1.47	0.05
2.	Criteria for judgment	Pretest-2	7.88	1.15	7.52	1.47	0.36
		Posttest-2	7.79	1.28	7.96	1.46	-0.17
3.	Evaluating evidence for judgment	Pretest-2	19.62	2.55	18.96	2.84	0.66
		Posttest-2	20.08	2.46	20.04	3	0.04

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.12 showed the difference in mean scores for pretest-2 and posttest-2 of control and experimental groups on sub-constructs of judgment subscale of Reflective Thinking Skills Scale (RTSS). For pretest-2 mean scores on 'knowledge of experience' sub-construct, the control group scored higher than experimental group by 0.41 points. For posttest-2 mean score on 'knowledge of experience' sub-construct, the control group scored higher than experimental group by 0.05 points.

As shown in table 4.12, for pretest-2 mean score on 'criteria for judgment' sub-construct, the control group scored higher than experimental group by 0.36 points whereas for posttest-2 mean score, the experimental group scored higher than control group by 0.17 points. For pretest-2 mean scores on 'evaluating evidence for judgment' sub-construct, the control group scored higher than experimental group by 0.66 points. For posttest-2 mean score on 'evaluating evidence for judgment' sub-construct, the control group scored higher by 0.04 points than experimental group.

Table 4.13
Descriptive Analysis of Pretest-1 & Posttest-1 Scores of Study Groups on Sub-constructs of Team-working Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Flexibility	Pretest-1	8.12	.95	7.87	1.36	0.25
		Posttest-1	7.58	1.50	7.65	1.55	-0.07
2.	Collaboration	Pretest-1	8.04	1.85	7.52	1.27	0.52
		Posttest-1	7.62	1.40	7.30	1.87	0.32
3.	Action research	Pretest-1	23.79	2.47	23.39	3.22	0.4
		Posttest-1	24.96	2.46	22.43	3.55	2.53

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.13 showed the difference in mean scores for pretest-1 and posttest-1 of control and experimental groups on sub-constructs of team-working subscale of Reflective Thinking Skills Scale (RTSS). For pretest-1 mean score on 'flexibility' sub-construct, the control group scored higher than experimental group by 0.25 points. For posttest-1 mean score on 'flexibility' sub-construct, the control group scored lower than experimental group by 0.07 points.

As shown in table 4.13, for pretest-1 mean score on 'collaboration' sub-construct, the control group was higher by 0.52 points than experimental group whereas for posttest-1 mean score, the control group scored higher by 0.32 points than experimental group. For 'action research' sub-construct, the pretest-1 mean score of control group was higher than that of experimental group by 0.4 points. For posttest-1 mean score on 'action research' sub-construct, the score of experimental group was lower by 2.53 points than control group.

Table 4.14

Descriptive Analysis of Pretest-2 & Posttest-2 Scores of Study Groups on Sub-constructs of Team-working Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Flexibility	Pretest-2	7.75	1.22	7.22	2.09	0.53
		Posttest-2	8.00	1.06	8.00	1.20	0
2.	Collaboration	Pretest-2	7.62	1.79	7.52	1.65	0.1
		Posttest-2	8.25	1.36	7.91	1.31	0.34
3.	Action research	Pretest-2	23.29	3.43	22.74	3.82	0.55
		Posttest-2	23.50	2.36	24.43	2.78	-0.93

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.14 showed the difference in mean scores for pretest-2 and posttest-2 of control and experimental groups on sub-constructs of team-working subscale of Reflective Thinking Skills Scale (RTSS). For pretest-2 mean score on 'flexibility' sub-construct, the control group scored higher than experimental group by 0.53 points. The difference for posttest-2 mean score on 'flexibility' sub-construct was zero between the study groups.

As shown in table 4.14, for pretest-2 mean score on 'collaboration' sub-construct, the control group scored higher than experimental group by 0.1 points whereas for, the control group earned higher posttest-1 mean score by 0.34 than experimental group. For pretest-2 mean score on 'action research' sub-construct, the control group scored higher than experimental group by 0.55 points. For posttest-2 mean score 'action research' sub-construct, the experimental group scored higher by 0.93 points than control group.

Table 4.15
Descriptive Analysis of Pretest-1 & Posttest-1 Scores of Study Groups on Sub-constructs of Decision-making Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Problem identification	Pretest-1	21.12	2.36	19.52	2.79	1.6
		Posttest-1	20.79	2.20	19.26	2.75	1.53
2.	Selecting course of action	Pretest-1	8.83	1.24	8.35	1.37	0.48
		Posttest-1	8.38	1.28	7.96	1.66	0.42
3.	Integrated thinking	Pretest-1	7.46	1.61	7.22	1.65	0.24
		Posttest-1	7.33	1.52	7.09	1.83	0.24

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.15 showed the difference in mean scores for pretest-1 and posttest-1 of study groups on sub-constructs of decision-making subscale of Reflective Thinking Skills Scale (RTSS). For pretest-1 mean score on 'problem identification' sub-construct, the control group scored higher than experimental group by 1.6 points. For posttest-1 mean score on 'problem identification' sub-construct, the control group scored higher than experimental group by 1.53 points.

As shown in table 4.15, for pretest-1 mean score on 'selecting course of action' sub-construct, the control group scored higher than experimental group by 0.48 points whereas for, the control group earned higher posttest-1 mean score by 0.42 points than experimental group. For pretest-1 mean score on 'integrated thinking' sub-construct, the control group scored higher than experimental group by 0.24 points. For posttest-1 mean score on 'integrated thinking' sub-construct, the control group scored higher than experimental group by 0.24 points.

Table 4.16
Descriptive Analysis of Pretest-2 & Posttest-2 Scores of Study Groups on Sub-constructs of Decision-making Subscale of Reflective Thinking Skills Scale (RTSS)

S#	Subscale	Group	Control group		Experimental group		[2]MD(Cntrl-Exp)
			Mean	[1]SD	Mean	[1]SD	
1.	Problem identification	Pretest-2	19.88	2.60	18.87	3.36	1.01
		Posttest-2	19.70	2.53	19.83	2.35	-0.13
2.	Selecting course of action	Pretest-2	8.20	1.38	7.74	1.81	0.46
		Posttest-2	8.42	1.25	8.52	1.27	-0.1
3.	Integrated thinking	Pretest-2	7.20	1.38	7.04	1.74	0.16
		Posttest-2	7.46	1.10	7.69	1.36	-0.23

[1]SD= Standard Deviation; [2]MD(Cntrl-Exp)=Mean Difference(Control-experimental)

Table 4.16 showed the difference in mean scores for pretest-2 and posttest-2 of study groups on sub-constructs of decision-making subscale of Reflective Thinking Skills Scale (RTSS). For pretest-2 mean score on 'problem identification' sub-construct, the control group scored higher than experimental group by 1.01 points. For posttest-2 mean score on 'problem identification' sub-construct, the control group scored lower than experimental group by 0.13 points.

As shown in table 4.16, for pretest-2 mean score on 'selecting course of action' sub-construct, the control group scored higher than experimental group by 0.46 points whereas the experimental group scored higher on posttest-2 than control group by 0.1 points. For pretest-2 mean score on 'integrated thinking' sub-construct, the control group scored higher than experimental group by 0.16 points. For posttest-2 mean score on 'integrated thinking' sub-construct, the experimental group scored higher than that of control group by 0.23 points.

4.1.1.4 Comparison of Pretests and Posttests' scores of Academic Achievement Levels of Control and Experimental Groups on RTSS

Table 4.17
Descriptive Analysis of Pretest and Posttest Mean Scores of Academic Achievement Subgroups of Control Group on Five Subscales of RTSS

S#	Subscale	Achievement group	N	Pr-1		Po-1		Pr-2		Po-2		Po2-Pr1
				Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1.	[1]Obs	Low achiever	5	50	4.47	44.80	4.82	45.20	4.02	48.60	4.72	-1.4
		Average	16	47.75	6.08	46	5.77	46.31	5.47	48.56	4.44	0.81
		High achiever	3	49.33	6.43	50.33	2.52	47.33	6.11	52.33	2.52	3
2.	[2]Com	Low achiever	5	42	2	40.40	5.86	43.60	4.16	41.40	3.13	0.6
		Average	16	42.88	3.59	41.88	5.11	40.38	5.28	41.38	5.29	-1.5
		High achiever	3	44.33	3.21	45.33	1.15	41.33	4.16	46.67	2.08	2.34
3.	[3]Jud	Low achiever	5	34.40	2.97	36.20	2.59	36.60	3.29	35.40	2.88	1
		Average	16	35.56	2.39	33.62	4.62	34.12	4.33	35.12	3	-0.44
		High achiever	3	37.67	3.21	40.33	3.51	37	4.58	40.33	3.05	2.66
4.	[4]TW	Low achiever	5	39.80	4.20	39.20	3.96	38	1.22	39.80	2.05	0
		Average	16	39.81	3.01	39.38	3.93	38.25	5.49	39.19	3.76	-0.62
		High achiever	3	41	2.64	46	2.64	42	8.72	42.67	2.89	1.67
5.	[5]DM	Low achiever	5	37.80	4.97	35.80	2.49	35.80	2.77	34.60	3.36	-3.2
		Average	16	36.94	3.32	36	4.02	34.31	4.44	35.19	3.74	-1.75
		High achiever	3	39.33	.58	40.33	2.52	39.67	6.66	39.33	1.53	0

[1]Obs=Observation;[2]Com=Communication;[3]Jud= Judgment;[4]TW=Team-working;[5]DM=Decision-making; SD=Standard Deviation; SD=Standard Deviation; Pr1=Pretest-1; Po1=Postttest-1; Pr2=Pretest-2; Po2=Postttest-2

Table 4.17 showed the pretest and posttest mean scores and standard deviation for first and second phase of the study for high, average and low achievers of control group. While looking at the difference of posttest and pretest percentage mean score for three academic achievement group, the high achiever group scored higher on posttest-2 mean score (Obs=52.33; Com=46.67; Jud=40.33; TW=42.67) as compared to its pretest-1 mean scores (Obs=49.33; Com=44.33; Jud=37.67; TW=41) on four subscales. The high achiever group did not make any change in mean scores for decision-making subscale for pretst-1 (DM= DM=39.33) and posttest-2 (DM= DM=39.33).

While looking at scores of average and low achievers for observation sub-scale, it was observed that average group improved its posstest-2 mean score by 0.81 points as compared to its pretest-1 mean score whereas the low achievers group dropped its posstest-2 mean score by 1.4 points as compared to its pretest-1 mean score. On communication sub-scale, the posttest-2 mean score of average group decreased by 1.5 points as compared to its pretest-1 mean score whereas the posttest-2 mean score of low achiever group improved by 0.6 points as compared to its pretest-1 mean score. On judgment sub-scale, the posttest-2 response of low achiever group improved by 1 point as compared to its pretest-1 mean score whereas there was a decrease in posttest-2 mean response of average group by 0.44 points as compared to its pretest-1 mean score. On team-working subscale, the posttest-2 mean response of average group decreased by 0.62 points as compared to its mean pretest-1 response while pretest-1 and posttest-2 mean scores of low achiever group did not show any change. On decision-making sub-scale, the posttest-2 response of low achiever group dropped by 3.2 points as compared to its pretest score whereas there was a decrease of 1.75 points in posttest-2 mean score of average group as compared to its pretest-1 mean score. By comparing the three groups, the high achiever group improved posttest-2 mean score more than the other two groups.

Table 4.18

Descriptive Analysis of Pretest and Posttest Scores of Academic Achievement Subgroups of Experimental Group on Five Subscales of RTSS

S#	Subscale	Achievement group	N	Pr-1		Po-1		Pr-2		Po-2		Po2-Pr1
				Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1.	[1]Obs	Low achiever	5	45.80	3.56	50	1.58	41.20	11.34	50.60	4.34	4.8
		Average	15	49.40	4.80	45.60	6.06	46.67	5.60	50.20	4.06	0.8
		High achiever	3	42.67	7.23	45	6.08	45.67	6.02	46.33	3.05	3.66
2.	[2]Com	Low achiever	5	41	3.94	41.20	5.07	35	3.32	42.60	3.20	1.6
		Average	15	41.40	3.22	39.80	5.53	41.20	5.84	42.27	3.61	0.87
		High achiever	3	40.33	5.69	43	4.36	40	1	37.33	2.52	-3
3.	[3]Jud	Low achiever	5	33.60	6.39	33	5.38	31.20	6.46	37.60	4.45	4
		Average	15	33.73	4.22	33.13	4.42	33.87	4.14	35.53	4.69	1.8
		High achiever	3	35	4.36	36.33	6.03	36	5.29	35	2.64	0
4.	[4]TW	Low achiever	5	36.80	2.39	39.80	3.11	34.80	5.93	41.40	3.36	4.6
		Average	15	39.60	4.07	36.47	5.34	38.13	6.34	40.60	3.92	1
		High achiever	3	38	6.93	38	7.21	38.67	3.78	37.33	2.30	-0.67
5.	[5]DM	Low achiever	5	35.20	5.49	39.60	3.78	30.80	8.23	35.60	5.08	0.4
		Average	15	35	4.87	32.33	3.66	34.27	4.82	36.40	3.48	1.4
		High achiever	3	35.33	1.53	35.33	6.66	35.33	3.79	35	1	-0.33

[1]Obs=Observation;[2]Com=Communication;[3]Jud= Judgment;[4]TW=Team-working;[5]DM=Decision-making; SD=Standard Deviation; Pr1=Pretest-1; Po1=Postttest-1; Pr2=Pretest-2; Po2=Postttest-2

Table 4.18 showed the pretest and posttest mean scores and standard deviation of low, average and high achievers of experimental group during first and second phase of the study on five subscales of reflective thinking skills scale (RTSS). By the comparing the pretest-1 and posttest-2 mean scores of low achievers on five reflective thinking skills, it was noticed that low achievers showed highest percentage of improvement on observation, communication, judgment and team-working subscales as compared to pretest1-posttest2 response difference for average and high achievers' groups. On decision-making subscale, the average group showed an increase of 1.4 points in posttest-2 mean score as compared to its pretest-1 mean score; it is the highest improvement for decision-making subscale as compared to academic achievement subgroups. By comparing mean scores of three subgroups on five subscales, the high achievers improved on observation subscale more after low achievers' group; for rest of the four subscales, the mean score improvement of average group was high after low achievement group. The low achievers' subgroup showed highest improvement in mean scores as compared to other groups for observation, communication, judgment and team-working subscales. For decision-making subscale, the low achievers' group showed high improvement in posstest-2 mean score after average group.

4.1.2 Inferential Statistical Analysis of Data for Reflective Thinking Skills Scale (RTSS)

4.1.2.1 *Comparison of Pretest and Posttest Performance of Experimental & Control Group on Reflective Thinking Skills Scale (RTSS): Hypotheses Testing*

H_o1 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

Table 4.19

Pairwise Analysis of Pretest-1 & Posttest-1 Mean Scores of Experimental Group & Control Group on RTSS (1st Phase of the Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	196.65	14.67	15.15	10		-.411	.681
Posttest-1 (experimental group)	23	192.22	20.42	9.58		13		
Pretest-1 (control group)	24	204.25	10.36	13.18	14		-.986	.324
Posttest -1 (control group)	24	199.96	19.16	11.55		10		

Wilcoxon signed-rank test in table 4.19 indicated no statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group (z= -.411; p=.681) on Reflective thinking Skills Scale (RTSS) during first phase of the study although there was a decrease in the mean score of posttest-1 as compared to pretest-1 score. Table 4.19 showed no statistically significant difference between pretest-1 and posttest-1 mean scores of control group (z=-.986, p=.324) on Reflective thinking Skills Scale (RTSS) during first phase of the study. For experimental group, 10 participants improved their RTSS score whereas 13 participants did not show increase in score during first phase of the study. For control group, 14 participants showed an improvement in RTSS score and 10 participants did not show any increase in RTSS score, during first phase of the study. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "Ho1 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study".

H_o2 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers of experimental group for gap period between two phases of the study.

Table 4.20
Pairwise Analysis of Posttest-1 & Pretest-2 Mean Scores of Experimental Group & Control Group on RTSS (gap Between Phases of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Posttest-1 (experimental group)	23	192.22	20.42	11.60	*10		-.017	.986
Pretest-2 (experimental group)	23	189.74	24.68	10.45		11		
Posttest-1 (control group)	24	199.96	19.16	13.91	**11		-.457	.648
Pretest-2 (control group)	24	196.33	20.65	10.25		12		

*There were 2 ties. **There was 1 ties.

As shown in table 4.20, Wilcoxon signed-rank test indicated statistically no significant difference between posstest-1 and pretest-2 mean scores of experimental group (z=-.017, p=.986) on Reflective thinking Skills Scale (RTSS). There was a statistically non-significant difference between posttest-1 and pretest-2 mean scores of control group (z=-.457, p=.648) on Reflective thinking Skills Scale (RTSS) for the gap period between two phases of the study, as given in table 4.20. For experimental group, 10 participants improved their RTSS score whereas 11 participants did not show increase in score during gap between first and second phase of the study. For control group, 11 participants showed an improvement in RTSS score and 12 participants did not show any increase in RTSS score, during gap period between first and second phase of the study. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers of experimental group for the gap period between first and second phase of the study".

H_o3 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

Table 4.21

Pairwise Analysis of Pretest-2 & Posttest-2 Mean Scores of Experimental Group & Control Group on RTSS (2nd Phase of the Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-2 (experimental group)	23	189.74	24.68	8.79	7		-2.327	.020
Posttest-2 (experimental group)	23	203.78	15.34	13.41		16		
Pretest-2 (control group)	24	196.33	20.65	10.30	10		-1.343	.179
Posttest -2 (control group)	24	202.25	14.84	14.07		14		

Table 4.21 showed a statistically significant difference between pretest-2 and posttest-2 mean scores of experimental group (z=-2.327, p=.020) on Reflective thinking Skills Scale (RTSS) with the higher mean score of posttest-2 (mean score= 203.78) for second phase of the study. There was statistically no significant difference between pretest-2 and posttest-2 mean scores of control group (z=-1.343, p=.179) on Reflective thinking Skills Scale (RTSS) as indicated by output of Wilcoxon signed-rank test in table 4.21. For

experimental group, 07 participants improved their RTSS score whereas 16 participants did not show increase in score during second phase of the study. For control group, 10 participants showed an improvement in RTSS score and 14 participants did not show any increase in RTSS score, during second phase of the study. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study".

H_o4 There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

Table 4.22
Pairwise Analysis of Pretest-1 & Posttest-2 Mean Scores of Experimental Group & Control Group on RTSS (Whole Study Duration)

Pretest score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	196.65	14.67	9.43	7		-2.191	.028
Posttest-2 (experimental group)	23	203.78	15.34	13.13		16		
Pretest-1 (control group)	24	204.25	10.36	13	*11		-.152	.879
Posttest -2 (control group)	24	202.25	14.84	11.08		12		

*There was 1 ties.

The output of Wilcoxon signed-rank test in table 4.22 showed a statistically significant difference between pretest-1 and posttest-2 mean scores of experimental group (z=-2.191, p=.028) on Reflective thinking Skills Scale (RTSS) with the higher mean score of posttest-2 (mean score= 203.78) for whole study duration. There was statistically no significant difference between pretest-1 and posttest-2 mean scores of control group (z=-.152, p=.879) on Reflective thinking Skills Scale (RTSS) as given in table 4.22. For experimental group, 07 participants improved their RTSS score whereas 16 participants did not show increase in score for the whole research study. For control group, 11 participants showed an improvement in RTSS score and 12 participants did not show any increase in RTSS score for the whole research study. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration".

H_o5 There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

Table 4.23

Pairwise Analysis of Pretest-1 & Posttest-1 Performance of Experimental Group on Observation Subscale of Reflective Thinking Skills Scale (RTSS) (1st Phase of the Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	47.74	5.29	13.05	11*		-.553	.580
Posttest-1 (experimental group)	23	46.48	5.55	9.95		11		
Pretest-1 (control group)	24	48.42	5.67	12.12	17		-1.602	.109
Posttest -1 (control group)	24	46.29	5.38	13.43		7		

*There were 1 ties.

In table 4.23, the output of Wilcoxon signed-ranked test showed no statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group ($z=-.553$, $p=.580$) on observation subscale of RTSS. There was statistically no significant difference between pretest-1 and posttest-1 mean scores of control group ($z=-1.602$, $p=.109$) on observation subscale of RTSS, as indicated in table 4.23. For experimental group, 11 participants improved their RTSS score whereas 11 participants did not show increase in score on observation subscale. For control group, 17 participants showed an improvement in RTSS score and 7 participants did not show any increase in RTSS score, on observation subscale. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study".

H_o6 There was statistically no significant difference between mean scores on observation subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

Table 4.24

Pairwise Analysis of Posttest-1 & Pretest-2 Performance of Experimental Group on Observation Subscale of Reflective Thinking Skills Scale (RTSS) (gap Between Phases of Study)

Pre-test Score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Posttest-1 (experimental group)	23	46.48	5.55	11.19	*8		-.175	.861
Pretest-2 (experimental group)	23	45.35	7.19	8.15		10		
Postttest-1 (control group)	24	46.29	5.38	12.25	**8		-.262	.793
Pretest -2 (control Group)	24	46.21	5.09	9.33		12		

*There were 5 ties. **There were 4 ties.

The output of Wilcoxon signed-ranked test, as given in table 4.24, showed statistically no significant difference between posttest-1 and pretest-2 mean scores of experimental group (z=-.175, p=.861) on observation subscale of RTSS during gap period of the two phases of the study. There was statistically no significant difference between posttest-1 and pretest-2 mean scores of control group (z=-.262, p=.793) on observation subscale of RTSS during gap period of the two phases of the study, as given in table 4.24. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on observation subscale of prospective teachers of experimental group for the gap period between first and second phase of the study".

H_o7 There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

Table 4.25

Pairwise Analysis of Pretest-2 & Posttest-2 Performance of Experimental Group on Observation Subscale of Reflective Thinking Skills Scale (RTSS) (2nd Phase of the Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-2 (experimental group)	23	45.35	7.19	7.31	8		-2.422	.015
Posttest-2 (experimental group)	23	49.78	4.08	14.50		15		
Pretest-2 (control group)	24	46.21	5.09	9.21	*7		-2.015	.044
Posttest-2 (control group)	24	49.04	4.35	12.57		15		

*There were 2 ties.

Table 4.25 showed statistically significant difference between pretest-2 and posttest-2 mean scores of experimental group (z=-2.422, p=.015) on observation subscale of RTSS with higher mean score on posttest-2 (mean score=49.78) for second phase of the study. Wilcoxon signed-rank test indicated statistically significant difference between pretest-2 and posttest-2 mean scores of control group (z=-2.015, p=.044) on observation subscale of RTSS with higher mean score on posttest-2 (mean score=49.04) for second phase of the study, as shown in table 4.25. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study".

H_o8 There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

Table 4.26
Pairwise Analysis of Pretest-1 & Posttest-2 Performance of Experimental Group on Observation Subscale of Reflective Thinking Skills Scale (RTSS) (Whole Study Duration)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	47.74	5.29	9.39	9		-1.632	.103
Posttest-2 (experimental group)	23	49.78	4.08	13.68		14		
Pretest-1 (control group)	24	48.42	5.67	11.85	*10		-.594	.552
Posttest-2 (control group)	24	49.04	4.35	12.12		13		

*There was 1 ties.

Wilcoxon signed-rank test in table 4.26 showed no statistically significant difference between pretest-1 and posttest-2 mean scores of experimental group (z=-1.632, p=.103) on observation subscale of RTSS during whole duration of the study. There was statistically no significant difference between pretest-1 and posttest-2 mean score of control group (z=-.594, p=.552) on observation subscale of RTSS during whole duration of the study, as shown in table 4.26. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration".

H_o9 There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

Table 4.27

Pairwise Analysis of Pretest-1 & Posttest-1 Performance of Experimental Group & Control Group on Communication Subscale of RTSS (First Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asym p. sig.
Pretest-1 (experimental group)	23	41.17	3.54	10.92	*12		-.541	.589
Posttest-1 (experimental group)	23	40.52	5.21	11.11		9		
Pretest-1 (control group)	24	42.88	3.23	14.29	12		-.618	.537
Posttest -1 (control group)	24	42	5.01	10.71		12		

*There were 2 ties.

As shown in table 4.27, no statistically significant difference was found between pretest-1 and posttest-1 mean scores of experimental group (z=-.541, p=.589) on communication subscale of RTSS during first phase of study. Wilcoxon signed-rank test, as shown in table 4.27, indicated no statistically significant difference between prestest-1 and posttest-1 mean score of control group (z=-.618, p=.537) on communication subscale of RTSS. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study".

H_o10 There was statistically no significant difference between mean scores on communication subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

Table 4.28

Pairwise Analysis of Posttest-1 & Pretest-2 Performance Of Experimental Group & Control Group on Communication Subscale of Reflective Thinking Skills Scale (RTSS) (gap Between Phases of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Posttest-1 (experimental group)	23	40.52	5.21	12.23	*11		-.662	.508
Pretest-2 (experimental group)	23	39.69	5.51	9.65		10		
Posttest-1 (control group)	24	42	5.01	11.85	**10		-.506	.613
Pretest -2 (control group)	24	41.17	4.94	9.15		10		

*There were 2 ties. **There were 4 ties.

The result of Wilcoxon signed-rank test in table 4.28 showed that no statistically significant difference between posttest-1 and pretest-2 mean scores of experimental group (z=-.662, p=.508) on communication subscale of RTSS during gap between two phases of the study. The output of Wilcoxon signed-rank test, as given in table 4.28, showed that there was statistically no significant difference between posttest-1 and pretest-2 mean scores of control group (z=-.506, p=.613) on communication subscale of RTSS during gap between two phases of the study. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on communication subscale of prospective teachers of experimental group for the gap period between first and second phase of the study".

H_o11 There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

Table 4.29

Pairwise Analysis of Pretest-2 & Posttest-2 Performance of Experimental Group & Control Group on Communication Subscale of Reflective Thinking Skills Scale (RTSS) (2nd Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-2 (experimental group)	23	39.69	5.51	8.61	*9		-1.323	.186
Posttest-2 (experimental group)	23	41.69	3.71	12.79		12		
Pretest-2 (control group)	24	41.17	4.94	10.38	13		-.429	.668
Posttest -2 (control group)	24	42.04	4.85	15		11		

*There were 2 ties.

Wilcoxon signed-rank test, as shown in table 4.29, indicated no statistically significant difference between pretest-2 and posttest-2 mean scores of experimental group (z=-1.323, p=.186) on communication subscale of RTSS during second phase of the study. There was also statistically no significant difference between pretest-2 and posttest-2 mean scores of control group (z=-.429, p=.668) on communication subscale of RTSS during second phase of the study, as given in table 4.29. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study".

H_o12 There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

Table 4.30

Pairwise Analysis of Pretest-1 & Posttest-2 Performance of Experimental Group & Control Group on Communication Subscale of Reflective Thinking Skills Scale (RTSS) (Whole Study Duration)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	41.17	3.54	9.50	*9		-.383	.702
Posttest-2 (Experimental Group)	23	41.69	3.71	10.45		10		
Pretest-1 (control group)	24	42.88	3.23	13.08	13		-.573	.566
Posttest -2 (control group)	24	42.04	4.85	11.82		11		

*There were 4 ties.

Wilcoxon signed-rank test, as shown in table 4.30, indicated no statistically significant difference between pretest-1 and posttest-2 mean scores of experimental group (z=-.383, p=.702) on communication subscale of RTSS during whole study duration. There was also statistically no significant difference between pretest-1 and posttest-2 mean scores of control group (z=-.573, p=.566) on communication subscale of RTSS during whole study duration, as given in table 4.30. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction for whole study duration".

H_o13 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

Table 4.31
Pairwise Analysis of Pretest-1 & Posttest-1 Performance of Experimental Group & Control Group on Judgment Subscale of Reflective Thinking Skills Scale (RTSS) (1st Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	33.87	4.54	12.27	*11		-.277	.782
Posttest-1 (experimental group)	23	33.52	4.72	10.73		11		
Pretest-1 (control group)	24	35.58	2.65	11.18	**11		-.674	.501
Posttest -1 (control group)	24	35	4.63	9.67		9		

*There was 1 ties. **There were 4 ties.

Wilcoxon signed-rank test, as shown in table 4.31, indicated no statistically significant difference between pretest-1 and posttest-1 mean score of experimental group ($z=-.277$, $p=.782$) on judgment subscale of RTSS during first phase of the study. Table 4.31 depicted statistically no significant difference between pretest-1 and posttest-1 mean scores of control group ($z=-.674$, $p=.501$) on judgment subscale of RTSS during first phase of the study. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study".

H_o14 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

Table 4.32
Pairwise Analysis of Posttest-1 & Pretest-2 Performance of Experimental Group & Control Group on Judgment Subscale of Reflective Thinking Skills Scale (RTSS) (gap Between Phases of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Posttest-1 (experimental group)	23	33.52	4.72	10.10	*10		-.150	.881
Pretest-2 (experimental group)	23	33.56	4.81	10.90		10		
Posttest-1 (control group)	24	35	4.63	12.38	13		-.316	.752
Pretest -2 (control group)	24	35	4.19	12.64		11		

*There were 3 ties.

The output of Wilcoxon signed-rank test in table 4.32 indicated statistically no significant difference between posttest-1 and pretest-2 mean scores of experimental group (z=-.150, p=.881) on judgment subscale of RTSS during gap between two phases of the study. There was also statistically no significant difference between posttest-1 and pretest-2 mean score of control group on (z=-.316, p=.752) on judgment subscale of RTSS during gap between two phases of the study, as given in table 4.32. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on judgment subscale of prospective teachers of experimental group for the gap period between first and second phase of the study".

H_o15 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

Table 4.33
Pairwise Analysis of Pretest-2 & Posttest-2 Performance of Experimental Group & Control Group on Judgment Subscale of Reflective Thinking Skills Scale (RTSS) (2nd Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-2 (experimental group)	23	33.56	4.81	13.10	*5		-1.995	.046
Posttest-2 (experimental group)	23	35.91	4.37	11.03		17		
Pretest-2 (control group)	24	35	4.19	10.78	**9		-.963	.336
Posttest -2 (control group)	24	35.83	3.34	12		13		

*There was 1 ties. **There was 2 ties.

The output of Wilcoxon signed-rank test in table 4.33 showed statistically significant difference between pretest-2 and posttest-2 mean scores of experimental group (z=-1.995, p=.046) with higher mean score on posttest-2 (mean score=35.91) for judgment subscale of RTSS for second phase of the study. Table 4.33 showed statistically no significant difference between pretest-2 and posttest-2 mean scores of control group (z=-.963, p=.336) on judgment subscale of RTSS for second phase of the study. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study".

H_o16 There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

Table 4.34
Pairwise Analysis of Pretest-1 & Posttest-2 Performance of Experimental Group & Control Group on Judgment Subscale of Reflective Thinking Skills Scale (RTSS) (Whole Study Duration)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	33.87	4.54	8.93	*7		-2.087	.037
Posttest-2 (experimental group)	23	35.91	4.37	12.70		15		
Pretest-1 (control group)	24	35.58	2.65	13.28	**9		-.228	.820
Posttest -2 (control group)	24	35.83	3.34	10.27		13		

*There was 1 ties. **There were 2 ties.

The output of Wilcoxon signed-rank test in table 4.34 showed a statistically significant difference between pretest-1 and posttest-2 mean score of experimental group (z=-2.087, p=.037) with higher mean score on posttest-2 (mean score=35.91) for judgment subscale of RTSS during whole study duration. Table 4.34 showed statistically no significant difference between pretest-1 and posttest-2 mean scores of control group (z=-.228, p=.820) on judgment subscale of RTSS during whole study duration, as shown in table 4.34. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration".

H_o17 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

Table 4.35

Pairwise Analysis of Pretest-1 & Posttest-1 Performance of Experimental Group & Control Group on Team-working Subscale of Reflective Thinking Skills Scale (RTSS) (1st Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	38.78	4.17	12.68	*11		-.836	.403
Posttest-1 (experimental group)	23	37.39	5.16	9.15		10		
Pretest-1 (control group)	24	39.96	3.13	9.42	**12		-.087	.931
Posttest -1 (control group)	24	40.17	4.30	13.11		9		

*There were 2 ties. **There were 3 ties.

The output of Wilcoxon signed-rank test in table 4.35 indicated statistically no significant difference between pretest-1 and posttest-1 mean score of experimental group ($z=-.836$, $p=.403$) on team-working subscale of RTSS during first phase of the study. Table 4.35 depicted statistically no difference between pretest-1 and posttest-1 mean scores of control group ($z=-.087$, $p=.931$) on team-working subscale of RTSS for first phase of the study. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study".

H_o18 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

Table 4.36
Pairwise Analysis of Posttest-1 & Pretest-2 Performance of Experimental Group & Control Group on Team-working Subscale of Reflective Thinking Skills Scale (RTSS) (gap Between Phases of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Posttest-1 (experimental group)	23	37.39	5.16	10.18	*11		-.122	.903
Pretest-2 (experimental group)	23	37.48	5.95	11.90		10		
Posttest-1 (control group)	24	40.17	4.30	8.75	**12		-1.352	.177
Pretest -2 (control group)	24	38.67	5.31	9.60		5		

*There were 2 ties. **There were 7 ties.

Table 4.36 indicated statistically no significant difference between posttest-1 and pretest-2 mean scores of experimental group (z=-.122, p=.903) on team-working subscale of RTSS during gap between two phases of the study. The output of Wilcoxon signed-rank test in table 4.36 also showed statistically no significant difference between posttest-1 and pretest-2 mean scores of control group (z=-1.352, p=.177) on team-working subscale of RTSS during gap between two phases of the study. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on team-working subscale of prospective teachers of experimental group for the gap period between first and second phase of the study".

H_o19 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

Table 4.37

Pairwise Analysis of Pretest-2 & Posttest-2 Performance of Experimental Group & Control Group on Team-working Subscale of Reflective Thinking Skills Scale (RTSS) (2nd Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-2 (experimental group)	23	37.48	5.95	7.58	*6		-1.996	.046
Posttest-2 (experimental group)	23	40.35	3.72	11.12		13		
Pretest-2 (control group)	24	38.67	5.31	10.85	**10		-.587	.557
Posttest -2 (control group)	24	39.75	3.47	12.04		12		

*There were 4 ties. **There were 2 ties.

The output of Wilcoxon signed-rank test in table 4.37 showed statistically significant difference between pretest-2 and posttest-2 mean score of experimental group (z=-1.996, p=.046) with higher mean score on posttest-2 (mean score=40.35) for team-working subscale of RTSS during second phase of the study. Table 4.37 depicted statistically no significant difference between pretest-2 and posttest-2 mean scores of control group (z=-.587, p=557) on team-working subscale of RTSS for second phase of the study. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study".

Ho20 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

Table 4.38
Pairwise Analysis of Pretest-1 & Posttest-2 Performance Of Experimental Group & Control Group on Team-working Subscale of Reflective Thinking Skills Scale (RTSS) (Whole Study Duration)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	38.78	4.16	7.72	*9		-1.603	.109
Posttest-2 (experimental group)	23	40.35	3.72	13.46		12		
Pretest-1 (control group)	24	39.96	3.13	11.14	**11		-.245	.807
Posttest -2 (control group)	24	39.75	3.47	10.85		10		

*There were 2 ties. **There were 3 ties.

The output of Wilcoxon signed-rank test in table 4.38 showed statistically significant difference between pretest-1 and posttest-2 mean score of experimental group (z=-1.603, p=.109) on team-working subscale of RTSS during whole study duration. Table 4.38 depicted statistically no significant difference between pretest-1 and posttest-2 mean scores of control group (z=-.245, p=.807) on team-working subscale of RTSS during whole study duration. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration".

H_o21 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.

Table 4.39

Pairwise Analysis of Pretest-1 & Posttest-1 Performance of Experimental Group & Control Group on Decision-Making Subscale of Reflective Thinking Skills Scale (RTSS) (1st Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	35.08	4.56	10.77	*11		-.505	.614
Posttest-1 (experimental group)	23	34.30	4.93	10.17		9		
Pretest-1 (control group)	24	37.42	3.49	11.68	**14		-.782	.434
Posttest -1 (control group)	24	36.50	3.79	12.50		9		

*There were 3 ties. **There are 1 ties.

The output of Wilcoxon signed-rank test in table 4.39 showed statistically no significant difference between pretest-1 and posttest-1 mean score of experimental group (z=-.505, p=.614) on decision-making subscale of RTSS during first phase of the study. Table 4.39 depicted statistically no significant difference between pretest-1 and posttest-1 mean score of control group (z=-.782, p=.434) on decision-making subscale of RTSS during first phase of the study. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study".

H_o22 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.

Table 4.40

Pairwise Analysis of Posttest-1 & Pretest-2 Performance of Experimental Group & Control Group on Decision-making Subscale of Reflective Thinking Skills Scale (RTSS) (gap Between Phases of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Posttest-1 (experimental group)	23	34.30	4.93	8.44	*8		-.024	.981
Pretest-2 (experimental group)	23	33.65	5.56	9.63		9		
Posttest-1 (control group)	24	36.50	3.79	11.25	**14		-1.969	.049
Pretest -2 (control group)	24	35.29	4.61	8.75		6		

*There were 6 ties. **There were 4 ties.

Wilcoxon signed-rank test indicated, in table 4.40, statistically no significant difference between posttest-1 and pretetst-2 mean scores of experimental group (z=-.024, p=.981) on decision-making subscale of RTSS during gap between two phases of the study. Table 4.40 indicated statistically significant difference between posttest-1 and pretest-2 mean scores of control group (z=-1.969, p=.049) with higher mean score on posttest-1 (mean score= 36.50) on decision-making subscale of RTSS during gap between two phases of the study. It showed a decrease in mean scores of control group on decision-making subscale of RTSS on pretest-2 as compared to posttest-1. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on decision-making subscale of prospective teachers of experimental group for the gap period between first and second phase of the study".

H_o23 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.

Table 4.41
Pairwise Analysis of Pretest-2 & Posttest-2 Performance of Experimental Group & Control Group on Decision-making Subscale of Reflective Thinking Skills Scale (RTSS) (2nd Phase of Study)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z value	Asymp. sig.
Pretest-2 (experimental group)	23	33.65	5.56	8.90	*5		-2.474	.013
Posttest-2 (experimental group)	23	36.04	3.57	11.66		16		
Pretest-2 (control group)	24	35.29	4.61	10.38	**12		-.412	.681
Posttest -2 (control group)	24	35.58	3.67	13.77		11		

*There were 2 ties. **There were 1 ties.

The result of Wilcoxon signed-rank test in table 4.41 showed statistically significant difference between pretest-2 and posttest-2 mean score of experimental group (z=-2.474, p=.013) with higher mean score of posttest-2 (mean score=36.04) on decision-making subscale of RTSS for second phase of the study. Table 4.41 depicted statistically no significant difference between pretest-2 and posttest-2 mean scores of control group (z=-.412, p=.681) on decision-making subscale of RTSS for second phase of the study. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study".

H_o24 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.

Table 4.42

Pairwise Analysis of Pretest-1 & Posttest-2 Performance of Experimental Group & Control Group on Decision-making Subscale of Reflective Thinking Skills Scale (RTSS) (Whole Study Duration)

Pre-test score	N	Mean	S.D.	Mean rank	Positive ranks	Negative ranks	Z	Asymp. sig.
Pretest-1 (experimental group)	23	35.09	4.56	8.81	*8		-.989	.323
Posttest-2 (experimental group)	23	36.04	3.57	10.86		11		
Pretest-1 (control group)	24	37.42	3.49	10.54	**13		-1.701	.089
Posttest -2 (control group)	24	35.58	3.67	8.83		6		

*There were 4 ties. **There were 5 ties.

The result of Wilcoxon signed-rank test in table 4.42 showed statistically no significant difference between pretest-1 and posttest-2 mean score of experimental group (z=-.989, p=.323) on decision-making subscale of RTSS during whole study duration. Table 4.42 displayed statistically no significant difference between pretest-1 and posttest-2 mean scores of control group (z=-1.701, p=.089) on decision-making subscale of RTSS during whole study duration. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration".

4.1.2.2 *Comparative analysis of Experimental and Control Group on Five Reflective Thinking Skills Using Mixed Between-Within ANOVA*

The control and experimental groups attempted pretest and posttest in each of the two phases of the study. Each group was tested four times so, mixed between-within ANOVA (Analysis of Variance) was used to find any significant change in reflective thinking skills of experimental and control group over time. The mixed between-within ANOVA helps to see the main effect of time duration of study, main effect of instruction method, and interaction effect of time and instruction method on dependent variable i.e., score on Reflective Thinking Skills Scale (RTSS). The mixed between-within ANOVA has some assumptions which were ensured to be met before applying the test for data: (i) the dependent variable must be on a continuous scale (ii) randomly selected sample from population (iii) the data had normal distribution (iv) there were no significant outliers in data (iv) the variability of scores for each of the groups (Levene's test) is same (Pallant, 2002, p. 196-198). The output of mixed between-within ANOVA for overall Reflective Thinking Skills Scale (RTSS) and its five sub-scales (observation, communication, judgment, team-working and decision-making) were given below in the same order.

H_o25 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on Reflective Thinking Skills Scale across various periods of time during the study.

Table 4.43

Descriptive Statistics for Experimental and Control Group on Reflective Thinking Skills Scale for Time 1, Time 2, Time 3 and Time 4

S#	Time	Group	N	Mean	Standard deviation
1	Pretest-1 (RTSS)	Control	24	204.25	10.36
		Experimental	23	196.65	14.67
2	Posttest-1 (RTSS)	Control	24	199.96	19.16
		Experimental	23	192.22	20.42
3	Pretest-2 (RTSS)	Control	24	196.33	20.65
		Experimental	23	189.74	24.68
4	Posttest-2 (RTSS)	Control	24	202.25	14.84
		Experimental	23	203.78	15.34

Table 4.44

Factorial ANOVA Summary for Reflective Thinking Skills by Group, Time and Their Interaction Effect

Source	Type III sum of squares	df	Mean square	F	Sig	Partial eta square
Time	2789.55	2.56	1088.79	4.830	.005	.097
Interaction of time-group	698.079	2.56	272.468	1.209	.308	.026
Error	25986.91	115.29	225.40			
Group	1221.96	1	1221.96	1.703	.199	.036
Error	32293.86	45	717.64			

The pretest-1, posttest-1, pretest-2 and posttest-2 mean scores of experimental and control group on Reflective Thinking Skills Scale (RTSS) were compared by applying mixed between-within ANOVA as shown in table 4.43 and 4.44. There were two independent variables: time (within-subjects variabl1e) and group (between-subjects variable). There were four levels of time variable: pretets-1, posttest-1, pretest-2 and posttest-2. There were two levels of group variable: control and experimental group.

Dependent variable was score on Reflective Thinking Skills Scale (RTSS). Preliminary checks ensured fulfillment of assumptions of normality, equality of covariance (Box's test) and equality of error variance (Levene's test). Mauchly's test of sphericity was statistically significant so, the value of Greenhouse-Geisser was used for interpreting the results for time and interaction effect.

Statistically significant difference across the four time points was observed [$F(2.56, 115.29)= 4.830$, $p< .01$, partial eta square=.097] and statistically non-significant difference between groups [$F(1,45)=1.703$, $p>.05$, partial eta square= .036] for score on Reflective Thinking Skills Scale (RTSS). Statistically non-significant interaction between time and group was observed [$F(2.56, 115.29)=1.209$, $p>.05$, partial eta square= .026] (as shown in table 4.44). Following up the difference for time indicated statistically no significant difference among pretest-1, posttest-1, pretest-2 and posttest-2 (i.e., for time variable), control group had statistically significant difference between posttest-1 and posttest-2 [Mean difference=11.565, $p< .05$], and pretest-2 and posttest-2 [Mean Difference= 14.043, $p< .05$] for experimental group. However, mean scores of control and experimental group gradually decreased over time for first and second phase of the study; both groups showed an improvement in posttest-2 scores as shown in table 4.43. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores of prospective teachers of control and experimental group on Reflective Thinking Skills Scale across various periods of time during the study".

H_o26 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on observation subscale across various periods of time during the study.

Table 4.45
Descriptive Statistics for Experimental and Control Group on Observation Subscale of RTSS for Time 1, Time 2, Time 3 & Time 4

S#	Time	Group	N	Mean	Standard deviation
1	Pretest-1 (RTSS)	Control	24	48.42	5.67
		Experimental	23	47.74	5.29
2	Posttest-1 (RTSS)	Control	24	46.29	5.38
		Experimental	23	46.48	5.55
3	Pretest-2 (RTSS)	Control	24	46.20	5.09
		Experimental	23	45.35	7.19
4	Posttest-2 (RTSS)	Control	24	49.04	4.35
		Experimental	23	49.78	4.08

Table 4.46
Factorial ANOVA Summary of Observation Subscale of RTSS by Group, Time and Their Interaction Effect

Source	Type III sum of squares	df	Mean square	F	Sig	Partial eta square
Time	383.74	3	127.91	6.012	.001	.118
Interaction of time-group	19.85	3	6.617	.311	.817	.007
Error	2872.47	135	21.278			
Group	1.094	1	1.094	.021	.886	.000
Error	2366.54	45	52.59			

Pretest-1, posttest-1, pretest-2 and posttest-2 scores of experimental and control group on observation subscale of Reflective Thinking Skills Scale were compared through mixed between-within ANOVA was conducted to compare the (RTSS) as shown in table

4.45 and 4.46. There were two independent variables: time (within-subjects variable) and group (between-subjects variable). Time included four levels: pretets-1, posttest-1, pretest-2 and posttest-2. There were two levels of group variable: control and experimental group. Dependent variable was score on observation subscale of RTSS. Preliminary checks ensured compliance with assumptions of normality, equality of covariance (Box's test), equality of error variance (Levene's test) and Mauchly's test of sphericity.

Statistically significant difference across the four time points [$F(3, 135)= 6.012$, $p< .05$, partial eta square=.118] and statistically non-significant difference between groups [$F(1,45)=.021$, $p>.05$, partial eta square= .000] were observed for score on observation subscale of RTSS. Statistically non-significant interaction was observed between time and group [$F(3, 135)=.311$, $p>.05$, partial eta square= .007] (as shown in table 4.46). Following up the difference for time indicated statistically non-significant difference among pretest-1, posttest-1, pretest-2 and posttest-2 (i.e., for time variable) for control group however, there was statistically significant difference between posttest-1 and posttest-2 [Mean difference=3.304, $p< .05$], and pretest-2 and posttest-2 [Mean Difference= 4.435, $p< .05$] for experimental group. However, mean scores of control and experimental group gradually decreased over time for pretest-1, posttest-1 and pretest-2; both groups showed an improvement in posttest-2 scores as shown in table 4.45. Keeping in view the data analysis output, the researcher failed to accept the null hypothesis "there was statistically no significant difference between mean scores of prospective teachers of control and experimental group on observation subscale across various periods of time during the study".

H_o27 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on communication subscale across various periods of time during the study.

Table 4.47
Descriptive Statistics for Experimental and Control Group on Communication Subscale of RTSS for Time 1, Time 2, Time 3 and Time 4

S#	Time	Group	N	Mean	Standard Deviation
1	Pretest-1 (RTSS)	Control	24	42.88	3.23
		Experimental	23	41.17	3.54
2	Posttest-1 (RTSS)	Control	24	42	5.01
		Experimental	23	40.52	5.21
3	Pretest-2 (RTSS)	Control	24	41.17	4.94
		Experimental	23	39.69	5.51
4	Posttest-2 (RTSS)	Control	24	42.04	4.85
		Experimental	23	41.69	3.71

Table 4.48
Factorial ANOVA Summary of Communication Subscale of RTSS by Group, Time and Their Interaction Effect

Source	Type III sum of squares	df	Mean square	F	Sig	Partial eta square
Time	73.64	3	24.55	1.586	.196	.034
Interaction of time-group	13.17	3	4.39	.284	.837	.006
Error	2089.28	135	15.476			
Group	73.298	1	73.298	1.968	.168	.042
Error	1676.415	45	37.254			

The pretest-1, posttest-1, pretest-2 and posttest-2 mean scores of experimental and control group on communication subscale of Reflective Thinking Skills Scale (RTSS) were compared through mixed between-within ANOVA as shown in table 4.47 and 4.48. There were two independent variables: time (within-subjects variable) and group (between-subjects variable). Time included four levels: pretets-1, posttest-1, pretest-2 and posttest-2. There were two levels of group variable: control and experimental group. Dependent variable was mean score on communication subscale of RTSS. Preliminary checks were ensured to comply with assumptions of normality, equality of covariance (Box's test), equality of error variance (Levene's test) and Mauchly's test of sphericity.

No statistically significant difference was found across the four time points [$F(3, 135)= 1.586$, $p> .05$, partial eta square=.034] and the statistically no significant difference between groups [$F(1,45)=1.968$, $p>.05$, partial eta square= .042] for mean score on communication subscale of RTSS. Statistically no significant interaction was observed between time and group [$F(3, 135)=.284$, $p>.05$, partial eta square= .006] (as shown in table 4.48). However, the score of control and experimental group gradually decreased over time for pretest-1, posttest-1 and pretest-2; both groups showed an improvement in posttest-2 scores as shown in table 4.47. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores of prospective teachers of control and experimental group on communication subscale across various periods of time during the study".

H_o28 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on judgment subscale across various periods of time during the study.

Table 4.49
Descriptive Statistics for Experimental and Control Group on Judgment Subscale of RTSS for Time 1, Time 2, Time 3 and Time 4

S#	Time	Group	N	Mean	Standard deviation
1	Pretest-1 (RTSS)	Control	24	35.58	2.65
		Experimental	23	33.87	4.54
2	Posttest-1 (RTSS)	Control	24	35	4.63
		Experimental	23	33.52	4.72
3	Pretest-2 (RTSS)	Control	24	35	4.19
		Experimental	23	33.56	4.81
4	Posttest-2 (RTSS)	Control	24	35.83	3.34
		Experimental	23	35.91	4.37

Table 4.50
Factorial ANOVA Summary of Judgment Subscale of RTSS by Group, Time and Their Interaction Effect

Source	Type III sum of squares	df	Mean square	F	Sig	Partial eta square
Time	80.55	3	26.85	2.532	.060	.053
Interaction of time-group	23.70	3	7.90	.745	.527	.016
Error	1431.38	135	10.603			
Group	60.709	1	60.709	1.553	.219	.033
Error	1759.611	45	39.102			

The pretest-1, posttest-1, pretest-2 and posttest-2 mean scores of experimental and control groups on judgment subscale of Reflective Thinking Skills Scale (RTSS) were compared through mixed between-within ANOVA as shown in table 4.49 and 4.50. There were two independent variables: time (within-subjects variable) and group (between-subjects variable). Time included four levels: pretets-1, posttest-1, pretest-2 and posttest-2. There were two levels of group variable: control and experimental group. Dependent variable was score on judgment subscale of RTSS. Preliminary checks were ensured to comply with assumptions of normality, equality of covariance (Box's test), equality of error variance (Levene's test) and Mauchly's test of sphericity. Levene' s test for pretest-1 score of judgment subscale was statistically significant ($F=7.071$, $p< .05$).

Statistically no significant difference was found across the four time points [$F(3, 135)= 2.532$, $p> .05$, partial eta square=.053] and also statistically no significant difference between score of both groups [$F(1,45)=1.553$, $p>.05$, partial eta square= .033] on judgment subscale of RTSS. Statistically no significant interaction was observed between time and group [$F(3, 135)=.745$, $p>.05$, partial eta square= .016] (as shown in table 4.50). However, performance of control and experimental group were relatively same over time for pretest-1, posttest-1 and pretest-2; the experimental group showed an improvement in posttest-2 scores as shown in table 4.49. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores of prospective teachers of control and experimental group on judgment subscale across various periods of time during the study".

H_o29 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on team-working subscale across various periods of time during the study.

Table 4.51
Descriptive Statistics for Experimental and Control Group on Team-working Subscale of RTSS for Time 1, Time 2, Time 3 and Time 4

S#	Time	Group	N	Mean	Standard deviation
1	Pretest-1 (RTSS)	Control	24	39.96	3.13
		Experimental	23	38.78	4.17
2	Posttest-1 (RTSS)	Control	24	40.17	4.30
		Experimental	23	37.39	5.16
3	Pretest-2 (RTSS)	Control	24	38.67	5.31
		Experimental	23	37.48	5.95
4	Posttest-2 (RTSS)	Control	24	39.75	3.47
		Experimental	23	40.35	3.72

Table 4.52
Factorial ANOVA Summary of Team-working Subscale of RTSS by Group, Time and Their Interaction Effect

Source	Type III sum of squares	df	Mean square	F	Sig	Partial eta square
Time	99.98	3	33.328	2.152	.097	.046
Interaction of time-group	66.92	3	22.307	1.44	.234	.031
Error	2090.48	135	15.485			
Group	60.56	1	60.56	1.772	.190	.038
Error	1537.99	45	34.178			

Pretest-1, posttest-1, pretest-2 and posttest-2 scores of experimental and control group on team-working subscale of Reflective Thinking Skills Scale (RTSS) were compared through mixed between-within ANOVA as shown in table 4.51 and 4.52. There were two independent variables: time (within-subjects variable) and group (between-subjects variable). Time included four levels: pretets-1, posttest-1, pretest-2 and posttest-2. There were two levels of group variable: control and experimental group. Dependent variable was score on team-working subscale of RTSS. Preliminary checks were ensured to comply with assumptions of normality, equality of covariance (Box's test), equality of error variance (Levene's test) and Mauchly's test of sphericity.

Statistically non-significant difference was found across the four time points [$F(3, 135)= 2.152$, $p> .05$, partial eta square=.046] and also statistically non-significant difference between score of both groups [$F(1,45)=1.772$, $p>.05$, partial eta square= .038] on team-working subscale of RTSS. Statistically non-significant interaction was observed between time and group [$F(3, 135)=1.44$, $p>.05$, partial eta square= .031] (as shown in table 4.52). However, mean score of control group was relatively same by the end of posttest-2 whereas experimental group showed an improvement in posttest-2 scores as shown in table 4.51. Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores of prospective teachers of control and experimental group on team-working subscale across various periods of time during the study".

H_o30 There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on decision-making subscale across various periods of time during the study.

Table 4.53

Descriptive Statistics for Experimental and Control Group on Decision-making Subscale of RTSS for Time 1, Time 2, Time 3 and Time 4

S#	Time	Group	N	Mean	Standard deviation
1	Pretest-1 (RTSS)	Control	24	37.42	3.49
		Experimental	23	35.09	4.56
2	Posttest-1 (RTSS)	Control	24	36.50	3.79
		Experimental	23	34.30	4.93
3	Pretest-2 (RTSS)	Control	24	35.29	4.61
		Experimental	23	33.65	5.56
4	Posttest-2 (RTSS)	Control	24	35.58	3.67
		Experimental	23	36.04	3.57

Table 4.54

Factorial ANOVA Summary of Decision-making Subscale of RTSS by Group, Time and Their Interaction Effect

Source	Type III sum of squares	df	Mean square	F	Sig	Partial eta square
Time	81.228	3	27.076	2.253	.085	.048
Interaction of time-group	58.866	3	19.62	1.633	.185	.035
Error	1622.048	135	12.015			
Group	95.55	1	95.55	2.472	.123	.052
Error	1739.446	45	38.654			

Pretest-1, posttest-1, pretest-2 and posttest-2 scores of experimental and control group on decision-making subscale of Reflective Thinking Skills Scale (RTSS) were compared through mixed between-within ANOVA as shown in table 4.53 and 4.54. There were two independent variables: time (within-subjects variable) and group (between-subjects variable). Time included four levels: pretets-1, posttest-1, pretest-2 and posttest-2. There were two levels of group variable: control and experimental group. Dependent variable was score on decision-making subscale of RTSS. Preliminary checks were ensured to comply with assumptions of normality, equality of covariance (Box's test), equality of error variance (Levene's test) and Mauchly's test of sphericity.

Statistically no significant difference was observed across the four time points [F(3, 135)= 2.253, p> .05, partial eta square=.048] and also statistically no significant difference between groups [F(1,45)=2.472, p>.05, partial eta square= .052] for score on decision-making subscale of RTSS. Statistically no significant interaction was found between time and group [F(3, 135)=1.633, p>.05, partial eta square= .035] (as shown in table 4.54). The mean scores of control and experimental group gradually decreased during posstest-1 as compared to pretest-1 mean scores but posttest-2 mean scores of experimental group increased as compared to its pretest-2 mean score (as shown in table 4.53). Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference between mean scores of prospective teachers of control and experimental group on decision-making subscale across various periods of time during the study".

4.1.2.3 *Comparison of Pretest and Posttest scores of Academic Achievement subgroups in Control and Experimental Group on Reflective Thinking Skills Scale (RTSS)*

H_o31 There was statistically no significant difference among pretest-1 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

Table 4.55
Pretest-1 Scores of Academic Achievement Subgroups of Experimental Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	df	Asymp. sig.
Low achievers	5	192.40	12.58	10.60	1.004	2	.605
Average	15	199.13	14.19	13.00			
High achievers	3	191.33	22.50	9.33			

Table 4.55 displayed the output of Kruskal-Wallis test for comparing the pretest-1 scores of low, average and high achievers of experimental group on Reflective Thinking Skills Scale (RTSS). There was no statistically significant difference (H (2) =1.004, p=.605) among the mean score of various academic achievement subgroups of experimental group on pretest-1 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference among pretest-1 mean scores of prospective teachers of various academic achievement subgroups of experimental group on Reflective Thinking Skills Scale".

H_o32 There was statistically no significant difference among posttest-1 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

Table 4.56
Posttest-1 Scores of Academic Achievement Subgroups of Experimental Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	df	Asymp. sig.
Low achievers	5	203.60	11.46	16.60	2.970	2	.227
Average	15	187.33	20.47	10.60			
High achievers	3	197.67	29.02	11.33			

Table 4.56 showed the output of Kruskal-Wallis test to compare the posttest-1 scores of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale (RTSS). Statistically non-significant difference (H (2) =2.970, p=.227) was observed among the mean scores of low, average and high achievers of experimental group on posttest-1 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference among posttest-1 mean scores of prospective teachers of various academic achievement subgroups of experimental group on Reflective Thinking Skills Scale".

H_o33 There was statistically no significant difference among pretest-2 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

Table 4.57
Pretest-2 Scores of Academic Achievement Subgroups of Experimental Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	df	Asymp. sig.
Low achievers	5	173.00	30.66	8.30	1.913	2	.384
Average	15	194.13	22.76	13.10			
High achievers	3	195.67	17.24	12.67			

Table 4.57 showed the result of Kruskal-Wallis test for comparing the pretest-2 score of low, average and high achievers of experimental group on Reflective Thinking Skills Scale (RTSS). Statistically non-significant difference (H(2) =1.913, p=.384) was observed among the mean scores of academic achievement subgroups of experimental group on pretest-2 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no

significant difference among pretest-2 mean scores of prospective teachers of various academic achievement subgroups of experimental group on Reflective Thinking Skills Scale".

H_o34 There was statistically no significant difference among posttest-2 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.

Table 4.58
Posttest-2 Scores of Various Academic Achievement Subgroups of Experimental Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	df	Asymp. sig.
Low achievers	5	207.80	16.90	13.50	2.912	2	.233
Average	15	205.00	15.29	12.73			
High achievers	3	191.00	9.16	5.83			

Table 4.58 showed the output of Kruskal-Wallis test to compare the posttest-2 scores of low, average and high achievers of experimental group on Reflective Thinking Skills Scale (RTSS). There was no statistically significant difference ($H(2) = 2.912$, $p = .233$) among the mean score of various academic achievement subgroups of experimental group on posttest-2 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference among posttest-2 mean scores of prospective teachers of various academic achievement subgroups of experimental group on Reflective Thinking Skills Scale".

H_o35 There was statistically no significant difference among pretest-1 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

Table 4.59

Pretest-1 Score of Academic Achievement Subgroups of Control Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	df	Asymp. sig.
Low achievers	5	204.00	8.46	11.80	2.082	2	.353
Average	16	202.94	11.33	11.69			
High achievers	3	211.67	5.69	18.00			

Table 4.59 showed the output of Kruskal-Wallis test to compare the pretest-1 scores of low, average and high achievers of control group on Reflective Thinking Skills Scale (RTSS). There was no statistically significant difference (H (2) =2.082, p=.353) among various academic achievement subgroups of control group on pretest-1 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to reject the null hypothesis "there was statistically no significant difference among pretest-1 mean scores of prospective teachers of various academic achievement subgroups of control group on Reflective Thinking Skills Scale".

H_o36 There was statistically no significant difference among posttest-1 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

Table 4.60

Posttest-1 Scores of Academic Achievement Subgroups of Control Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	df	Asymp. sig.
Low achievers	5	196.40	16.71	11.60	5.386	2	.068
Average	16	196.88	19.11	11.13			
High achievers	3	222.33	8.08	21.33			

Table 4.60 showed the output of Kruskal-Wallis test to compare the posttest-1 scores of low, average and high achievers of control group on Reflective Thinking Skills Scale (RTSS). Statistically non-significant difference (H (2) =5.386, p=.068) was observed among the mean score of various academic achievement subgroups of control group on posttest-1 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to reject null hypothesis "there was statistically no significant difference among posttest-1 mean scores of prospective teachers of various academic achievement subgroups of control group on Reflective Thinking Skills Scale".

H_o37 There was statistically no significant difference among pretest-2 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

Table 4.61
Pretest-2 Scores of High, Average and low Achievers of Control Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	df	Asymp. sig.
Low achievers	5	199.20	10.69	14.40	1.329	2	.514
Average	16	193.38	22.05	11.34			
High achievers	3	207.33	27.54	15.50			

Table 4.61 showed the output of Kruskal-Wallis test for comparing the pretest-2 scores of low, average and high achievers of control group on Reflective Thinking Skills Scale (RTSS). Statistically non-significant difference (H (2) =1.329, p=.514) was found among the mean scores of various academic achievement subgroups of control group on pretest-2 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to reject null hypothesis " there was statistically no significant difference

among pretest-2 mean scores of prospective teachers of various academic achievement subgroups of control group on Reflective Thinking Skills Scale".

H_o38 There was statistically no significant difference among posttest-2 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.

Table 4.62

Posttest-2 Score of Academic Achievement Subgroups of Control Group on RTSS (Kruskal-Wallis Test)

Test scores	N	Mean	S.D.	Mean rank	Chi-square	Df	Asymp. sig.
Low achievers	5	199.80	8.53	11.30	6.211	2	.045
Average	16	199.44	15.33	11.09			
High achievers	3	221.33	.58	22.00			

Table 4.62 showed the output of Kruskal-Wallis test to compare the posttest-2 scores of low, average and high achievers of control group on Reflective Thinking Skills Scale (RTSS). Statistically significant difference (H (2) =6.211, p=.045) was found among the mean scores of various academic achievement subgroups of control group on posttest-2 of Reflective Thinking Skills Scale (RTSS). Keeping in view the data analysis output, the researcher failed to accept null hypothesis "there was statistically no significant difference among posttest-2 mean scores of prospective teachers of various academic achievement subgroups of control group on Reflective Thinking Skills Scale". A post-hoc test, Mann-Whitney U test was applied for pair wise analysis of posttest-2 score of academic achievement levels of control group as shown in tables given below.

Table 4.63

Posttest-2 Scores of Average and low Achievers of Control Group on RTSS (Mann-Whitney U test)

Test scores	N	Mean	SD	Mean rank	Sum of ranks	Mann-Whitney U	Z	Asymp. sig.
Low achievers	5	199.80	8.53	11.30	56.50	38.500	-.124	.901
Average	16	199.44	15.33	10.91	174.50			

Table 4.63 showed the result of Mann-Whitney U test as statistically non-significant difference between average and low achievers of control group for posttest-2 scores on Reflective Thinking Skills Scale (RTSS) (z=-.124, p=.901) with the highest mean rank for low achievers.

Table 4.64

Posttest-2 Scores of High and low Achievers of Control Group on RTSS (Mann-Whitney U test)

Test scores	N	Mean	SD	Mean rank	Sum of ranks	Mann-Whitney U	Z	Asymp. sig.
Low achievers	5	199.80	8.53	3.00	15.00	.000	-2.249	.024
High achievers	3	221.33	.58	7.00	21.00			

Table 4.64 displayed the result of Mann-Whitney U test as statistically significant difference between high and low achievers of control group for posttest-2 scores on Reflective Thinking Skills Scale (RTSS) (z=-.2.249, p=.024) with the highest mean rank for high achievers.

Table 4.65
Posttest-2 Scores of Average and High Achievers of Control Group on RTSS (Mann-Whitney U test)

Test scores	N	Mean	SD	Mean rank	Sum of ranks	Mann-Whitney U	Z	Asymp. sig.
Average	16	199.44	15.33	8.69	139.00	3.000	-2.354	.019
High achievers	3	221.33	.58	17.00	51.00			

Table 4.65 displayed the output of Mann-Whitney U test with a statistically significant difference between average and high achievers of control group for posttest-2 scores on Reflective Thinking Skills Scale (RTSS) (z=-.2.354, p=.019), and the highest mean rank for high achievers.

4.2 Academic Achievement Test

H_o39 There was statistically no significant difference between academic achievement of prospective teachers of experimental and control groups during first phase of the study.

Table 4.66

Comparison of Gain Scores of Control and Experiemntal Group for First Phase of Study

S#	Level of item	Item type	Experimental group			Control group			Mann-Whitney U test		
			N	Mean rank	Sum of ranks	N	Mean rank	Sum of ranks	Mann-Whitney U value	Z value	Sig value
1	Remembering	SA-I	23	29.26	673	24	18.96	455	155	-2.624	.009
		SA-O	23	27.96	643	24	20.21	485	185	-1.988	.047
		RR-I	23	26.61	612	24	21.50	516	216	-2.390	.017
		RR-O	23	26.09	600	24	22	528	228	-2.113	.035
		RR-E	23	25.57	588	24	22.50	540	240	-1.809	.070
2	Understanding	SA-I	23	26.61	612	24	21.50	516	216	-2.390	.017
		SA-O	23	26.61	612	24	21.50	516	216	-2.387	.017
		RR-I	23	26.61	612	24	21.50	516	216	-2.388	.017
		RR-O	23	26.09	600	24	22	528	228	-2.113	.035
		RR-E	23	25.27	588	24	22.50	540	240	-1.809	.070
3	Applying	SA-I	23	21	483	24	26.88	645	207	-1.675	.094
		SA-O	23	20.96	482	24	26.92	646	206	-1.812	.070
		RR-I	23	32.35	744	24	16	384	84	-4.930	.000
		RR-O	23	31.30	720	24	17	408	108	-4.494	.000
		RR-E	23	29.22	672	24	19	456	156	-3.602	.000
4	Analyzing	SA-I	23	24.65	567	24	23.38	561	261	-.332	.740
		SA-O	23	25.72	591.50	24	22.35	536.50	236.50	-.865	.387
		RR-I	23	35.32	744	24	16	384	84	-4.897	.000
		RR-O	23	31.83	732	24	16.50	396	96	-4.688	.000
		RR-E	23	28.70	660	24	19.50	468	168	-3.117	.002
5	Evaluating	SA-I	23	27.78	639	24	20.38	489	189	-1.901	.057
		SA-O	23	25.70	591	24	22.38	537	237	-.842	.400
		RR-I	23	25.57	588	24	22.50	540	240	-1.809	.070
		RR-O	23	25.57	588	24	22.50	540	240	-1.809	.070
		RR-E	23	24	552	24	24	576	276	.000	1.000
6	Creating	SA-I	23	23.61	543	24	24.38	585	267	-.196	.844
		SA-O	23	25.70	591	24	22.38	537	237	-.846	.398
		RR-I	23	25.57	588	24	22.50	540	240	-1.809	.070
		RR-O	23	25.57	588	24	22.50	540	240	-1.809	.070
		RR-E	23	24	552	24	24	576	276	.000	1.000

SA-I= Short Answer-Interpretation; SA-O= Short Answer- Organization; RR-I= Restricted Response- Interpretation; RR-O= Restricted Response-Organization; RR-E= Restricted Response-Elaboration

Table 4.66 showed the mean rank of gain scores on interpretation and organization of short answer questions and restricted response items, and elaboration of restricted response items earned by control and experimental group for first phase of the study. Mann-Whitney U test (a non-parametric test) applied for comparing the mean rank of gain scores of experimental and control groups, showed statistically significant difference between both groups.

Table 4.66 displayed the higher mean rank of gain scores of experimental group as compared to control group on interpretation and organization of short answer and restricted response items, and elaboration of restricted response items at remembering level. The p-value for Mann-Whitney U test was statistically significant for difference between mean rank of gain scores of experimental and control group with the higher mean rank of experimental group for interpretation and organization of short answer and restricted response items at remembering level. However, statistically non-significant difference was found between experimental and control group for mean rank of gain score on elaboration of restricted response items at remembering level, as indicated in table 4.66.

Mean rank of gain scores of experimental group at understanding level was higher than control group for interpretation and organization of short answer and restricted response items, and elaboration of restricted response items, as given in table 4.66. The output of Mann-Whitney U test had statistically significant difference between mean rank of gain scores of experimental and control group on interpretation and organization of short answer and restricted response items with the higher mean rank for experimental group. However, statistically non-significant difference was observed between mean rank of gain scores of experimental and control group on elaboration of restricted response items, as shown in table in 4.66.

Table 4.66 showed higher mean rank of gain score of experimental group on interpretation, organization and elaboration of restricted response items at applying level whereas the control group scored higher mean rank of gain scores on interpretation and organization of short answer questions. The output of Mann-Whitney U test displayed statistically non-significant difference between control and experimental group on interpretation and organization of short answer questions. However, statistically significant difference was observed between control and experimental group for mean rank of gain scores on interpretation, organization and elaboration of restricted response items with the higher mean rank of experimental group at applying level, as shown in table 4.66.

Table 4.66 displayed higher mean rank of gain scores of experimental group than control group on interpretation and organization of short answer questions and restricted response items, and elaboration of restricted response items at analyzing level. Statistically non-significant difference was observed between control and experimental group after applying Mann-Whitney U test for mean rank of gain score of interpretation and organization of short answer questions. However, statistically significant difference was found between experimental and control group on interpretation, organization and elaboration of restricted response items at analyzing level, as given in table 4.66.

Table 4.66 showed higher mean rank of gain scores for the experimental group than control group on interpretation and organization of short answer and restricted response items at evaluating level. There was no difference between control and experimental group on mean rank for gain scores on elaboration of restricted response items. The output of Mann-Whitney U test showed statistically non-significant difference between mean rank of gain scores of control and experimental group on interpretation and organization of short answer and restricted response items, and elaboration of restricted response items, as shown in table 4.66.

Table 4.66 contained the mean rank of gain scores of experimental and control group on interpretation and organization of short answer and restricted response items, and elaboration of restricted response items at creating level. The control group had higher mean rank for gain score than experimental group on interpretation of short answer questions. The experimental group had higher mean rank for gain scores than control group on organization of short answer and restricted response items, and interpretation of restricted response items. No difference was observed between experimental and control group for mean rank of gain scores on elaboration of restricted response items. Statistically non-significant difference was observed between experimental and control group after applying Mann-Whitney U test, on interpretation and organization of short answer question and restricted response items, and elaboration of restricted response items at creating level, as given in table 4.66. Keeping in view the data analysis output, the researcher failed to accept null hypothesis "there was statistically no significant difference between academic achievement scores of prospective teachers of experimental and control group during first phase of the study".

H_o40 There was statistically no significant difference between academic achievement of prospective teachers of experimental and control group during second phase of the study.

Table 4.67

Comparison of Gain Scores of Control and Experiemntal Group for Second Phase of Study

S#	Level of item	Item type	Experimental group			Control group			Mann-Whitney U test		
			N	Mean rank	Sum of ranks	N	Mean rank	Sum of ranks	Mann-Whitney U value	Z value	Sig value
1	Remembering	SA-I	23	21.33	490.50	24	26.56	637.50	214.50	-1.324	.186
		SA-O	23	22.76	523.50	24	25.19	604.50	247.50	-.613	.540
		RR-I	23	27.78	639	24	20.38	489	189	-2.029	.042
		RR-O	23	25.15	578.50	24	22.90	549.50	249.50	-.599	.549
		RR-E	23	25.96	597	24	22.13	531	231	-1.015	.310
2	Understanding	SA-I	23	21.85	502.50	24	26.06	625.50	226.50	-1.161	.246
		SA-O	23	23	529	24	24.96	599	253	-.516	.606
		RR-I	23	27.30	628	24	20.83	500	200	-1.691	.091
		RR-O	23	25.33	582.50	24	22.73	545.50	245.50	-.673	.501
		RR-E	23	26.02	598.50	24	22.06	529.50	229.50	-1.031	.302
3	Applying	SA-I	23	25.07	576.50	24	22.98	551.50	251.50	-.559	.576
		SA-O	23	23.43	539	24	24.54	589	263	-.294	.769
		RR-I	23	27.30	628	24	20.83	500	200	-1.724	.085
		RR-O	23	27	621	24	21.13	507	207	-1.601	.109
		RR-E	23	27.74	638	24	20.42	490	190	-1.947	.052
4	Analyzing	SA-I	23	24.96	574	24	23.08	554	254	-.493	.622
		SA-O	23	24	552	24	24	576	276	.000	1.00
		RR-I	23	29.89	687.50	24	18.35	440.50	140.50	-2.969	.003
		RR-O	23	30.04	691	24	18.21	437	137	-3.053	.002
		RR-E	23	31	713	24	17.29	415	115	-3.546	.000
5	Evaluating	SA-I	23	27.07	622.50	24	21.06	505.50	205.50	-1.581	.114
		SA-O	23	25.48	586	24	22.58	542	242	-.749	.454
		RR-I	23	28.76	661.50	24	19.44	466.50	166.50	-2.494	.013
		RR-O	23	28.91	665	24	19.29	463	163	-2.587	.010
		RR-E	23	29.70	683	24	18.54	445	145	-3.072	.002
6	Creating	SA-I	23	23.46	539.50	24	24.52	588.50	263.50	-.272	.786
		SA-O	23	24.26	558	24	23.75	570	270	-.131	.896
		RR-I	23	28.76	661.50	24	19.44	466.50	166.50	-2.494	.013
		RR-O	23	28.91	665	24	19.29	463	163	-2.587	.010
		RR-E	23	29.70	683	24	18.54	445	145	-3.072	.002

SA-I= Short Answer-Interpretation; SA-O= Short Answer- Organization; RR-I= Restricted Response- Interpretation; RR-O= Restricted Response-Organization; RR-E= Restricted Response-Elaboration

Table 4.67 showed the mean rank of gain scores of experimental and control group for second phase of the study, on interpretation and organization of short answer questions and restricted response items, and elaboration of restricted response items. Mann-Whitney U-test was applied for determining statistically difference between experimental and control group on interpretation and organization of short answer questions and restricted response items, and elaboration of restricted response items at remembering, understanding, applying, analyzing, evaluating and creating levels.

Table 4.67 showed higher mean rank of gain scores of control group than experimental group on interpretation and organization of short answer questions at remembering level; however, this difference was statistically non-significant. The mean rank of gain scores of experimental group was higher than control group on interpretation, organization and elaboration of restricted response items. Statistically significant difference was found between experimental and control group after applying Mann-Whitney U-test on interpretation of restricted response items at remembering level. Table 4.67 displayed statistically non-significant difference between experimental and control group on organization and elaboration of restricted response items at remembering level.

Mean rank of gain scores of control group, as given in table 4.67, was higher than experimental group on interpretation and organization of short answer questions at understanding level. However, table 4.67 displayed this difference as statistically non-significant. The mean rank of gain scores of experimental group was higher than control group on interpretation, organization and elaboration of restricted response items at understanding level; however, this difference was statistically non-significant as indicated by the output of Mann-Whitney U-test in table 4.67.

Table 4.67 displayed higher mean rank of gain scores of experimental group than control group on interpretation of short answer question and restricted response items, organization and elaboration of restricted response items at applying level. The mean rank of gain scores of control group was higher than experimental group on organization of short answer questions at applying level. However, statistically non-significant difference was found between experimental and control group for mean rank of gain scores on short answer and restricted response items at applying level.

At analyzing level, as shown in table 4.67, the experimental group had higher mean rank of gain score than control group on organization of short answer questions. There was no difference between mean rank of gain scores of experimental and control group on organization of short answer questions. However, table 4.62 showed statistically non-significant difference between mean rank of gain scores of experimental and control group on interpretation and organization of short answer questions at analyzing level. The mean rank of gain score of experimental group was higher and statistically significant from control group on interpretation, organization and elaboration of restricted response items (table 4.67).

Table 4.67 showed higher mean rank of gain score of experimental group than control group on interpretation and organization of short answer questions and restricted response item, and elaboration of restricted response item at evaluating level. However, statistically non-significant difference was found between mean rank of gain scores of experimental and control group on interpretation and organization of short answer questions. Table 4.67 displayed statistically significant difference between mean rank of gain score of experimental and control group on interpretation, organization and elaboration of restricted response items at evaluating level.

Table 4.67 showed higher mean rank of gain score of control group higher than experimental group on interpretation of short answer question at creating level. The mean rank of gain score of experimental group was higher than control group on organization of short answer question, interpretation and elaboration of restricted response item at creating level. Statistically non-significant difference was found between mean rank of gain scores of experimental and control group on interpretation and organization of short answer questions at creating level. However, a statistically significant difference was indicated in table 4.67 between the mean rank of gain score of experimental and control group on interpretation, organization and elaboration of restricted response item with the higher mean rank score of experimental group. Keeping in view the data analysis output, the researcher failed to accept null hypothesis "there was statistically no significant difference between academic achievement scores of prospective teachers of experimental and control group during second phase of the study".

H_o41 There was statistically no significant difference between academic achievement of prospective teachers of experimental and control group for the whole study duration.

Table 4.68

Comparison of Gain Scores of Control and Experiemntal Group for Whole Duration of the Study

S#	Level of item	Item type	Experimental group			Control group			Mann-Whitney U test		
			N	Mean rank	Sum of ranks	N	Mean rank	Sum of ranks	Mann-Whitney U value	Z value	Sig value
1	Remembering	SA-I	23	24.11	554.50	24	23.90	573.50	273.50	-.054	.957
		SA-O	23	25.35	583	24	22.71	545	245	-.667	.505
		RR-I	23	28.09	646	24	20.08	482	182	-2.200	.028
		RR-O	23	25.48	586	24	22.58	542	242	-.771	.440
		RR-E	23	26.07	599.50	24	22.02	528.50	228.50	-1.073	.283
2	Understanding	SA-I	23	24.83	571	24	23.21	557	257	-.465	.642
		SA-O	23	25.09	577	24	22.96	551	251	-.567	.571
		RR-I	23	27.61	635	24	20.54	493	193	-1.849	.064
		RR-O	23	25.65	590	24	22.42	538	238	-.840	.401
		RR-E	23	26.24	603.50	24	21.85	524.50	224.50	-1.143	.253
3	Applying	SA-I	23	25.50	586.50	24	22.56	541.50	241.50	-.788	.431
		SA-O	23	23.85	548.50	24	24.15	579.50	272.50	-.079	.937
		RR-I	23	27.65	636	24	20.50	492	192	-1.921	.055
		RR-O	23	27.39	630	24	20.75	498	198	-1.830	.067
		RR-E	23	28.13	647	24	20.04	481	181	-2.166	.030
4	Analyzing	SA-I	23	25.98	597.50	24	22.10	530.50	230.50	-1.007	.314
		SA-O	23	26.65	613	24	21.46	515	215	-1.344	.179
		RR-I	23	29.89	687.50	24	18.35	440.50	140.50	-2.969	.003
		RR-O	23	30.04	691	24	18.21	437	137	-3.053	.002
		RR-E	23	31	713	24	17.29	415	115	-3.546	.000
5	Evaluating	SA-I	23	27.65	636	24	20.50	492	192	-1.850	.064
		SA-O	23	26.57	611	24	21.54	517	217	-1.272	.203
		RR-I	23	28.54	656.50	24	19.65	471.50	171.50	-2.380	.017
		RR-O	23	28.70	660	24	19.50	468	168	-2.476	.013
		RR-E	23	29.54	679.50	24	18.69	448.50	148.50	-2.996	.003
6	Creating	SA-I	23	24.93	573.50	24	23.10	554.50	254.50	-.465	.642
		SA-O	23	27.17	625	24	20.96	503	203	-1.572	.116
		RR-I	23	28.54	656.60	24	19.65	471.50	171.50	-2.380	.017
		RR-O	23	28.70	660	24	19.50	468	168	-2.476	.013
		RR-E	23	29.54	679.50	24	18.69	448.50	148.50	-2.996	.003

SA-I= Short Answer-Interpretation; SA-O= Short Answer- Organization; RR-I= Restricted Response- Interpretation; RR-O= Restricted Response-Organization; RR-E= Restricted Response-Elaboration

Table 4.68 displayed the mean rank of overall gain scores of experimental and control groups on organization and interpretation of short answer questions, organization, interpretation and elaboration of restricted response items. The p-value (significance value) of Mann-Whitney U test was found to be statistically significant for interpretation on restricted response items at remembering level, elaboration on restricted response items at applying level, and for all the three components (i.e., interpretation, organization and elaboration) of restricted response items at analyzing, evaluating and creating levels.

Table 4.68 showed higher mean rank of gain scores of experimental group than control group on interpretation and organization of short answer questions at remembering level. Similarly, the experimental group had higher mean rank than control group for gain scores on interpretation, organization and elaboration of restricted response items at remembering level. However, the result of Mann-Whitney U test found statistically significant difference only for interpretation of restricted response item with higher mean rank of gain scores of experimental group at remembering level (table 4.68).

The experimental group showed higher mean rank of gain scores on test items at understanding level than control group (table 4.68). However, statistically non-significant difference was found between gain scores of experimental and control group on interpretation and organization of short answer and restricted response items in addition to elaboration of restricted response items at understanding level, as given in table 4.68.

Table 4.68 indicated higher mean rank of gain scores of experimental group than control group on interpretation of short answer question and restricted response items, and organization and elaboration of restricted response items at applying level. The mean rank of control group on organization of short answer items was higher than experimental group. However, statistically significant difference was found between control and experimental group only for elaboration of restricted response items with higher mean rank of gain scores of experimental group at applying level, as shown in table 4.68.

Table 4.68 showed the mean rank of gain scores of experimental and control groups on short answer and restricted response items at analyzing level. The mean rank of gain scores of experimental group was higher than control group on interpretation and organization of short answer questions and restricted response questions, and elaboration of restricted response items. Statistically non-significant difference was found between experimental and control group on mean rank of gain scores on interpretation and organization of short answer question. Statistically significant difference was found between mean rank of experimental and control group for interpretation, organization and elaboration of restricted response items with higher mean rank for experimental group at analyzing level (table 4.68).

Table 4.68 showed higher mean rank of gain scores of experimental group than control group for interpretation and organization of short answer questions and restricted response items, and elaboration of restricted response items at evaluating level. However, statistically non-significant difference was found between experimental and control group for mean rank of gain scores on interpretation and organization of short answer questions. Statistically significant difference was observed between mean rank of gain scores of experimental and control group on interpretation, organization and elaboration of restricted response items with higher mean rank for experimental group at evaluating level, as given in table 4.68.

Table 4.68 showed higher mean rank of gain score of experimental group than control group on interpretation and organization of short answer questions and restricted response items, and elaboration of restricted response items for creating level. Statistically non-significant difference was observed between mean rank of gain score of experimental and control group on interpretation and organization of short answer questions. The p-value of Mann-Whitney U test showed statistically significant difference between mean rank of gain scores of experimental and control group on interpretation, organization and elaboration of restricted response items at creating level with a higher mean rank of experimental group, as indicated in table 4.68. Keeping in view the data analysis output, the researcher failed to accept null hypothesis "there was statistically no significant difference between academic achievement scores of prospective teachers of experimental and control group for the whole study duration".

H_o42 There was statistically no significant difference among academic achievement scores of prospective teachers of experimental group during first phase of the study.

Table 4.69

Comparative Analysis of Pretest-1 and Posttest-1 of Experiemntal Group on Achievment Test (1st Phase of Study)

S#	Level of item	Item type	N	Pretest-1		Posttest-2		Mean rank positive	Positive rank	Negative rank	Z value	Sig value
				Mean	SD	Mean	SD					
1	Remembering	[1]SA-I	23	.087	.288	3.391	1.88	12.45[6]	22	1	-4.153	.000
		[2]SA-O	23	.087	.288	2.83	2.27	10.44[7]	18[17]	1	-3.763	.000
		[3]RR-I	23	.000	.000	.217	.42	3.00	5[18]	0	-2.236	.025
		[4]RR-O	23	.000	.000	.174	.39	2.50	4[19]	0	-2.000	.046
		[5]RR-E	23	.000	.000	1.30	.34	2.00	3[20]	0	-1.732	.083
2	Understanding	[1]SA-I	23	.000	.000	.217	.42	3.00	5[21]	0	-2.236	.025
		[2]SA-O	23	.000	.000	.304	.63	3.00	5[22]	0	-2.070	.038
		[3]RR-I	23	.000	.000	.260	.54	3.00	5[23]	0	-2.121	.034
		[4]RR-O	23	.000	.000	.174	.39	2.50	4[24]	0	-2.000	.046
		[5]RR-E	23	.000	.000	.130	.34	2.00	3[25]	0	-1.732	.083
3	Applying	[1]SA-I	23	.000	.000	.348	.57	4.00	7[26]	0	-2.530	.011
		[2]SA-O	23	.000	.000	.260	.54	3.00	5[27]	0	-2.121	.034
		[3]RR-I	23	.000	.000	.783	.59	8.50	16[28]	0	-3.189	.000
		[4]RR-O	23	.000	.000	.652	.57	7.50	14[29]	0	-3.638	.000
		[5]RR-E	23	.000	.000	.435	.50	5.50	10[30]	0	-3.162	.002
4	Analyzing	[1]SA-I	23	2.913	1.41	3.522	.84	9.62[8]	13[31]	5	-1.771	.076
		[2]SA-O	23	4.087	2.02	5.435	.84	9.21[9]	14[32]	2	-3.192	.001
		[3]RR-I	23	.043	.208	.913	.73	8.50	16[33]	0	-3.704	.000
		[4]RR-O	23	.043	.208	.826	.65	8.00	15[34]	0	-3.626	.000
		[5]RR-E	23	.043	.208	.478	.59	6.05[10]	10[35]	1	-2.673	.008
5	Evaluating	[1]SA-I	23	3.30	1.55	4.652	1.11	10.13[11]	16[36]	2	-3.378	.001
		[2]SA-O	23	4.74	1.96	6.435	1.50	9.31[12]	16[37]	1	-3.464	.001
		[3]RR-I	23	.043	.208	.174	.39	2.00	3[38]	0	-1.732	.083
		[4]RR-O	23	.043	.208	.174	.39	2.00	3[39]	0	-1.732	.083
		[5]RR-E	23	.043	.208	.043	.20	1.50[13]	1[40]	1	-.000	1.00
6	Creating	[1]SA-I	23	4.04	1.39	6.869	1.32	12.30[14]	20[41]	2	-3.906	.000
		[2]SA-O	23	4.95	1.87	4.826	1.43	7.50[15]	7	8	-3.603	.665
		[3]RR-I	23	.043	.208	.173	.39	2.00	3[42]	0	-1.732	.083
		[4]RR-O	23	.043	.208	.173	.39	2.00	3[43]	0	-1.732	.083
		[5]RR-E	23	.043	.208	.043	.20	1.50[16]	1[44]	1	-.000	1.00

[1]Short Answer-Interpretation. [2]Short Answer- Organization. [3]Restricted Response- Interpretation. [4]Restricted Response-Organization. [5]Restricted Response-Elaboration. [6]Negative mean rank was 2.00. [7]Negative mean rank was 1.00. [8]Negative mean rank was 9.20. [9]Negative mean rank was 3.50. [10]Negative mean rank was 5.50. [11]Negative mean rank was 4.50. [12] Negative mean rank was 4.00. [13] Negative mean rank was 1.50. [14] Negative mean rank was 3.50. [15] Negative mean rank was 8.44. [16] Negative mean rank was 1.50. [17]4 Ties. [18]18 Ties. [19]19 Ties. [20]20 ties. [21]18 Ties. [22]18 Ties. [23]18 Ties. [24]19 Ties. [25]20 Ties. [26]16 Ties. [27]18 Ties. [28]7 Ties. [29]9 Ties. [30]13 Ties. [31]5 Ties. [32]7 Ties. [33]7 Ties. [34]8 Ties. [35]12 Ties. [36]5 Ties. [37]5 Ties. [38]20 Ties. [39]20 Ties. [40]21 Ties. [41]1 Ties. [42]20 Ties. [43]20 Ties. [44]21 Ties.

Table 4.69 showed the pretest-1 and posttest-1 mean scores of experimental group on academic achievement test for first phase of the study. The mean test scores of experimental group were obtained on short answer question and restricted response items at remembering, understanding, applying, analyzing, evaluating and creating levels on pretest-1 and posttest-1, as shown in table 4.69.

Statistically significant difference was found between pretest-1 and posttest-1 mean score of experimental group for first phase of the study for interpretation ($z=-4.153$, $p<.05$) and organization ($z=-3.763$, $p<.05$) of short-answer questions at knowledge level, as shown in table 4.69. Table 4.69 also indicated statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group at interpretation ($z=-2.236$, $p<.05$) and organization ($z=-2.00$, $p<.05$) of restricted response items at knowledge level. For elaboration of restricted response items at knowledge level, statistically non-significant difference ($z=-1.732$, $p>.05$) was observed between pretest-1 and posttest-1 mean scores of experimental group (table 4.69). Table 4.69 also showed statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group at interpretation ($z=-2.236$, $p<.05$) and organization ($z=-2.070$, $p<.05$) of short-answer questions, and interpretation ($z=-2.121$, $p<.05$) and organization ($z=-2.00$, $p<.05$) of restricted response items at understanding level. However, statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group on elaboration ($z=-1.732$, $p>.05$) of restricted response items at understanding level, as shown in table 4.69. Table 4.69 indicated statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-2.530$, $p<.05$) and organization ($z=-2.121$, $p<.05$) of short-answer questions, and on interpretation ($z=-3.189$, $p<.05$) and organization($z=-3.638$, $p<.05$) and elaboration ($z=-3.162$, $p<.05$) of restricted response items at applying level. Statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-1.771$, $p>.05$) of short answer question at analyzing level. Table 4.69 showed statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group on organization of short-answer questions ($z=-3.192$, $p<.05$) and restricted response items ($z=-3.626$, $p<.05$), and interpretation ($z=-3.704$, $p<.05$) and elaboration ($z=-2.673$, $p<.05$) of restricted response items at analyzing level. Statistically significant difference was found between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-3.378$, $p<.05$) and organization ($z=-3.464$, $p<.05$) of short answer questions at evaluating level, as given in table 4.69. However, statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-1.732$, $p>.05$), organization ($z=-1.732$, $p>.05$) and elaboration ($z=-.000$, $p>.05$) of restricted response items at evaluating level, as shown in table 4.69. Table 4.69 showed statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-3.906$, $p<.05$) of short answer questions at creating level. Statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group on organization of short answer questions ($z=-3.603$, $p>.05$), and organization ($z=-1.732$, $p>.05$), interpretation ($z=-1.732$, $p>.05$) and elaboration ($z=-.000$, $p>.05$) of restricted response items, as shown in table 4.69. Keeping in view the data analysis output, the researcher failed to accept null hypothesis "there was statistically no significant difference among academic achievement scores of prospective teachers of experimental group during first phase of the study".

H_o43 There was statistically no significant difference among academic achievement scores of prospective teachers of experimental group during second phase of the study.

Table 4.70

Comparative Analysis of Pretest-2 and Posttest-2 of Experiemntal Group on Achievment Test (2nd Phase of Study)

S#	Level of item	Item type	N	Pretest-1		Posttest-2		Mean rank positive	Positive rank	Negative rank	Z value	Sig value
				Mean	SD	Mean	SD					
1	Remembering	[1]SA-I	23	.609	.891	8.13	2.12	12	23	0	-4.209	.000
		[2]SA-O	23	.609	.891	7.87	2.26	11.50	22[10]	0	-4.125	.000
		[3]RR-I	23	.043	.208	1.739	.689	11	21[11]	0	-4.167	.000
		[4]RR-O	23	.043	.208	1.391	.940	9	17[12]	0	-3.720	.000
		[5]RR-E	23	.043	.208	1.391	.940	10.33[6]	18[13]	1	-3.747	.000
2	Understanding	[1]SA-I	23	.348	.487	1.26	.688	8.73[7]	15[14]	1	-3.358	.001
		[2]SA-O	23	.304	.47	1.174	.778	9.47[8]	15[15]	2	-3.201	.001
		[3]RR-I	23	.043	.208	2.652	1.11	11.50	22[16]	0	-4.160	.000
		[4]RR-O	23	.043	.208	2.260	1.29	10.50	20[17]	0	-3.961	.000
		[5]RR-E	23	.043	.208	2.217	1.24	10	19[18]	0	-3.920	.000
3	Applying	[1]SA-I	23	.043	.208	1.26	.86	9.00	17[19]	0	-3.758	.000
		[2]SA-O	23	.043	.208	1.087	.90	8.00	15[20]	0	-3.520	.000
		[3]RR-I	23	.043	.208	2.652	.93	12	23	0	-4.238	.000
		[4]RR-O	23	.043	.208	2.522	.99	12	23	0	-4.239	.000
		[5]RR-E	23	.043	.208	2.391	.99	12	23	0	-4.239	.000
4	Analyzing	[1]SA-I	23	2.478	.79	5.87	.34	12.00	23	0	-4.298	.000
		[2]SA-O	23	2.521	.66	3.52	.66	7.50	14[21]	0	-3.360	.001
		[3]RR-I	23	.043	.208	2.956	1.19	12	23	0	-4.232	.000
		[4]RR-O	23	.043	.208	2.826	1.23	12	23	0	-4.230	.000
		[5]RR-E	23	.043	.208	2.652	1.23	12	23	0	-4.238	.000
5	Evaluating	[1]SA-I	23	3.739	.54	4.96	.877	10.76[9]	19[22]	1	-3.826	.000
		[2]SA-O	23	3.348	.93	6.869	1.36	11.50	22[23]	0	-4.144	.000
		[3]RR-I	23	.000	.000	1.217	.95	8.50	16[24]	0	-3.630	.000
		[4]RR-O	23	.000	.000	1.174	.98	8	15[25]	0	-3.535	.000
		[5]RR-E	23	.000	.000	1.087	.95	8	15[26]	0	-3.493	.000
6	Creating	[1]SA-I	23	3.174	.89	5.30	1.02	11	21[27]	0	-4.050	.000
		[2]SA-O	23	2.956	.928	7.22	1.04	12	23	0	-4.221	.000
		[3]RR-I	23	.000	.000	1.217	.95	8.50	16[28]	0	-3.630	.000
		[4]RR-O	23	.000	.000	1.174	.98	8	15[29]	0	-3.535	.000
		[5]RR-E	23	.000	.000	1.087	.95	8	15[30]	0	-3.493	.000

[1]Short Answer-Interpretation. [2]Short Answer- Organization. [3]Restricted Response- Interpretation. [4]Restricted Response-Organization. [5]Restricted Response-Elaboration. [6]Negative mean rank was 4.00. [7]Negative mean rank was 5.00. [8]Negative mean rank was 5.50. [9]Negative mean rank was 5.50. [10]1 Ties. [11]2 Ties. [12]6 Ties. [13]4 Ties. [14]7 Ties. [15]6 Ties. [16]1 Ties. [17]3 Ties. [18]4 Ties. [19]6 Ties. [20]8 Ties. [21]9 ties. [22]3 Ties. [23]1 Ties. [24]7 Ties. [25]8 Ties. [26]8 Ties. [27]2 Ties. [28]7 Ties. [29]8 Ties. [30]8 Ties.

Table 4.70 showed the pretest-2 and posttest-2 mean scores of experimental group on academic achievement test during second phase of the study. The mean test scores of experimental group were obtained on short answer question and restricted response items at remembering, understanding, applying, analyzing, evaluating and creating on pretest-2 and posttest-2, as shown in table 4.70.

Statistically significant difference was found between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-4.209$, $p<.05$) and organization ($z=-4.125$, $p<.05$) of short-answer questions at remembering level for second phase of the study (table 4.70). Table 4.70 indicated statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-4.167$, $p<.05$), organization ($z=-3.720$, $p<.05$) and elaboration ($z=-3.747$, $p<.05$) of restricted response items at remembering level. Table 4.70 showed statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-3.358$, $p<.05$) and organization ($z=-3.201$, $p<.05$) of short-answer questions, interpretation ($z=-4.160$, $p<.05$) and organization ($z=-3.961$, $p<.05$) and elaboration ($z=-3.920$, $p<.05$) of restricted response items at understanding level. Table 4.70 showed statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-3.758$, $p<.05$) and organization ($z=-3.520$, $p<.05$) of short-answer questions, and interpretation ($z=-4.238$, $p<.05$), organization ($z=-4.239$, $p<.05$) and elaboration ($z=-4.239$, $p<.05$) of restricted response items at applying level. Table 4.70 displayed statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-4.298$, $p<.05$) and organization ($z=-3.360$, $p<.05$) of short-answer questions, and interpretation ($z=-4.232$, $p<.05$), organization ($z=-4.230$, $p<.05$) and elaboration ($z=-4.238$, $p<.05$) of restricted response items at analyzing level. Statistically significant difference was found between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-3.826$, $p<.05$) and organization ($z=-4.144$, $p<.05$) of short answer questions, and interpretation ($z=-3.630$, $p<.05$), organization ($z=-3.535$, $p<.05$) and elaboration ($z=-3.493$, $p<.05$) of restricted response items at evaluating level, as given in table 4.70. Table 4.70 indicated a statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-4.050$, $p<.05$) and organization ($z=-4.221$, $p<.05$) of short answer questions, and interpretation ($z=-3.630$, $p<.05$), organization ($z=-3.535$, $p<.05$) and elaboration ($z=-3.493$, $p<.05$) of restricted response items at creating level. Keeping in view the data analysis output, the researcher failed to accept null hypothesis "there was statistically no significant difference among academic achievement scores of prospective teachers of experimental group during second phase of the study".

H_o44 There was statistically no significant difference among academic achievement scores of prospective teachers of experimental group for the whole study duration.

Table 4.71

Comparative Analysis of Pretest-1 and Posttest-2 of Experiemntal Group on Achievment Test (Whole Study Duration)

S#	Level of item	Item type	N	Pretest-1		Posttest-2		Mean rank positive	Positive rank	Negative rank	Z value	Sig value
				Mean	SD	Mean	SD					
1	Remembering	[1]SA-I	23	.087	.288	8.13	2.12	12	23	0	-4.213	.000
		[2]SA-O	23	.087	.288	7.87	2.26	12	23	0	-4.215	.000
		[3]RR-I	23	.000	.000	1.739	.689	11.50	22[11]	0	-4.247	.000
		[4]RR-O	23	.000	.000	1.391	.940	9.50	18[12]	0	-3.816	.000
		[5]RR-E	23	.000	.000	1.391	.940	9.50	18[13]	0	-3.816	.000
2	Understanding	[1]SA-I	23	.000	.000	1.26	.688	10.50	20[14]	0	-4.041	.000
		[2]SA-O	23	.000	.000	1.174	.778	9.50	18[15]	0	-3.834	.000
		[3]RR-I	23	.000	.000	2.652	1.11	11.50	22[16]	0	-4.164	.000
		[4]RR-O	23	.000	.000	2.260	1.29	10.50	20[17]	0	-3.969	.000
		[5]RR-E	23	.000	.000	2.217	1.24	10.50	20[18]	0	-4.006	.000
3	Applying	[1]SA-I	23	.000	.000	1.26	.86	9.00	17[19]	0	-3.787	.000
		[2]SA-O	23	.000	.000	1.087	.90	8.00	15[20]	0	-3.542	.000
		[3]RR-I	23	.000	.000	2.652	.93	12	23	0	-4.246	.000
		[4]RR-O	23	.000	.000	2.522	.99	12	23	0	-4.249	.000
		[5]RR-E	23	.000	.000	2.391	.99	12	23	0	-4.248	.000
4	Analyzing	[1]SA-I	23	2.913	1.41	5.87	.34	12.00	23	0	-4.247	.000
		[2]SA-O	23	4.087	2.02	3.52	.66	11.29[6]	7[21]	14	-1.290	.197
		[3]RR-I	23	.043	.208	2.956	1.19	12	23	0	-4.232	.000
		[4]RR-O	23	.043	.208	2.826	1.23	12	23	0	-4.230	.000
		[5]RR-E	23	.043	.208	2.652	1.23	12	23	0	-4.238	.000
5	Evaluating	[1]SA-I	23	3.30	1.55	4.96	.877	11.11[7]	18[22]	2	-3.591	.000
		[2]SA-O	23	4.74	1.96	6.87	1.36	9.88[8]	17[23]	1	-3.614	.000
		[3]RR-I	23	.043	.208	1.217	.95	8.50	16[24]	0	-3.611	.000
		[4]RR-O	23	.043	.208	1.174	.98	8	15[25]	0	-3.508	.000
		[5]RR-E	23	.043	.208	1.087	.95	8	15[26]	0	-3.487	.000
6	Creating	[1]SA-I	23	4.04	1.39	5.30	1.02	11.69[9]	16[27]	4	-3.101	.002
		[2]SA-O	23	4.95	1.87	7.22	1.04	10.93[10]	20[28]	1	-3.603	.000
		[3]RR-I	23	.043	.208	1.217	.95	8.50	16[29]	0	-3.611	.000
		[4]RR-O	23	.043	.208	1.174	.98	8	15[30]	0	-3.508	.000
		[5]RR-E	23	.043	.208	1.087	.95	8	15[31]	0	-3.487	.000

[1]Short Answer-Interpretation. [2]Short Answer- Organization. [3]Restricted Response- Interpretation. [4]Restricted Response-Organization. [5]Restricted Response-Elaboration. [6]Negative mean rank was 10.86. [7]Negative mean rank was 5.00. [8]Negative mean rank was 3.00. [9]Negative mean rank was 5.75. [10]Negative mean rank was 12.50. [11]1 Ties. [12]5 Ties. [13]5 Ties. [14]3 Ties. [15]5 Ties. [16]1 Ties. [17]3 Ties. [18]3 Ties. [19]6 Ties. [20]8 ties. [21]2 Ties. [22]3 Ties. [23]5 Ties. [24]7 Ties. [25]8 Ties. [26]8 Ties. [27]3 Ties. [28]2 Ties. [29]7 Ties. [30]8 Ties. [31]3 Ties.

Table 4.71 showed the pretest-1 and posttest-2 mean scores of experimental group for whole study duration on academic achievement test at remembering, understanding, applying, analyzing, evaluating and creating level.

Table 4.71 displayed statistically significant difference between pretest-1 and posttest-2 of experimental group on interpretation (z=-4.213, p<.05) and organization (z=-3.215, p<.05) of short answer questions at remembering level. Statistically significant difference was found between pretest-1 and posttest-2 of experimental group on interpretation (z=-4.247, p<.05), organization (z=-3.816, p<.05) and elaboration (z=-3.816, p<.05) of restricted response items at remembering level. Table 4.71 indicated statistically significant difference between pretest-1 and posttest-2 of experimental group for interpretation (z=-4.041, p<.05) and organization (z=-3.834, p<.05) of short answer questions at understanding level. Statistically significant difference was observed between pretest-1 and posttest-2 of experimental group on interpretation (z=-4.164, p<.05), organization (z=-3.969, p<.05) and elaboration (z=-4.006, p<.05) of restricted response items at understanding level. Table 4.71 displayed statistically significant difference between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.787, p<.05) and organization (z=-3.542, p<.05) of short answer questions at applying level. Statistically significant difference was observed between pretest-1 and posttest-2 of experimental group on interpretation (z=-4.246, p<.05), organization (z=-4.249, p<.05) and elaboration (z=-4.248, p<.05) of restricted response items at applying level, as given table 4.71. Table 4.71 also indicated statistically significant difference between pretest-1 and posttest-2 of experimental group on interpretation of short answer question (z=-4.247, p<.05) and restricted response items (z=-4.232, p<.05), and organization (z=-4.230, p<.05) and elaboration (z=-4.238, p<.05) of restricted response items at analyzing level. Statistically non-significant difference was observed between pretest-1 and posttest-2 of experimental group on organization of short answer question (z=-1.290, p>.05) at analyzing level, as given in table 4.71. Statistically significant difference was found between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.591, p<.05) and organization (z=-3.614, p<.05) of short answer question at evaluating level, as given in table 4.71. The statistically significant difference was also found between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.611, p<.05), organization (z=-3.508, p<.05) and elaboration (z=-3.487, p<.05) of restricted response items at evaluating level. Statistically significant difference was observed between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.101, p<.05) and organization (z=-3.603, p<.05) of short answer question at creating level, as given in table 4.71. Table 4.71 showed that the statistically significant difference was also found between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.611, p<.05), organization (z=-3.508, p<.05) and elaboration (z=-3.487, p<.05) of restricted response items, and organization and elaboration of restricted response items at creating level. Keeping in view the data analysis output, the researcher failed to accept null hypothesis "there was statistically no significant difference among academic achievement scores of prospective teachers of experimental group for the whole study duration".

4.3 Perception Scale About Flipped Classroom Instruction (FCI)

The data on perception scale was collected from participants of experimental group. The data from scale about perception of prospective teachers about Flipped Classroom Instruction (FCI) were analyzed construct wise through frequency, percentage, mean and standard deviation. There were five constructs in perception scale about FCI: Instruction of subject concepts, use of technology resources, classroom environment, social interaction and preference for instructional method.

The perception scale was a seven-point scale. The seven options against each item were definitely true (7 points), true (6 points), somewhat true (5 points), slightly true (4 points), somewhat untrue (3 points), untrue (2 points) and definitely untrue (1 points). The five items of perception scale were about the duration of use of technology tools per week for the course involved in this study. Table 4.71 showed the nominal data about duration of use of various technology tools for the course of the study.

4.2.1 Duration of Use of Technology Tools per Week by Participants of Experimental Group

Table 4.72
Duration of use of Various Technology Tools by Participants of Experimental Group per Week

Technology tool	08 hours and more	05 to 07 hours	02 to 04 hours	01 hour or less than 01 hour
Personal computer	0	4 (17.4%)	17 (73.9%)	2 (8.7%)
Internet	3 (13%)	7 (30.4%)	8 (34.8%)	5 (21.7%)
Phone call	0	5 (21.7%)	4 (17.4%)	14 (60.9%)
Text message	0	5 (21.7%)	5 (21.7%)	13 (56.5%)
WhatsApp	3 (13%)	6 (26.1%)	7 (30.4%)	7 (30.4%)

Table 4.72 showed the duration of use of various technology tools per week by the participants of experimental group for the course selected for this study. Most of the participants (17) used personal computer for 02-04 hours per week during the study; four participants used it for 05-07 hours per week and two participants used it for 01 or less than 01 hour per week for the course. Only three participants used the internet for 08 or more hours per week for this course, seven participants for 05-07 hours, and eight participants for 02-04 hours whereas five participants used internet for 01 or less than 01 hour per week for this course. The statistics for duration of use of phone call and text messages are very close. Fourteen participants used phone call for 01 hour or less than 01 hour and four persons for 02-04 hours per week for learning the course whereas five participants used it for 05-07 hours. Thirteen participants used text message for 01 hour or less than 01 hour

for learning course per week; five participants used it for 02-04 hours whereas five persons used it for 05-07 hour per week for the course. Just like internet, the use of WhatsApp was high among participants with 3 persons using it for 08 hours or more, 6 participants using it for 05-07 hours, 07 participants with 02-04 hours and 07 persons using the WhatsApp for 01 hour or less than 01 hour per week for course related activities. Figure 4.7 depicted a graphical picture of the data mentioned in table 4.72.

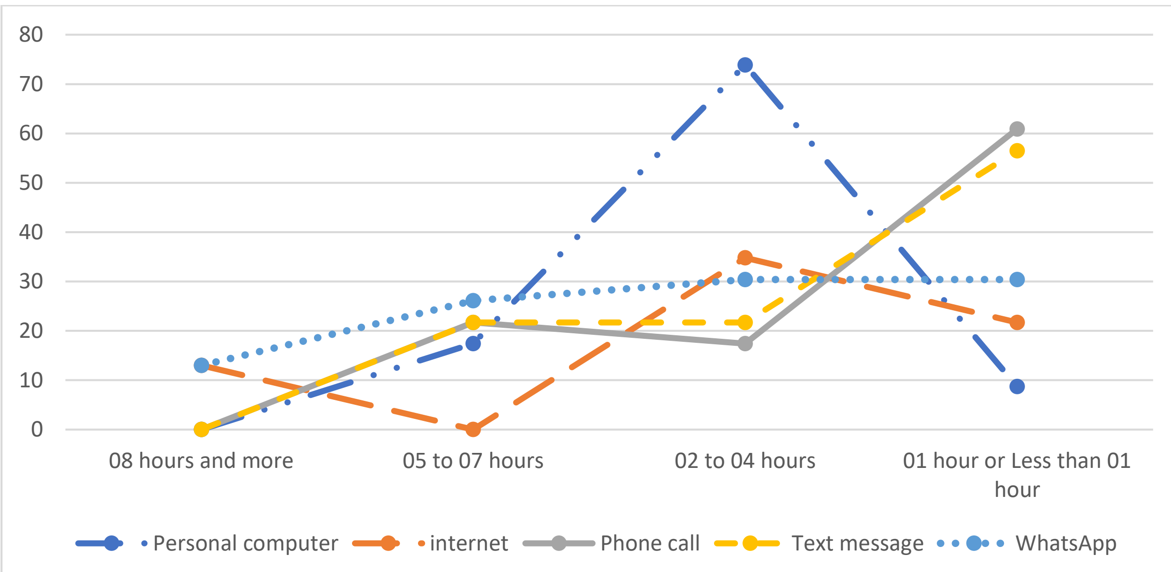


Figure 4.7 Duration of use of Various Technology Tools per Week by Participants of Experimental Group

Table 4.73

Duration of use of Technology Tools per Week by Various Academic Achievement Groups of Prospective Teachers

Technology tool	Academic achievement group	08 hours and more	05 to 07 hours	02 to 04 hours	01 hour or less than 01 hour
Personal computer	High achievers	0	1 (33.3%)	2 (66.7%)	0
	Average	0	3 (20%)	11 (73.3%)	1(6.7%)
	Low achievers	0	0	4 (80%)	1(20%)
Internet	High achievers	1 (33.3%)	1 (33.3%)	1 (33.3%)	0
	Average	2 (13.3%)	5 (33.3%)	5 (33.3%)	3 (20%)
	Low achievers	0	1 (20%)	2 (40%)	2 (40%)
Phone call	High achievers	0	1 (33.3%)	1 (33.3%)	1 (33.3%)
	Average	0	3 (20%)	2 (13.3%)	10 (66.7%)
	Low achievers	0	1 (20%)	1 (20%)	3 (60%)
Text message	High achievers	0	1(33.3%)	0	2 (66.7%)
	Average	0	4(26.7%)	3(20%)	8 (53.3%)
	Low achievers	0	0	2(40%)	3 (60%)
WhatsApp	High achievers	0	1 (33.3%)	0	2 (66.7%)
	Average	3 (20%)	4 (26.7%)	4 (26.7%)	4 (26.7%)
	Low achievers	0	1 (20%)	3 (60%)	1 (20%)

Table 4.73 showed the duration of use of various technology tools by high, average and low achiever group per week for the course. It showed that majority of high, average and low achievers used the personal computer for 02-04 hours per week for one course. The high achievers were using the internet for 08 or more hours, 05-07 hours and for 02-04 hours where the low achievers accessed the internet for 05-07 hours, 02-04 hours and 01 or less than one hour. Five average participants accessed the internet for 05-07 hours and five average group members used the internet for 02-04 hours per week where two and three average participants used the internet for 08 hours or more and 01 hours or less than 01 hour, respectively. Majority of the high, average and low achievers were using the phone call and text messages for 02-04 hours and 01 hour or less than 01 hour. Majority of the high achievers used the WhatsApp for 01 hour or less than 01 hour and majority of the low

achievers used for 02-04 hours for the course per week whereas the average group showed a balanced distribution for use of WhatsApp for all the available time slots. Figure 4.8 showed it.

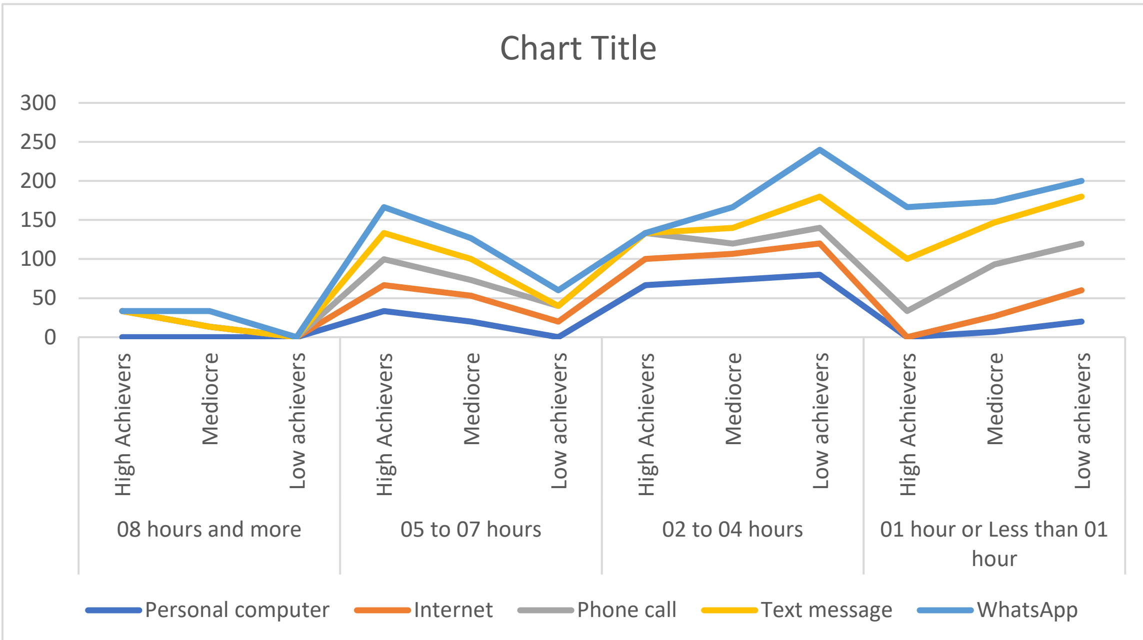


Figure 4.8 Duration of use of Technology Tools by Various Academic Achievement Groups of Prospective Teachers

4.2.2 Descriptive Statistical Analysis of Perception Scale About Flipped Classroom Instruction (FCI)

The descriptive analysis of perception scale about Flipped Classroom Instruction is given below. The mean and standard deviation of responses on constructs of perception scale are given in table 4.74.

Table 4.74

Descriptive Analysis of Responses of Experimental Group on Perception Scale About FCI

S#	Construct	Subconstruct	N	Mean of sub-construct	SD of sub-construct	Mean of construct	SD of construct
1.	Instruction of subject concepts	Understanding subject concepts	23	5.93	.54	6.02	.528
		Lesson structure	23	6.11	.66		
2.	Use of technology resources	Access to technology resources	23	6.13	.59	6.15	.53
		Ease of using technology resources	23	6.17	.76		
3.	Classroom environment	Learning environment	23	6.34	.42	5.87	.55
		Effort for learning	23	5.39	1.06		
4.	Social interaction	Access to teacher/peers	23	6.07	.48	6.15	.42
		Interactive activities	23	6.22	.46		
5.	Preference for instructional method	_	23	-	-	5.28	.42

As shown in table 4.74, the mean response of participants of experimental group was inclined towards "somewhat true" and "true" for all of the constructs and sub-constructs. As per responses on the sub-construct "lesson structure" (N=23; M= 6.11; SD=.66), student teachers perceived that use of technology for understanding concepts and relating classroom learning with daily life were focused during the class. As per mean response (N=23; M=5.93; SD=.54) on sub-construct "understanding concepts", the participants perceived that they have understood the subject concepts.

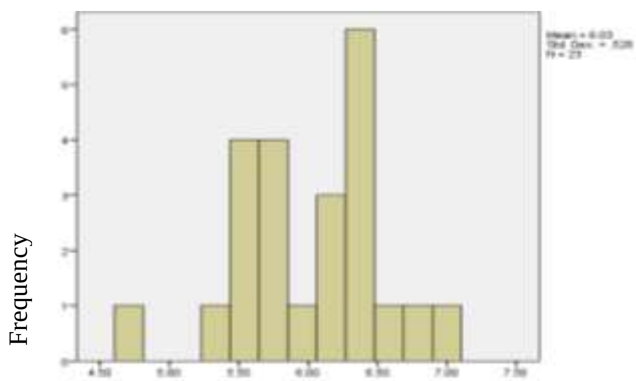
The statistical output for sub-construct "access to technology resources" (N=23; M=6.13; SD=.59) suggested that the participants of experimental had access and training for using technology tools. The mean response of participants of experimental group for sub-construct "ease of using technology resources" (N=23; M=6.17; SD=.76) indicated that they enjoyed the use of technology resources and used it for finding required information about the course.

The statistical output for sub-construct "learning environment" (N=23; M=6.34; SD=.42) showed that participants of experimental group perceived a positive experience with class activities, assessment, feedback on performance and personal growth. The mean response of participants of experimental group on sub-construct "effort for learning" (N=23; M=5.39; SD=1.06) showed that they, to some extent, worked harder to perform well in this course as compared to other courses.

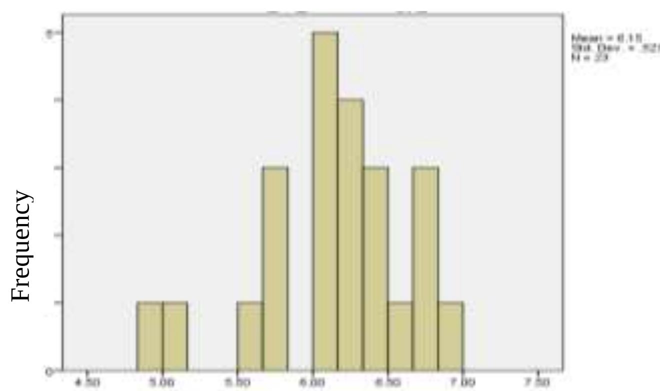
The mean response of participants of experimental group on sub-construct "access to teacher/peers" (N=23; M=6.07; SD=.48) showed that they had access to their teacher and peers for the learning support. The mean response of participants of experimental group on sub-construct "interactive activities" (N=23; M=6.22; SD=.46) showed that they had a supportive role of peers and teacher for the class activities. They also preferred to work in group activity as compared to individual class work.

The statistical output for construct "preference for instructional method" (N=23; M=5.28; SD=.42) showed that the satisfaction and preference of prospective teachers for instructional method was in favor of Flipped Classroom Instruction (FCI). However, the mean score of this construct was less as compared to other constructs. The possible reason may be that it required a considerable effort on the part of prospective teachers to adjust and work according to new class routine and requirements. Figure 4.10 showed a graphical picture of mean response and standard deviation of experimental group on constructs of perception scale about Flipped Classroom Instruction (FCI).

Keeping in view the larger value of standard deviation, it appeared that the data had wider spread of scores around mean value. Therefore, figure 4.9 presents the graphical display of the responses of participants of experimental group on constructs of perception scale about FCI. The graphs showed that almost all of the participants of experimental group were either true or somewhat true about various aspects covered in perception scale.



Values of Perception Scale for
Instruction of subject concepts



Values of Perception Scale for use
of technology resources

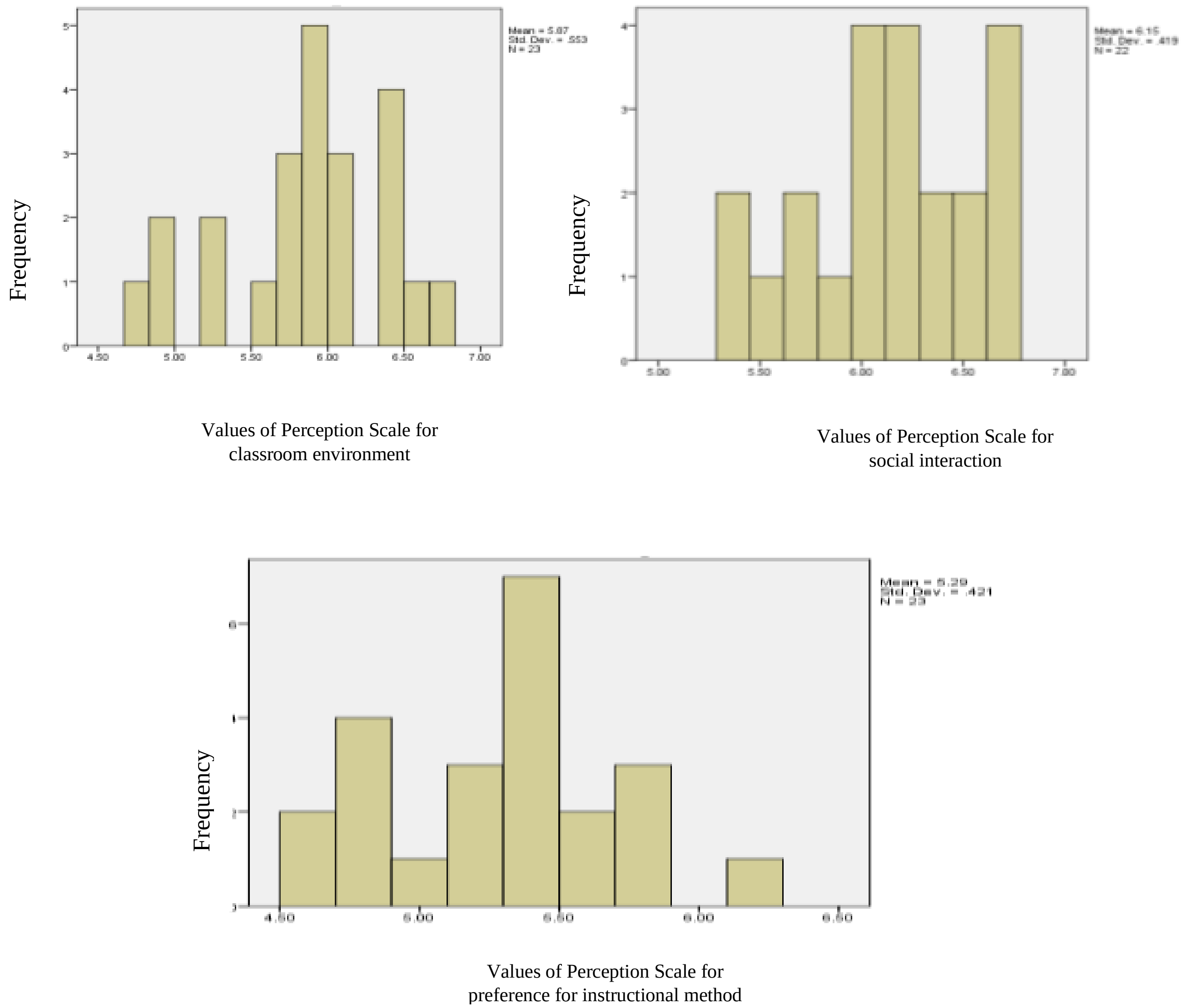


Figure 4.9 Graphical Representation of Responses on Perception Scale About FCI

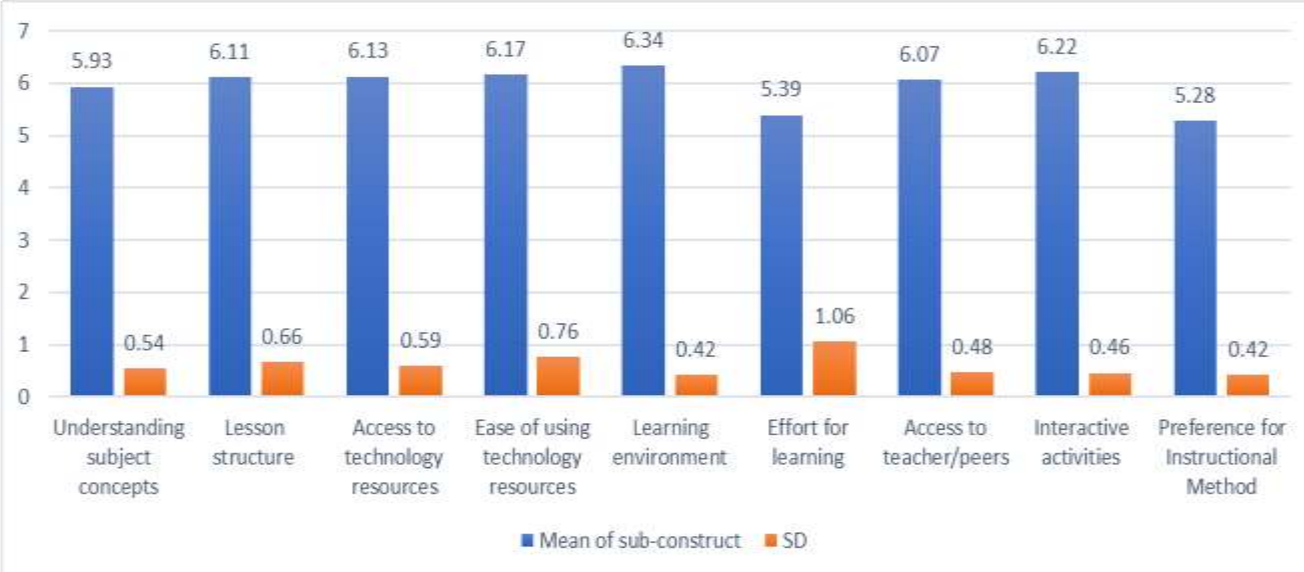


Figure 4.10 Mean Responses of Participants on Sub-constructs of Perception Scale

4.2.3 Academic Achievement Wise Analysis of Group Wise Perception of Prospective Teachers About Flipped Classroom Instruction (FCI)

Ho45 There was statistically no significant difference among perception of prospective teachers of achievement subgroups of experimental group about their learning experiences with Flipped Classroom Instruction (FCI).

Table 4.75
Mean Score and Standard Deviation of Experimental Group on Constructs of Perception Scale About FCI

S#	Construct	Group	N	Mean	SD	Mean rank	Chi-square	df	Sig value
1	Instruction of subject concepts	Low achiever	5	6.22	.49	16.10	2.416	2	.299
		Average	15	5.9	.56	10.47			
		High achiever	3	6.28	.24	12.83			
2	Utilization of technology resources	Low achiever	5	6.40	.81	16.70	6.934	2	.031
		Average	15	6.00	.42	9.30			
		High achiever	3	6.47	.09	17.67			
3	Classroom environment	Low achiever	5	5.82	.53	11.70	.210	2	.900
		Average	15	5.93	.54	12.40			
		High achiever	3	5.67	.82	10.50			
4	Social interaction	Low achiever	5	6.23	.52	13.30	2.276	2	.320
		Average	15	6.06	.41	10.00			
		High achiever	3	6.40	.18	15.50			
5	Preference for instructional method	Low achiever	5	5.36	.67	12.80	.647	2	.724
		Average	15	5.29	.36	12.30			
		High achiever	3	5.13	.30	9.17			

Table 4.75 showed the mean score, standard deviation and output of Kruskal-Wallis test for various academic achievement levels in experimental group on five constructs of perception scale about Flipped Classroom Instruction (FCI). The outputs of Kruskal-Wallis test showed statistically non-significant difference among various academic achievement subgroups on constructs of perception scale about FCI except utilization of technology resources. Therefore, the researcher failed to accept null hypothesis "there was statistically no significant difference among perception of prospective teachers of high, average and low achievement subgroups of experimental group about their learning experiences with

Flipped Classroom Instruction (FCI) ". Figure 4.11 showed the graphical representation of mean scores of three academic achievement groups on five constructs of perception scale about Flipped Classroom Instruction (FCI).

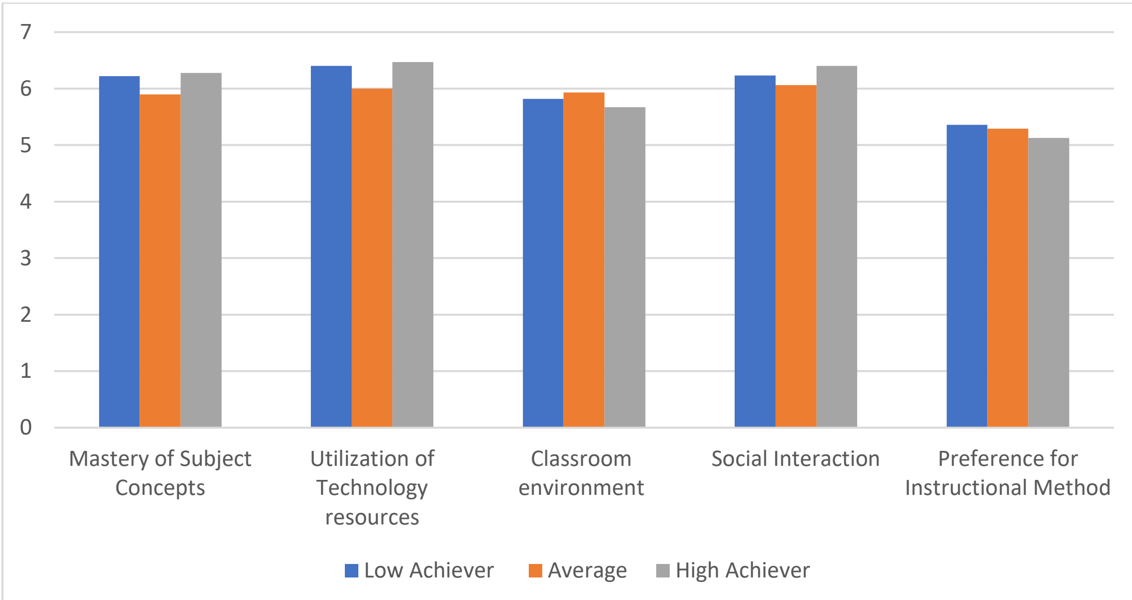


Figure 4.11 Mean Score of Participants of Experimental group on Constructs of Perception Scale About FCI

Keeping in view the statistically significant difference among academic achievement subgroups on their mean response on utilization of technology resources, a post-hoc test (i.e., Mann-Whitney U test) was applied for pairwise comparison of three academic achievement groups for construct "utilization of technology resources".

Table 4.76
Post-hoc (Mann-Whitney U) Test for Construct "Utilization of Tehncology Resources"

S#	Construct	Academic achievement	N	Mean	SD[1]	Mean rank	Mann-Whitney U	Sig value
1	Utilization of technology resources	Low achiever	5	6.40	.81	14.70	16.50	.066
		Average	15	6.00	.42	9.10		
2	Utilization of technology resources	Average	15	6.00	.42	8.20	3.00	.017
		High achiever	3	6.47	.09	16.00		
3	Utilization of technology resources	Low achiever	5	6.40	.81	5.00	5.00	.571
		High achiever	3	6.47	.09	3.67		

SD[1]= Standard Deviation

The test statistics in table 4.76 showed that high achievers had more positive perception about utilization of technology resources during course as compared to average group of prospective teachers (U=3.00, p=.020).

Table 4.77
Mean Score and Standard Deviation of Experimental Group on Sub-constructs of Perception Scale About FCI

S#	Construct	Subconstruct	Academic achievement	N	Mean	SD	Mean rank	Chi-square	df	Sig value
1	Instruction of subject concepts	Understanding subject concepts	Low achiever	5	6.25	.50	16.10	2.701	2	.259
			Average	15	5.82	.58	10.47			
			High achiever	3	6.00	.25	12.83			
		Lesson structure	Low achiever	.5	6.20	.65	12.60	1.813	2	.404
			Average	15	6.00	.69	10.90			
			High achiever	3	6.56	.50	16.50			
2	Utilization of technology resources	Access to technology resources	Low achiever	5	6.60	.43	17.70	7.681	2	.021
			Average	15	5.91	.58	9.23			
			High achiever	3	6.44	.19	16.33			
		Ease of using technology resources	Low achiever	5	6.20	1.25	14.60	2.165	2	.339
			Average	15	6.10	.66	10.53			
			High achiever	3	6.50	.00	15.00			
3	Classroom environment	Learning environment	Low achiever	5	6.13	.77	10.30	.760	2	.684
			Average	15	6.39	.29	12.07			
			High achiever	3	6.50	.17	14.50			
		Effort for learning	Low achiever	5	5.50	.50	12.60	.232	2	.891
			Average	15	5.47	1.12	12.13			
			High achiever	3	4.83	1.60	10.33			
4	Social interaction	Access to teacher/peers	Low achiever	5	6.13	.50	12.90	1.267	2	.531
			Average	15	6.00	.50	11.00			
			High achiever	3	6.33	.33	15.50			
		Interactive activities	Low achiever	5	6.32	.54	13.60	2.072	2	.355
			Average	15	6.13	.45	10.04			
			High achiever	3	6.47	.30	14.83			
5	Preference for instructional method	-	Low achiever	5	5.36	.67	12.80	.647	2	.724
			Average	15	5.29	.36	12.30			
			High achiever	3	5.13	.30	9.17			

Table 4.77 showed the mean score, standard deviation and outputs of Kruskal-Wallis test for various academic achievement levels in experimental group on sub-constructs of perception scale about Flipped Classroom Instruction (FCI). The output of Kruskal-Wallis test showed no statistically significant difference among various academic achievement subgroups on constructs of perception scale about FCI except ‘access to technology resources’.

Keeping in view the statistically significant difference among academic achievement subgroups on their mean response on access to technology resources, a post-hoc test (i.e., Mann-Whitney U test) was applied for pairwise comparison of academic achievement groups with each other for sub-construct "access to technology resources".

Table 4.78
Post-hoc (Mann-Whitney U) Test for Construct "Access to Technology Resources"

S#	Construct	Academic achievement	N	Mean	SD[1]	Mean rank	Mann-Whitney U	Sig value
1	Access to technology resources	Low achiever	5	6.13	.50	15.80	11.00	.019
		Average	15	6.00	.50	8.73		
2	Access to technology resources	Average	15	6.00	.50	8.50	7.50	.076
		High achiever	3	6.33	.33	14.50		
3	Access to technology resources	Low achiever	5	6.13	.50	4.90	5.50	.571
		High achiever	3	6.33	.33	3.83		

SD[1]=Standard Deviation

Table 4.78 showed that the low achievers had more positive perception about their access to technology resources during course as compared to average prospective teachers (U=11.00, p=.019).

4.2.4 Analysis of Responses of Experimental Group on Components of Flipped Classroom (A Part of Perception Scale about FCI)

Table 4.79 shows the various components of course taught through Flipped Classroom Instruction (FCI) rated by the participants of experimental group on the basis of what helped them most in learning course concepts, which components of Flipped Classroom Instruction (FCI) they liked the most and which components of Flipped Classroom Instruction (FCI) they found challenging during the research study. Their responses on this portion were collected after the study was completed.

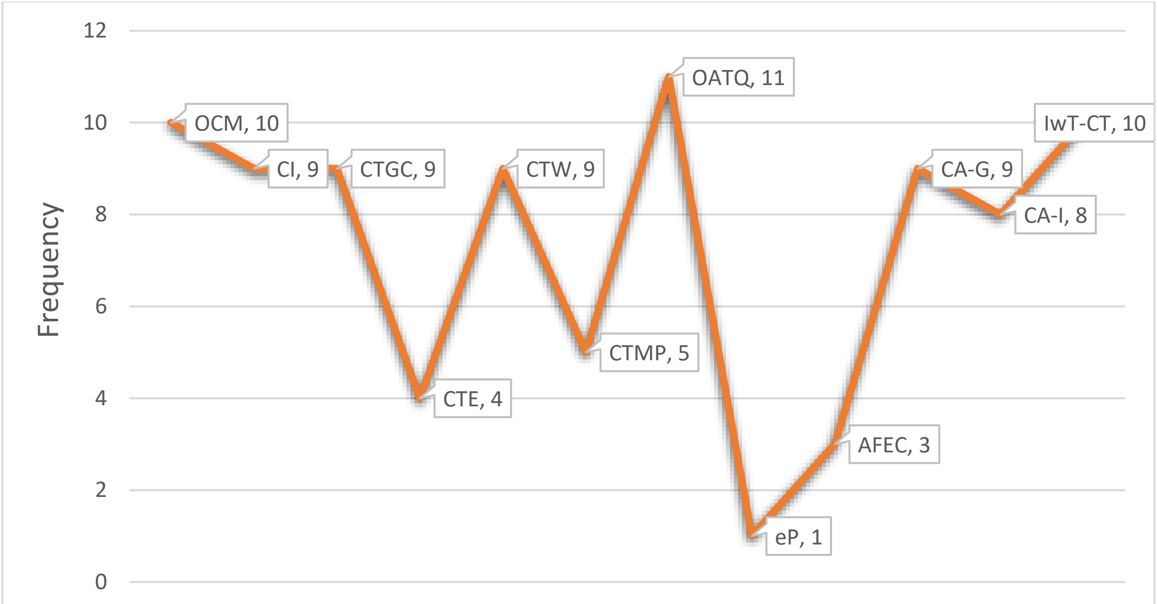
Table 4.79
Rating of Various Components of Course Using Flipped Classroom Instruction as Helpful, Interesting and Challenging

S#	Component of the course	Interesting	Liked	Challenging
1	Access to online course materials	10 (43.5%)	10(43.5%)	7(30.4%)
2	Classroom interaction	9 (39.1%)	9(39.1%)	8(34.8%)
3	Communication through Google Classroom	9 (39.1%)	6(26.1%)	6(26.1%)
4	Communication through email	4(17.4%)	5(21.7%)	1(4.3%)
5	Communication through WhatsApp	9(39.1%)	12(52.2%)	2(8.7%)
6	Communication through mobile phone	5(21.7%)	6(26.1%)	2(8.7%)
7	Online assessment through quiz	11(47.8%)	8(34.8%)	7(30.4%)
8	e-portfolio	1(4.3%)	1(4.3%)	2(8.7%)
9	Assessment for feedback at the end of a class	3(13%)	9(39.1%)	3(13%)
10	Classroom activity-group work	9 (39.9%)	6(26.1%)	5(21.7%)
11	Classroom activity-individual assignment	8(34.8%)	4(17.4%)	6(26.1%)
12	Interaction with teacher during class time	10(43.5%)	10(43.5%)	2(8.7%)

As shown in table 4.79, the feature of Flipped Classroom Instruction (FCI) rated by 47.8% participants as interesting was "online assessment through quiz" with "access to online course materials (marked by 43.5% participants)" and "interaction with teacher during class time (marked by 43.5% participants)" as second highest components. The component "classroom activity-group activity" was marked as interesting by 39.9% participants. The three features of Flipped Classroom Instruction (FCI) rated as interesting by 39.1% participants were "classroom interaction", "communication through Google Classroom" and "communication through WhatsApp". "Classroom activity-individual assignment" was rated as interesting by 34.8% participants. The four features of Flipped Classroom "communication through mobile phone", "communication through email", "assessment for feedback at the end of class" and "e-portfolio" were rated as interesting by 21.7%, 17.4%, 13% and 4.3% participants, respectively. Figure 4.12 depicted the statistics for various features of Flipped Classroom Instruction (FCI) rated as interesting by prospective teachers.

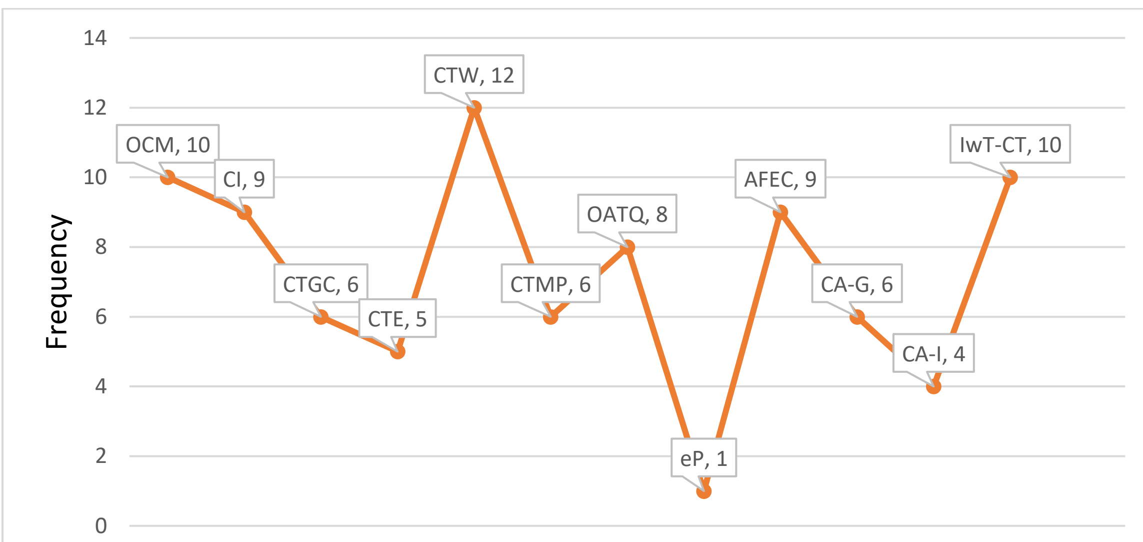
Table 4.79 showed statistics for features of Flipped Classroom Instruction (FCI) rated as liked by the participants. The feature liked by 52.2% participants was communication through WhatsApp. The features liked by 43.5% participants were access to online course materials and interaction with teacher during class time. "Classroom interaction" and "assessment for feedback at the end of a class" were liked by 39.1% participants. The feature "online assessment through quiz" was liked by 34.8% participants whereas "communication through Google Classroom", "communication through mobile phone" and "classroom activity-group work" were liked by 26.1% participants. Three features "communication through email", "classroom activity-individual assignment" and "e-portfolio" were liked by 21.7%, 17.4% and 4.3% participants. Figure 4.13 displayed the statistics for various features of Flipped Classroom Instruction (FCI) liked by participants of the experimental group.

According to the statistics given in table 4.79, the feature of Flipped Classroom Instruction (FCI) found challenging by 34.8% participants was classroom interaction whereas "access to online course materials" and "online assessment through quiz" were rated as challenging by 30.4% participants. The features "communication through Google Classroom" and "classroom activity-individual assignment" were found challenging by 26.1% participants. "Classroom activity-group work" was challenging for 21.7% participants and "assessment for feedback at the end of a class" was perceived as challenging by 13% participants. The features "communication through WhatsApp", "communication through mobile phone", "e-portfolio" and "interaction with teacher during class time" were found challenging by 8.7% participants whereas 4.3% participants found "communication through email" as a challenging feature of Flipped Classroom Instruction (FCI). Figure 4.14 showed the statistics for various features of Flipped Classroom Instruction (FCI) rated as challenging by participants of the experimental group.



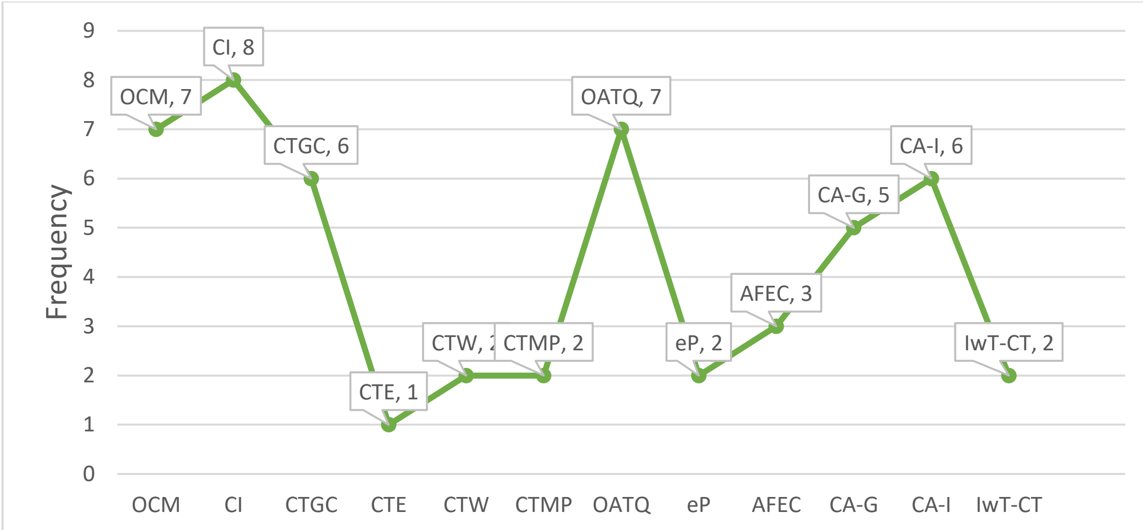
OCM= Access to online course materials; CI= Classroom interaction; CTGC= Communication through Google Classroom; CTE= Communication through Email; CTW= Communication through WhatsApp; CTMP= Communication through mobile phone; eP=e-Portfolio; OATQ= Online assessment through quiz; AFEC= Assessment for feedback at the end of a class; CA-G= Classroom activity-group work; CA-I= Classroom activity-individual assignment; IwT-CT= Interaction with Teacher during class time

Figure 4.12 Components of Flipped Classroom Rated as Interesting by Experimental Group



OCM= Access to online course materials; CI= Classroom interaction; CTGC= Communication through Google Classroom; CTE= Communication through Email; CTW= Communication through WhatsApp; CTMP= Communication through mobile phone; eP=e-Portfolio; OATQ= Online assessment through quiz; AFEC= Assessment for feedback at the end of a class; CA-G= Classroom activity-group work; CA-I= Classroom activity-individual assignment; IwT-CT= Interaction with Teacher during class time

Figure 4.13 Components of Flipped Classroom Liked by Experimental Group



OCM= Access to online course materials; CI= Classroom interaction; CTGC= Communication through Google Classroom; CTE= Communication through Email; CTW= Communication through WhatsApp; CTMP= Communication through mobile phone; *eP=e-Portfolio;* OATQ= Online assessment through quiz; AFEC= Assessment for feedback at the end of a class; CA-G= Classroom activity-group work; CA-I= Classroom activity-individual assignment; IwT-CT= Interaction with Teacher during class time

Figure 4.14: Components of Flipped Classroom Rated as Challenging by Experimental Group

Table 4.80

Various Components of Course Used for Flipped Classroom Instruction (FCI) Rated as Helpful for Learning, Interesting and Challenging by Experimental Group

S#	Component of the course	Interesting			Liked			Challenging		
		HA[1]	M[2]	LA[3]	HA[1]	M[2]	LA[3]	HA[1]	M[2]	LA[3]
1	Access to online course materials	1 (10%)	7 (70%)	2 (20%)	2 (20%)	6 (60%)	2 (20%)	0	5 (71.4%)	2 (28.6%)
2	Classroom interaction	2 (22.2%)	6 (66.7%)	1 (11.1%)	1 (11.1%)	6 (66.7%)	2 (22.2%)	1 (12.5%)	5 (62.5%)	2 (25%)
3	Communication through Google Classroom	2 (22.2%)	6 (66.7%)	1 (11.1%)	2 (33.3%)	4 (66.7%)	0	1 (16.7%)	3 (50%)	2 (33.3%)
4	Communication through email	1 (25%)	3 (75%)	0	2 (40%)	3 (60%)	0	0	1 (100%)	0
5	Communication through WhatsApp	3 (33.3%)	6 (66.7%)	0	2 (16.7%)	7 (58.3%)	3 (25%)	0	2 (100%)	0
6	Communication through mobile phone	1 (20%)	3 (60%)	1 (20%)	2 (33.3%)	4 (66.7%)	0	0	2 (100%)	0
7	Online assessment through quiz	1 (9.1%)	5 (45.5%)	5 (45.5%)	1 (12.5%)	6 (75%)	1 (12.5%)	0	5 (71.4%)	2 (28.6%)
8	e-portfolio	0	0	1 (100%)	0	0	1 (100%)	0	2 (100%)	0
9	Assessment for feedback at the end of a class	1 (33.3%)	1 (33.3%)	1 (33.3%)	1 (11.1%)	7 (77.8%)	1 (11.1%)	0	1 (33.3%)	2 (66.7%)
10	Classroom activity-group work	1 (11.1%)	5 (55.6%)	3 (33.3%)	1 (16.7%)	4 (66.7%)	1 (16.7%)	1 (20%)	2 (40%)	2 (40%)
11	Classroom activity-individual assignment	1 (12.5%)	5 (62.5%)	2 (25%)	1 (25%)	2 (50%)	1 (25%)	2 (33.3%)	3 (50%)	1 (16.7%)
12	Interaction with teacher during class time	1 (10%)	7 (70%)	2 (20%)	1 (10%)	5 (50%)	4 (40%)	0	1 (50%)	1 (50%)

[1]HA= High Achiever; [2]M= Average; [3]LA= Low Achiever

Table 4.80 showed the statistics of ratings of academic achievement group of experimental group for various features of Flipped Classroom Instruction (FCI). While looking at the ratings of features of FCI by participants as interesting, the features of FCI perceived as interesting by all academic achievement groups were "access to online course materials", "classroom interaction", "communication through Google Classroom", "classroom activity-group work", "classroom activity-individual assignment" and "interaction with teacher during class time". The features of FCI liked by most of the participants of different academic achievement subgroups of experimental group included "access to online course materials", "classroom interaction", "communication through WhatsApp", "online assessment through quiz", "classroom activity-group work" and "interaction with teacher during class time". The features of FCI which were perceived as challenging by most of the participants of various academic achievement groups, were "access to online course materials", "classroom interaction", "communication through Google Classroom", "online assessment through quiz", "classroom activity- group work" and "classroom activity-individual assignment".

4.4 Analysis of Focus Group Discussion About Learning Experiences with Flipped Classroom Instruction (FCI)

The focus group discussions were analyzed in Urdu language for each group. After the analysis of focus group discussion of five groups separately, the data was compared, integrated and/or merged for themes and subthemes of data. For this purpose, constant comparison analysis (Strauss & Corbin, 1998: as cited as Leech & Onwuegbuzie, 2008) was used. It consisted of three stages: open coding (attaching description to smaller chunks of data), axial coding (grouping the codes into categories on the basis of similarity of information involved in) and selective coding (creating a theory out of data by integrating and refining the information in the codes for generating themes). The constructs and sub-constructs of perception scale guided for grouping codes for sub-themes and themes. The description of themes was written in English language with some supporting quotes of prospective teachers from focus group discussion. The quotes are given in Urdu language.

4.4.1 Instruction of Subject Concepts

Under theme 'Instruction of Subject Concepts', the sub-themes related to participants experiences about learning of subject concepts and lesson structure are covered.

4.4.1.1 *Learning of Subject Concepts*

The sub-themes related to learning of subject concepts are given below:

1. **Expectations About Course.** The course "Critical Thinking and Reflective Practices" has been first time introduced in teacher education programme (B.Ed. 04 year). There is no such course offered at school/college level in Pakistani context. Therefore, participants of the study were not exactly aware of the contents of this course. So, when asked about expectations about the course, the participants had mixed opinions from being interested to study a new course to considering it a difficult course and nervousness. Only two out of 23 participants thought before the start of the semester that the course might be related to Psychology or thinking and generating new ideas. One student had a goal at the start of the semester for improving her result; another student aimed to understand the subject concepts and one student was nervous because she did not know how to use computer. About 07 participants considered this course difficult at the start of the semester whereas rest of the students were either confused or had no idea about what they would study/do. As the course was new and unique for prospective teacher, four participants were interested in the course.

2. Course Expectations Versus Course Overall Experience. When the participants were asked to share about their experiences of this course, their opinions were very positive about it. They felt some positive change in class routine. While comparing their classroom experiences with course expectations, the participants have a mixed opinion. The experience of five participants met their expectations for this course; the course expectations of nine participants were different and not good about this course so, their experience was very different and good. Some of their views are given below:

اسٹارٹ میں کنفیوزڈ تھے کیونکہ ایک (ٹیچنگ) میتھڈ سے دوسرے میتھڈ میں جا رہے تھے۔
یہ ہماری توقعات کے مطابق تھا۔ لرننگ اور انڈر اسٹینڈنگ بہتر ہوئی۔ انوائر منٹ اچھا تھا۔

پہلے ایکٹیوٹیز کا آئیڈیا نہیں تھا۔ جب ہم نے کچھ ایکٹیوٹیزانٹرنیٹ کے ذریعے کیں تو یہ نئی چیز تھی۔

پہلے کنفیوزڈ تھے لیکن اب ہر ٹاپک کلئیر ہے۔

انوالڈ ان ایکٹیوٹیز، انوالڈ ان ایکپیرینس اور نوٹس بھی ملتے تھے۔

اس کورس میں کانسیپٹس کلئیر ہوئے تو ہمیں رٹا لگانے کی ضرورت نہیں پڑی۔

میں نے سوچا تھا کہ ہم تھیوریٹیکلی پڑھیں گے اور ایگزیم دیں گے لیکن ایکٹیوٹیزایک ڈفرنٹ چیز تھی اس کورس میں۔

ہمیں سینئیرز نے بتایا تھا کہ (یہ) سبجیکٹ ٹف ہے لیکن ہمیں ایزی لگا۔

Some participants were comparing their experiences of this course with other courses, and found it different because of getting learning material before class time and studying it before class time, activities and quiz. Few of their comments about their experience are given below:

باقی سجیکٹس میں ہم ٹیسٹ کے لیے پڑھتے تھے۔

"اس سجیکٹ میں ہم نے ڈیلی کا ڈیلی پڑھا ہے اور ایک دن میں اتنا نہیں پڑھا۔"
(participants wanted to say that they studied on daily basis but as the material for one class was small so, per day it was not burdensome)

سائنس سجیکٹس سے یہ اس طرح مختلف تھا کہ سائنس سجیکٹس میں ہم اینڈ پر ایکسپیریمنٹ کرتے ہیں اور اس کورس میں ہر ٹاپک کے اینڈ پر ایکٹیوٹی کرتے تھے۔

مٹیریل ایک دن پہلے دیا جاتا تھا ہم ریوائز کرتے اور سوالات تیار کر کے آتے تھے۔ دوسری کلاسز میں آن دی سپاٹ پتہ لگتا تھا کہ آج یہ پڑھ رہے ہیں۔

پہلے ایسا نہیں سوچا تھا کہ کوئز اور ایکٹیوٹیز ڈیلی بیسز پر کریں گے لیکن کوئز اور ایکٹیوٹیز ڈیلی بیسز پر کیں۔ پہلے چیزوں کو اپلیکیشن لیول پر نہیں کرتے تھے لیکچر میتھڈ میں ایسا نہیں تھا۔ اس کورس میں اپلیکیشن لیول پر کام کیا اور سیکھا اور ڈیلی کا ڈیلی پڑھنا پڑا سو ہمیں یاد رہ گئے یہ ٹاپکس۔

3. **Duration of Class.** The class was of one-hour duration on one day and two hours duration on second day in every week. The participants were comparing this course routine with other courses and shared that they were involved in the lesson so they could not notice the passing of class time. One of the participated said,

سیشن بورنگ نہیں تھا۔۔۔ ہمیں وقت کا پتہ ہی نہیں لگتا تھا ایک یا دو گھنٹے کی کلاس کا پتہ ہی نہیں لگتا تھا۔ اور ریلیکس ہو کر کام کرتے تھے۔

4. **Components of Lesson Plan.** As the course was new and unique for prospective teacher so four participants were interested in the course because it was new for them. This course involved study of learning material at home, completing an online quiz in class, an interactive classroom activity within class time and writing a reflective journal after every class. One participant explained the routine of using learning material for this course.

جو بھی ٹاپک دیا جاتاتھا وہ کلاس سے پہلے پڑھ کر آتے تھے۔ پھر جو پرابلم ہوتاتھا وہ میڈم سے ڈسکس کرتے تھے۔

Various components of a lesson maintained the intertest of participants in the course. It included video, multimedia, computer, notes, quizzes, classroom activity, learning environment, learning material, teacher's guidance and reflective journal. Two participants mentioned the class environment as a source of interest for this course. One participant mentioned the reflective journal as a useful component of daily lesson plan. All of the participants were of the view that notes helped them to understand topics because they were easy and detailed so, that they had to search through internet for a few things. One participant said that each concept had at least one example; they could not see such practice with notes of other subjects. Two participants mentioned that we got notes along with videos, so it helped us a lot. One participant said that most of the time, we do not need to read notes because we had seen videos on the topic {so, she preferred to study by watching video, video watching might be time-saving and interesting for her}.

5. **Availability of Teacher's Guidance.** The role of teacher was very important in the course because students cannot understand learning material and/or complete learning activity without her guidance. So, the teacher ensured to be approachable for the students within and after class time. The students may

contact her after class time though text messages, phone call and WhatsApp. A class activity was based on the learning material for that topic so, it was necessary to understand the topic for successfully completing the activity. Two participants said,

شروع میں مشکل لگتا تھا لیکن ٹیچر کی گائیڈنس نے ہیلپ کی کورس میں انٹریسٹ لینے میں۔

6. **Progress Towards Becoming Independent Learner.** While working in Flipped Classroom, the participants were taking charge of their learning journey. They felt this change and mentioned it in focus group discussion. Two participants found that they were less dependent on others for understanding the learning material because when they were studying on their own, they got answers for questions arising in their mind. It also developed a sense of responsibility among students that they had to study the material before coming to class. In case, they were unable to read at home, they were given some time within class to study material then they attempted quiz and activity. The comments of these two participants are given below:

باقی کورس میں پہلے لیکچر پھر سوالات۔ اس (کورس) میں ہم پہلے خود پڑھتے پھر ایکٹیوٹی (کرتے) تو سوالات پوچھتے (تھے)۔ جب ہم خود (ایکٹیوٹی) کرتے تھے تو بہت سے سوالات کے جوابات خود بھی ملنا شروع ہوگئے اور خود سے پڑھنے کی اچھی عادت ڈیویلپ ہوئی۔

ہم لرننگ کے لیے دوسروں پر بہت کم انحصار کر رہے تھے۔باقی کورسز میں یہ ہوتا کہ ہم گھر سے آجاتے کہ ٹیچر لیکچر دیں گے لیکن اس (کورس) میں ہم خود تیاری کرتے پھر جو ڈفیکلٹی آتی وہ ٹیچر سے پوچھتے۔

(As we have to prepare by our own selves, so we have to be responsible.)

Few participants mentioned their unique experiences of attending this course including mental relaxation, course understanding, rephrasing answers in our own words and studying extra topics besides course outline.

(اس کورس میں) کوئی ایک ٹاپک بھی ہم نے جلدی میں نہیں پڑھا۔ ہر ٹاپک کے لیے ہم نے کوئز اور ایکٹیوٹی کی ہے تو ہمیں سارے ٹاپکس کلئیر ہیں۔

ہم کلاس میں مینٹلی ریلیکس ہو کر جاتے تھے۔

(ٹیچر نے) کورس کے علاوہ کچھ ٹاپکس ایکسٹرا بھی کروائے۔ ٹاپکس سے ہٹ کے بھی پڑھا کورس ٹاپکس کے علاوہ۔

یہ ایک تھیوریٹیکل سبجیکٹ تھا سواس سے ہمیں یہ آئیڈیا ملا کہ اس کو کیسے انٹیریسٹنگ اور ایکٹیوٹیز کے ذریعے کر سکتے ہیں۔ کریٹیکل تھنکنگ کو ڈرائی، بورنگ، تھیوریٹیکل سبجیکٹ سمجھا جاتا ہے۔

7. Applying Course Concepts in Various Situations. All of the participants were sure that they could apply the course material in activities. One participant said,

ایکسپلینیشن اور ڈیسکرپشن میں فرق پتہ لگا۔

Three participants said,

ریزننگ، ایویڈنس ڈھونڈنا اورریزننگ کی بنیاد پر کمپئیر کرنا سیکھا۔

A participant mentioned about learning brainstorming for various subjects and two other participants learnt about different types of questions. One participant mentioned that we can improve our future experiences on the basis of past experiences (*it is an implication of critical and reflective thinking*); another participant said,

کریٹیکل تھنکنگ کے ذریعے میں اپنے فیوچر ایکسپیر ینسز کو بہتر بنا سکتی ہوں۔-

Another participant shared that they practiced through activities so when they look at some topic, they can generate ideas. Twelve participants were of the view that we learnt to use our mind for critical thinking.

8. **Recognizing Class Activities for Grasping Course Concepts.** Under this sub-theme, the participants highlighted the importance of class activities for learning and applying concepts of the subject. Some participants also mentioned that they were able to use the skills in various real-life situations. All of the participants were in general agreement about the significance of class activities for understanding subject concepts. Three participants mentioned that the classroom activities enhanced their interest in the subject. Eight participants highlighted the importance of class activities for learning and clarifying concepts. Four other participants experienced thinking about others' points of view and diverse perspective of a situation. Two participants learnt the skills of analysis and synthesis whereas one participant developed self-analysis habit because of class activities. Some other benefits of class activities mentioned by participants are given below:

آن لائن ایکٹیوٹیز میرے لیے ایک نئی چیز تھی.

ہم نے 'لرننگ بائی ڈوئنگ' کے ذریعے سیکھا ہے۔

ایکٹیوٹیز کی وجہ سے ٹاپک کو سمپل لینگویج میں لکھ سکتی ہوں۔

ڈسکشن کی وجہ سے ہیزیٹیشن (ہچکچاہٹ)دور ہوئی۔

ڈسکشن (کی وجہ) سے کمیونیکیشن سکل بہتر ہوئی۔

میری کورس ایکسپیکٹیشنز (توقعات) پوری ہوئی ہیں کلاس ایکٹیوٹیز کے ونڈرفل ایکسپیرینس کی وجہ سے۔

There were group and individual class activities in the course; both types of activities were appreciated by the participants. One participant said,

انڈیویجول (انفرادی) اسائنمنٹ کی وجہ سے ایکٹیوٹی کو خود ختم کرنے کی ریسپانسبلٹی پیدا ہوئی اور گروپ ایکٹیویٹی کی وجہ سے ہمارا آپس میں انٹریکشن بڑھا ہے۔

Two other participants could easily recall subject concepts because they have performed class activities related to those concepts.

گروپ ڈسکشن مجھے بہت ایکسائیٹڈ کرتی تھی۔

ہم نے کویسچننگ ٹیکنیک اور کلاس کے اندر کیسے سوالات کرنے ہیں، کے بارے میں سیکھا۔

ہم ایگزیم میں خود سے جواب لکھ سکتے ہیں۔ اگر ہم ایک ٹاپک ریوائز نہیں کر سکتے تو پھر بھی ایکٹیویٹیز کی وجہ سے کم از کم ہمیں آئیڈیا ہے کہ ہم نے اس ٹاپک میں کیا پڑھا ہے۔

خود سے جواب لکھ سکتے ہیں۔

Some class activities were in group form and other were individual activities. While talking about their experiences with individual and group activities, two participants preferred group activities because group work helped them to finish their activity in less time. The comment of one participant is given below:

گروپ ایکٹیوٹی میں مزا آتا تھا لیکن انڈیویجول (انفرادی) ایکٹیوٹی مشکل لگتی تھی کیونکہ پہلے سمجھ نہیں آتی تھی جب (سمجھ) آتی تھی تب بہت ٹائم لگ جاتا تھا۔

The participants were completing their class activities in Urdu and English languages according to their preference. One participant explained,

(کلاس ایکٹیوٹی میں) ہمیں اردو (زبان) استعمال کرنا الاؤڈ تھا (اجازت تھی) ---- ہم اپنی انگلش (زبان) امپروو (بہتر) کرنا چاہتے تھے۔

9. **Becoming a More Skillful Learner.** Besides learning subject concepts and application skills, the participants also mentioned some general skills which were developed by them during their experience with Flipped Classroom Instruction. It included taking initiative for asking questions, learning to cooperate with my colleagues, the art of presentation, thinking before answering a question, and using technology tools for searching for some information. Some comments of the participants are given below:

خود سے کویسچنز (سوالات) کا آنسر(جواب) لکھ سکتے (ہیں)۔

کولیگز کے ساتھ کوآپریٹ (تعاون) کرنا سیکھا۔

پریزینٹیشن دینے کا طریقہ سیکھا۔

یہ کورس لینے سے پہلے ہم بغیر سوچے سمجھے جواب دیتے تھے۔

سوچنے کا موقع ملا ہے۔

ٹیکنالوجی ٹولز یوزکرنا جیسے ای میل چیک کرنا یا ٹاپک کے لیے جنرل ویب براؤزنگ کرنا (سیکھا)۔

ہمیں کانفیڈینس ملا خود سے انفارمیشن لینے کے لیے اور نروس نیس ختم ہوئی۔

اگر ٹیچر گائیڈ نہیں کرتا یا ان سے ریکوائرڈ گائیڈنس نہیں ملتی تو خود سے میٹیریل سرچ کرسکتے۔

4.2 Use of Technology Resources

The sub-themes related to use of technology resources by the participants for learning the course concepts are given below:

1. **Access to Technology Resources.** All the participants had android phones with the package for WhatsApp and text messages. They sent

the reflective journal after each class through text message to their teacher. During class time, there was a continuous availability of internet as the learning material and quiz was available online. There were multiple devices of internet operating during class time so that if there was some issue of speed or signal, the personal computers (PCs) or mobile phone can be connected with other device. Majority of the participants had internet facility at their homes. Only two students had no access to internet at home so, they could get learning material from their class fellows through Bluetooth or downloading it during class time.

2. **Familiarity With Technology Tools.** Five participants mentioned that they have studied computers in their school years so, it was not very difficult for them to operate a computer. One participant said that because of technology use, the course experiences were unique for us. She said,

> اگر ٹیکنالوجی نکال دیں اس کورس میں سے تو پیچھے لیکچر میتھڈ رہ جاتا ہے۔

3. **Alternative Source to Access Learning Material.** All the participants agreed that technology provided access to learning material including videos and quiz anytime. All the participants were provided hard and soft copy of the learning material, so they could study the learning material anywhere and anytime. One participant commented,

> "ٹیکنالوجی کے کچھ ایشوز تھے لیکن ہمارے پاس لرننگ میٹیریل،
> گروپ میں بھی اویلیبل (موجود) ہوتا تھا ہارڈ کاپی میں بھی اویلیبل (موجود) ہوتا تھا۔۔۔۔ لیکن
> وٹس ایپ نے ایشو ریزالو کردیا۔

Hard copy helped us to study and understand anywhere".

4. **Problems Faced While Accessing Technology Resources.** Majority of the participants had no major issue with the use of technology however, they highlighted some problems they faced and how they dealt with it during the course. Four participants mentioned in the focus group discussion that there was light issue for some time in one class. They said,

> ہم بعد میں اس ٹائم کو کسی ایکٹیوٹی یا ڈسکشن کے لیے یوز کرتے تھے، اس طرح ہم نے اس ٹائم کو اچھی طرح یوٹیلائز (استعمال) کرنا شروع کردیا۔

Seven participants highlighted that in the beginning classes, there was an issue of internet speed and four participants said that it was problem of personal computers (PCs) however, later on, these problems were resolved. For resolving these problems, strategies such as use of multiple devices of internet, use of mobile phone in place of personal computers (PCs) and sharing/using personal computers which were available, were adopted. 02 participants had to make new Gmail account, but one participant said that I usually forgot the password. Another two students had to develop WhatsApp account for this course.

5. **Recognizing Technology Resources for Understanding Subject Concepts.** The participants realized the benefits of using technology tools for learning subject concepts. Their responses for use of technology tools were related to three aspects: understanding of subject concepts, thinking critically and reflective journaling through text messages. For understanding of subject

concepts, five participants were of the view that the use of technology helped them to understand the subject concepts maintained their interest in the subject. Few comments given by the participants are given below:

لیکچر کے ذریعے اسٹوڈنٹ بور ہو سکتا مثلا برین اسٹارمنگ اور وین ڈائیا گرام کی ویڈیو دیکھی تو سمجھ آیا، لیکچر کے ذریعے سمجھ نہ آتا۔

(ویڈیو دیکھتے ہوئے) ساری اٹینشن ویبلز(بصری عنصر) کی طرف ہوتی تھی اور کیوریوسٹی (تجسس) ہوتی تھی کہ اب کیا ہوگا۔

ایک پکچر ہزار ورڈز(الفاظ) پہ بھاری ہے۔
{a picture is worth a thousand words}

The participants highlighted the benefit of technology resources about their learning to think critically. Few comments given by the participants are given below:

اینا لائز اور ایویلویٹ کرنا سیکھا۔ کسی سچوایشن سے کیسے کوپ کرتے ہیں بجائے پریشان ہو نے کے۔

ٹیکنالوجی کے ذریعے کریٹیکل تھنکنگ پڑھنا بیسٹ ہے کیونکہ اس سے (کانسیپٹ) یاد رہتا ہے تو پیپر کی پریپریشن (تیاری) ہوگئی۔

6. **Use of Technology for an Improved Class Experience.** A few participants felt a difficulty for using technology resources in the start however, they realized its benefits and mentioned it in focus group discussion at the end. One participant said,

شروع میں اتنا انٹریسٹ نہیں تھا لیکن جب تھوڑا فیمیلیر(مانوس) ہوگئی تو میں نے انٹریسٹ لینا شروع کردیا۔

Participants were active and focused during this class. A participant said,

اس سبجیکٹ کی کلاس میں ہم ایکٹیورہتے تھے ٹیکنالوجی کو یوز کرنے کی وجہ سے۔۔ حالانکہ دوسرے سبجیکٹس کی کلاسز میں ٹیچرپڑھاتا رہتا اوراسٹوڈنٹس لیکچر کے دوران سو بھی جاتے۔ (کیونکہ وہ پیسیو تھے)

Two more comments by the participants are given below:

ہم فوکسڈ تھے، ہم اپنے کام سے ہٹ نہیں رہے تھے اورہمارا مائنڈ ڈائیورٹ (منتشر) نہیں ہو رہا تھا۔

(ویڈیو دیکھتے ہوئے) ساری اٹینشن ویبلز(بصری عنصر) کی طرف ہوتی تھی اور کیوریوسٹی (تجبس) ہوتی تھی کہ اب کیا ہوگا۔

ایک پکچر ہزار ورڈز(الفاظ) پہ بھاری ہے۔

میڈم وٹس ایپ پہ ویڈیو سینڈ کرتی تھی اورہم دیکھتے تھے تو ہم زیادہ جلدی سیکھتے تھے۔

Participants were discussing and even asking questions from each other in Google Classroom and WhatsApp group. As one participant said,

> "*We get to know about views of each other through WhatsApp and Google Classroom.*"

The text messages were used by students to send reflective journal to their teacher after every class. They mentioned the benefit of reflective journal for an improved classroom experiences; it was also found useful for teacher to incorporate the suggestions of students in daily class routine. One participant said,

ریفلیکٹیوجرنل ہرکلاس کے اینڈ پرلکھتے تھے سوہم اپنی پرابلمز شئیر کرتے اور نیکسٹ ڈے (اگلے دن) وہ ریزالو ہو جاتیں تھیں۔

Another participant said,

" ریفلیکٹیوجرنل ایک نئی چیز تھی ہمارے لیے اور

it is useful to know about students."

7. **Performance on Online Quiz.** Online quiz was a part of daily class routine. It was related to the learning material which students have to study for that class. If a student obtained low marks on quiz, he/she can re-attempt the quiz to improve his/her score. One participant mentioned,

ہمیں کوئز کے مارکس کا کرائٹیریا (معیار) میٹ (پورا) کرنا ہوتا تھا۔

When a student gets low marks, he/she was able to look at marks and items which he/she correctly attempted. In this way, he/she was able to locate where he/she needs to read the material again. He/she can access the learning material, re-read it and re-attempt the quiz. In this way, if a student was not only able to read the learning material before class, he/she was also provided time and facilitation to read it in class before attempting online quiz. A participant said,

اس کلاس میں اگر ہم (لرننگ) مٹیریل گھر سے پڑھ کر نہیں آئے تو اس وقت کلاس میں پڑھتے
تھے یا فرینڈز سے گائیڈنس لے لیتے تھے۔ حالانکہ اس میں ایکسٹرا ٹائم لگ جاتا لیکن ہم ڈیلی بیسز
پر کام مکمل کر رہے تھے چاہے گھر پر ہو یا کالج میں۔

8. **Problems Faced While Using Technology Resources.** One participant mentioned that in the starting classes, the videos used as learning resources were in English language so, it was difficult to understand some words due to the accent. In this situation, they approached the teacher for detailed notes of those topics and searched online for the videos related to that topic in Urdu or other local language, that's how they dealt with the problem. The comment of the participant is given below:

لیکچر کے لیے ہمیں جو ویڈیو دی جا رہی تھی وہ انگلش (زبان) میں تھی تو اس کے ایکسنٹ کی وجہ سے ہمیں کچھ ورڈز(الفاظ) سمجھ نہیں آرہے تھے۔۔۔اگلا بندہ جو لیکچر دے رہا ہے وہ کیاکہنا چاہ رہا ہے؟ اس کے کہنے کا کیا مقصد ہے؟۔۔۔پھر ہم نے میڈم سے ڈسکس کیا اور اسی ٹاپک سے ریلیٹڈ (متعلق) ڈیٹیل (تفصیل) سے نوٹس لیے اور انٹرنیٹ سے اس سے ریلیٹڈ ویڈیو دیکھی جو اردو یا دوسری زبان تھی۔

4.3 Classroom Environment

1. **Responsibilities of Students for Course Activities.** The students were expected to carry out certain tasks for this course. It included reading learning material, participating in class activities, attempting online quiz and writing reflective journal. One participant said that the nature of this course was different as compared to other courses. One participant commented,

لرننگ مٹیریل ایک دن پہلے دیا جاتا تھا اور ہمیں وہ گھر پر اسٹڈی کرنا ہوتا تھا۔

Three participants shared that notes were easy. Another participant said,

ڈیلی بیسز پہ پڑھے بغیر ایکٹیوٹی نہیں کرسکتے تھے جبکہ باقی کلاسزمیں روز کا روز نہیں پڑھتے تھے اورلیکچر کے بعد پڑھتے تھے۔

The remarks of one participant were:

باقی کورسز میں اسی دن ٹاپک پتہ لگتا اور اسی دن پڑھتے تو مشکل ہوتا تھا۔

Six participants commented on the online quiz. The remarks of one participant are given below:

کوئز ہم کلاس میں اٹیمپٹ کرتے تھے کیونکہ میڈم کہتی تھی کہ کوئز سالو (حل) کرتے ہوئے انوائرمنٹ سیم (ایک جیسا) ہونا چاہیئے۔

Another participant commented:

کوئز میں 90٪ مارکس چاہیئے ہوتے تھے۔ اگر 90٪ مارکس نہیں آتے تھے تو ہم یا تو کوئز دوبارہ اٹیمپٹ کرتے تھے یا لرننگ مٹیریل دوبارہ پڑھتے اور پھر کوئز اٹیمپٹ کرتے۔

Some other expectations from participants as described by them, were following the instructions of teacher, leading the group during class activity, maintaining discipline within classroom and no sharing of class details with control group. One participant added,

ایکٹیوٹی کرنے کے لیے نوٹس کو اسٹڈی کرنا ضروری تھا۔

Six participants said that we were accomplishing our class work on daily basis. The comment of one participant is given below:

روز کا کام روز کرتے تھے ورنہ ہم پیچھے رہ جاتے۔

One participant added,

اس کلاس میں اگر ہم (لرننگ)مٹیریل گھر سے پڑھ کر نہیں آئے تواس وقت کلاس میں
پڑھتے تھے یا فرینڈز سے گائیڈنس لے لیتے تھے۔۔۔حالانکہ اس میں ایکسٹرا ٹائم لگ جاتا لیکن ہم
ڈیلی بیسز پر کام مکمل کر رہے تھے چاہے گھر پرہو یا کالج میں۔

While talking about their experience with their responsibilities for course activities, the prospective teachers' perception appeared to be a positive one. Three participants found it interesting, one participant rated it as a good experience, two found it a not-boring experience and three found class activities easy and short. The comment of one participant is given below:

دوسرے کورسز کی دو اکھٹی کلاسز میں ہم بور ہو جاتے تھے لیکن اس کلاس میں ہمیں ٹائم
کاپتہ ہی نہیں چلتا تھا۔

Another participant added,

باقی کورسز میں ہم چیزیں (کانسیپٹس) یاد کرتے تھے لیکن اس کورس کی ایکٹیویٹیزمیں ہمیں
خود سوچ کے کام کرنا پڑتا تھا۔ ۔

2. **Support Available From Course Teacher.** Participants said that through group activities, their interaction with the class fellows and teacher

strengthened. Five participants added that if there was any problem, teacher explained it according to need of the student. The comment of one participant is given below:

اگر کوئی پرابلم ہوتی تھی تو ٹیچر، اسٹوڈنٹ کے لیول پر جاکر اس کو ایکسپلین کرتی تھی۔

While talking about class activities, three participants mentioned that the class activities appeared difficult to us but due to support from teacher, we gradually accomplished it. One participant commented on it, as given below:

اسٹارٹ میں ایکٹیویٹیز بورنگ اور مشکل لگتی تھی (03)۔ کیونکہ ہم یوز ٹو (عادی) نہیں تھے۔
لیکن جب میڈم سمجھاتی تھی تو ایزیلی (آسانی) سے کر لیتے تھے۔

If a student was absent from class, then s/he was guided for the reading material and class activity as per her/his need. So, there was individualized instruction facility available for the participants of the study. One participant commented,

اگر ایک اسٹوڈنٹ کسی دن نہیں آیا تو اسے اگلے دن نوٹس، کوئز اور ایکٹیویٹیز ملتی تھیں۔ ٹیچراسے ایکٹیویٹی بھی الگ سے سمجھا دیتی تھی، کوئی پرابلم ہو تو اسٹوڈنٹ اپنے ٹیچر سے پوچھ لیتا(/ لیتی)۔ کلاس فیلوز اس سے پریویس (پچھلی) کلاس کا ڈسکس کرتے یا ریوائز کرتے کہ پچھلی کلاس میں کیا کیا تھا اور کوئی کنفیوژن ہوتی تو ٹیچر کلئیر کرتی۔

4.4 Social Interaction

1. **Interaction With Teacher.** This theme covers the nature, ways and modes of interaction between teacher and the students. While talking about modes of interaction, the participants mentioned that the teacher was easily accessible to students in-class for face-to-face interaction, and after-class through WhatsApp and text messages. While discussing cooperative interaction with the teacher, the one participant mentioned about the teacher as cooperative, and another participant perceived the teacher as facilitating; five participants perceived the

teacher to be friendly and one referred the teacher as punctual. Students can ask question or share their difficulties and problems with the teacher. Two participants mentioned that they accessed the teacher through text messages and WhatsApp when they were facing some difficulty. One participant said,

کوئی ڈفیکلٹی (مشکل) ہوتی تو ٹیکسٹ میسج یا وٹس ایپ گروپ کے تھرو (ذریعے) پوچھ لیتے تھے۔

Participants received an in-time support from teacher, as described by them. They also gained confidence and encouragement in asking questions from their teacher due to easy access and facilitating role of the teacher. A participant commented,

کلاس میں یا موبائل پہ اسی وقت ریسپانڈ کرتی تھیں۔

The remarks of two participants are given below:

ہم کافی دفعہ پوچھتے تھے لیکن ٹیچر نے کبھی ڈانٹا نہیں۔

ہم انہیں رات کو بھی کانٹیکٹ کرتے تھے--- ہم میں کانفیڈینس آیا سوال پوچھنے کے لیے--- ہم یہ نہیں سوچتے تھے کہ سوال کیسا ہے یا ٹیچر کیا سوچے گا؟

Nine participants mentioned that they had a cooperative interaction with their teacher. While elaborating on this cooperative interaction, two participants said that they can easily share their problems with the teacher; three participants perceived that their teacher understood their problem and seven participants mentioned that their problems got resolved. The comment of one participant is given below:

---(ٹیچر کے) کوآپریٹیو ہونے کی وجہ سے اتنا برڈن (بوجھ) محسوس نہیں ہوتا تھا اور ہم اتنا ہیزٹیٹ (ہچکچاتے) نہیں کرتے تھے--- بالکل ایک فیملی کی طرح شیئر کرتے تھے۔

While adding on to the learning support from teacher, the participant mentioned about the prepared lecture as a helpful thing, three participants referred to detailed explanation of a topic and another highlighted the constructive feedback during class presentation. The participants also got answers for questions about previously studied topics and received suggestions/guidance/support if they did not study at home. However, the teacher was very careful in explaining a concept to students as mentioned by one participant. The teacher explained key aspect(s) or few main points or responds to a question very specifically. The comment of one participant is given below:

> ٹیچر ہر چیز (کانسیپٹ) ایکسپلین نہیں کرتی تھیں۔۔۔ وہ کچھ چیزیں ہمارے لیے رہنے دیتی تھیں کہ ہم نوٹس میں سے پڑھیں۔ اس کا فائدہ یہ ہوا کہ ہم گھر جا کر پڑھتے تھے۔۔۔ اگر ہمیں سب کچھ پڑھا دیا جاتا تو ہم گھر جا کر نہ پڑھتے۔۔

2. **Cooperative Interaction Among Peers.** This theme covers types of activities for peer interaction, cooperation and competition among peers. While talking about interaction with peers, two participants perceived more interaction during this course as compared to the other courses. The comment of one participant is given below:

> دوسری کلاسز کے مقابلے میں اس کورس میں زیادہ انٹریکشن ہوا۔۔۔ پہلے آپس میں (ٹاپک کے حوالے سے) بہت کم بات ہوتی تھی۔

The cooperative interaction of students with each other included within class and out-of-class activities, formal and informal interaction. So, it appears that it covered wide range of opportunities for students to interact and cooperate with each other. While discussing about cooperative interaction, ten participants mentioned about it during class activities and one participant perceived it during reflective journal writing. Two participants mentioned a cooperative interaction with peers during out-of-class discussion, one referred to WhatsApp group and one participant highlighted class presentation for it.

Further discussing the cooperative behavior of class fellows with each other, three participants mentioned about sharing of learning materials (videos, notes, presentations). One participant commented on it as given below:

کچھ لوگوں (اسٹوڈنٹس) کے گھر میں انٹرنیٹ نہیں تھا تو ایک بندہ مٹیریل ڈاؤن لوڈ کرتا تھا اور باقیوں کو بلیو ٹوتھ سے شئیر کر دیتا تھا۔

One participant referred to helping peers to understand a concept well and another participant talked about helping shy students to discuss/contribute during group activity. One participant mentioned about supporting a slow learner/low achiever to perform equally well and another highlighted about assisting peers to resolve problem/unclear points while talking about peer support. Two participants mentioned that we were discussing after a class about way of attempting a particular class activity. Two participants commented,

(کلاس) ایکٹیویٹیز کی وجہ سے انٹریکشن زیادہ ہوا۔

کوآپریشن (تعاون) پروموٹ ہوا کیونکہ سلو اسٹوڈنٹس اچھا پرفارم کر سکتے تھے اپنے پییرز (ساتھی) کی سپورٹ کے ساتھ جن کا کانسیپٹ کلئیر ہو۔۔۔ اور ایک شائے اسٹوڈنٹ اپنے فیلوز کے ساتھ بات کر سکتا تھا اس پرابلم کے بارے میں جو وہ فیس (سامنا) کر رہا ہے۔

As far as within and out-of-class interaction was concerned, the participants mentioned that they interacted for this course more during out-of-class time as compared to within-class because within class, we were mostly busy with activities. It was an indication of their emotional commitment with this course that they were discussing about it with their fellows after class time.

Experimental group consisted of two male and twenty-one female student teachers. So, for group activity, the boys had to work with each other mostly because girls tend to choose other girls as their group fellows. The participants were free to independently join a group. So, the boys found the group activity as same for them in routine. They suggested some random allocation for a group activity so that they can get a chance to work with other class fellows and learn from them as It appears that there was some gender -based grouping for group class activity and it may be the result of socio-cultural experiences of the participants.

3. **Competition Among Peers.** There was a sort of competition among class fellows during this course. However, the responses of participants reflected that it was a kind of healthy competition among class fellows. Four participants mentioned about the presence of competition among peers. The participants referred to different factors while talking about competition i.e., two participants highlighted about their effort to perform well in a group activity as compared to other groups. One participant mentioned about completing the activity earlier than class fellows, two participants talked about performing better on an activity than other class fellows, one participant described about performing well in a class presentation and one participant referred to finishing quiz earlier than other students. Besides this, two participants mentioned that cooperation outweighed competition for this course. one participant commented,

ہمیں کمپٹیشن سے زیادہ کوآپریشن (تعاون) فیل (محسوس) ہوا-

4.5 Preference for Instructional Method

1. **Experience of Participants With FCI.** While talking about their preference for an instructional method between traditional and FCI, twenty-two participants chose the flipped classroom instruction. One participant added,

   لیکچر ود اے وی ایڈز (سمعی و بصری معاونات) ہو تو زیادہ بہتر ہے۔

   Twelve participants had a satisfying and exciting experience while learning through this method. The features of FCI which were highlighted by the participants included easy and memorable method for course concepts by one participant, interesting method for a course by six participants, and helpful method for learning concepts and thinking skills by five participants.

2. **Recommendation of FCI for Other Courses.** Throughout school and college education, the dominant mode of teaching is lecture method; activities are rarely used in public school system as per opinion of participants. Therefore, the participants took some time to shift and adjust to FCI in the start of the study. But when they get used to it, they felt the change in themselves regarding comprehension of subject concepts, general skills, technology experiences and interaction with their teacher and class fellows, and classroom routine. While recommending FCI for other courses, three participants asked for using it for science subjects, and one participant mentioned about using it for Pakistan Studies because it was boring for that participant. The comments of two participants are given below:

   سائنس (سبجیکٹس) کے لیے یہ میتھڈ یوز ہونا چاہیئے کیونکہ اس کورس میں (ہم) سوال پوچھنے
   سے ہیزیٹیٹ (ہچکچاتے) نہیں کرتے تھے۔

پاکستان اسٹڈیز کے سبجیکٹ کے لیے یہ میتھڈ یوز ہونا چاہیئے--- وہ (سبجیکٹ) بورنگ ہے -

3. **Suggestions for Improving Implementation of FCI in Future**. The suggestions for improving implementation of FCI were related to two sub-themes: one sub-theme was about suggestions which came from the problems faced during this study and the other one came from further improvement of FCI. The suggestions related to the problems faced during the course by the participants included use of videos with local language by one participant, providing topic summary while handing out notes of learning material by four participants, resolution of problems related to Personal Computers and internet speed, and allocation of more time for difficult topics by one participant.

    The suggestions for further improvement of FCI included the use of online activities by one participant and using case studies of actual classrooms as part of the course by another participant as the participants were prospective teachers so it would prepare them for effectively dealing with the students in future.

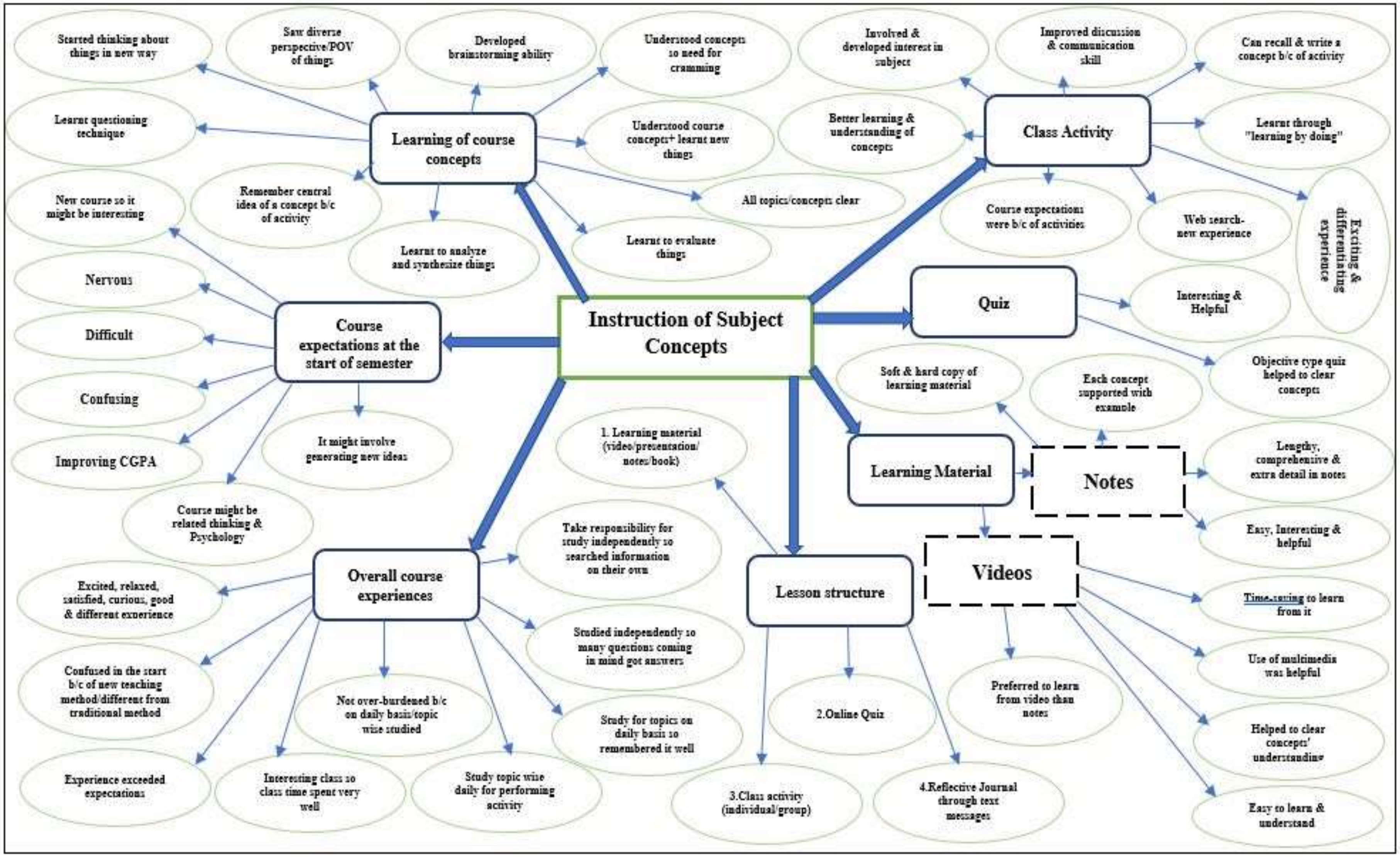


Figure 4.15 Highlights of Theme 'Instruction of Subject Concepts'

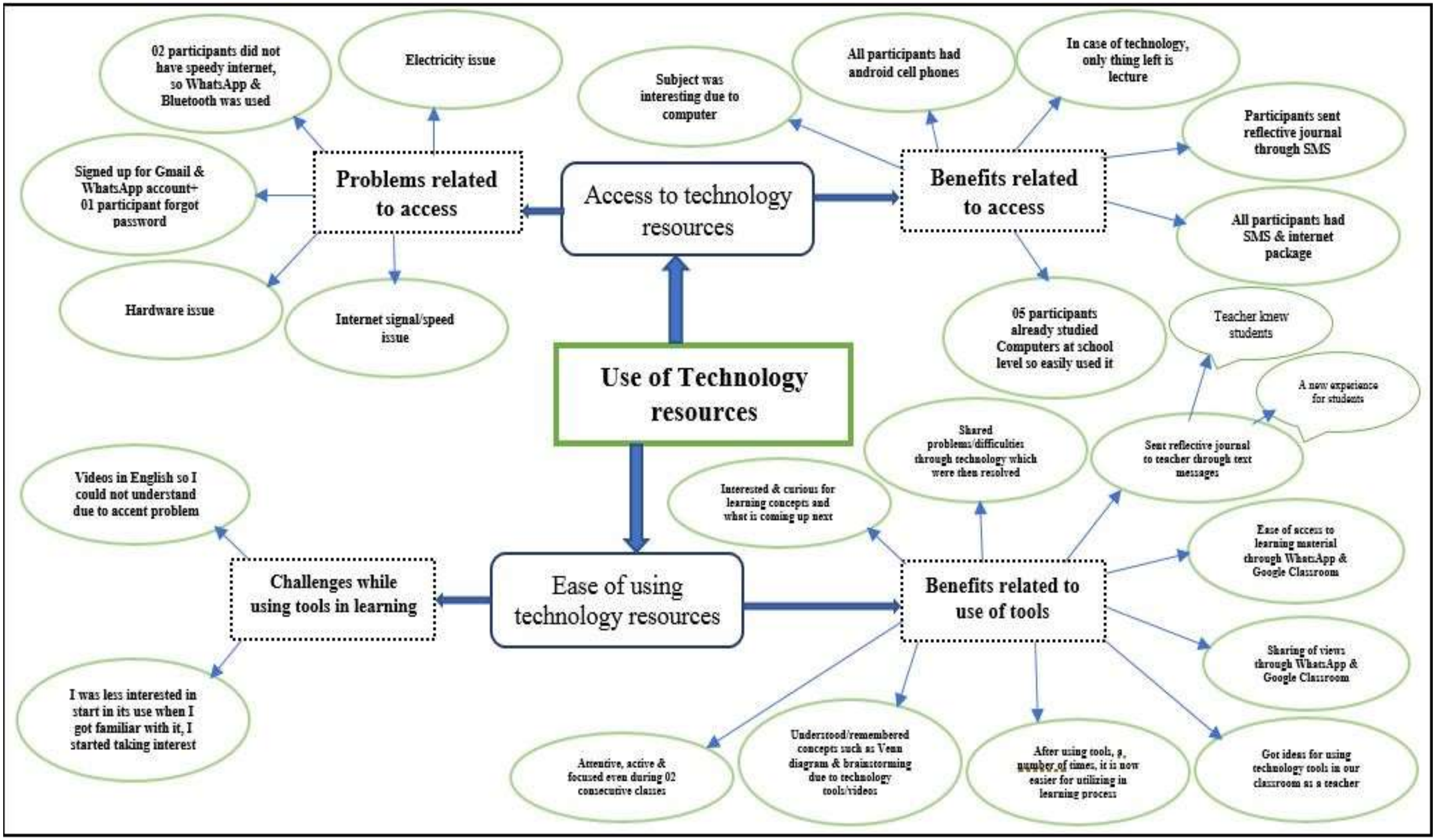


Figure 4.1146 Highlights of Theme 'Use of Technology Resources'

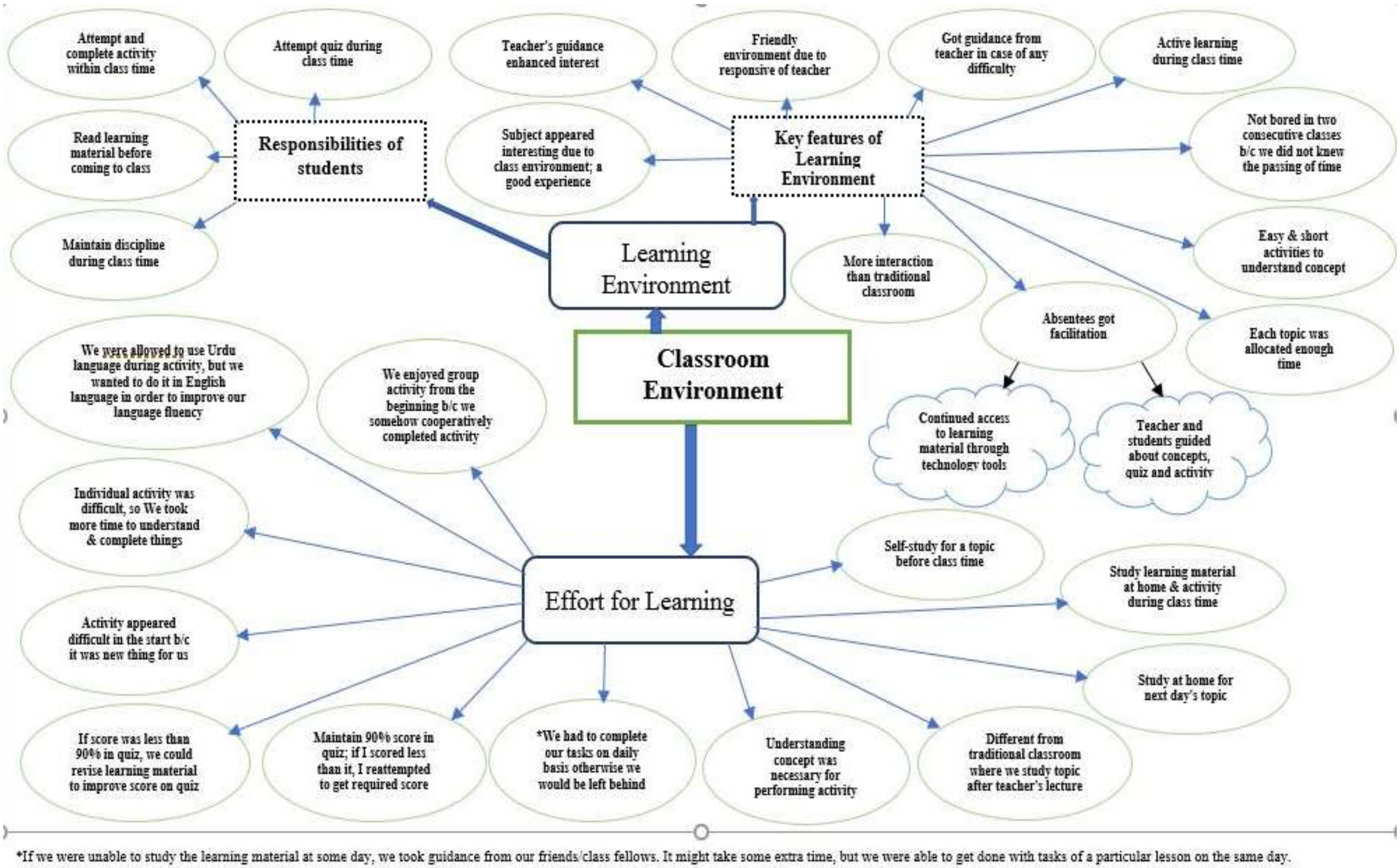


Figure 4.157 Highlights of Theme 'Classroom Environment'

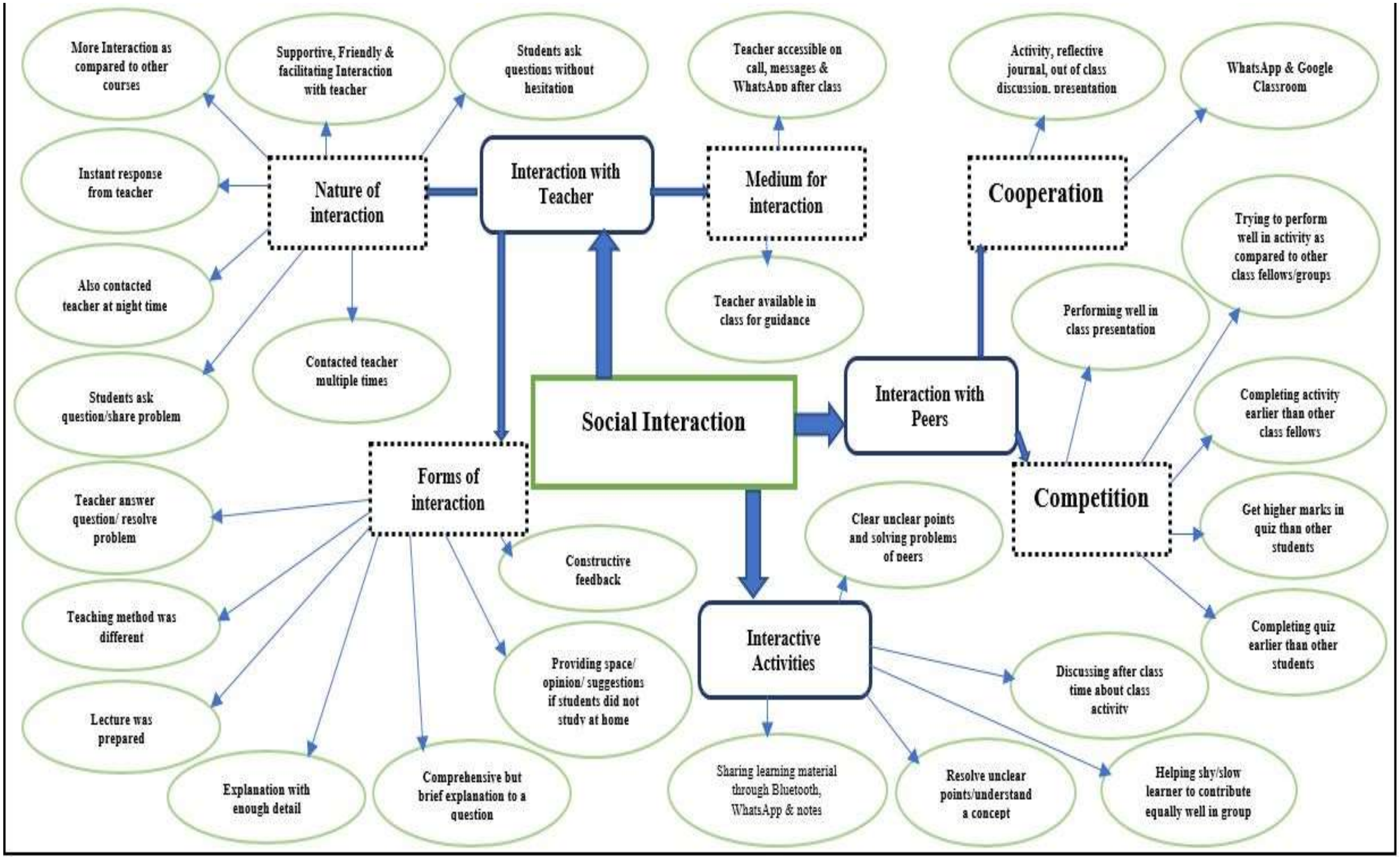


Figure 4.18 Highlights of Theme 'Social Interaction'

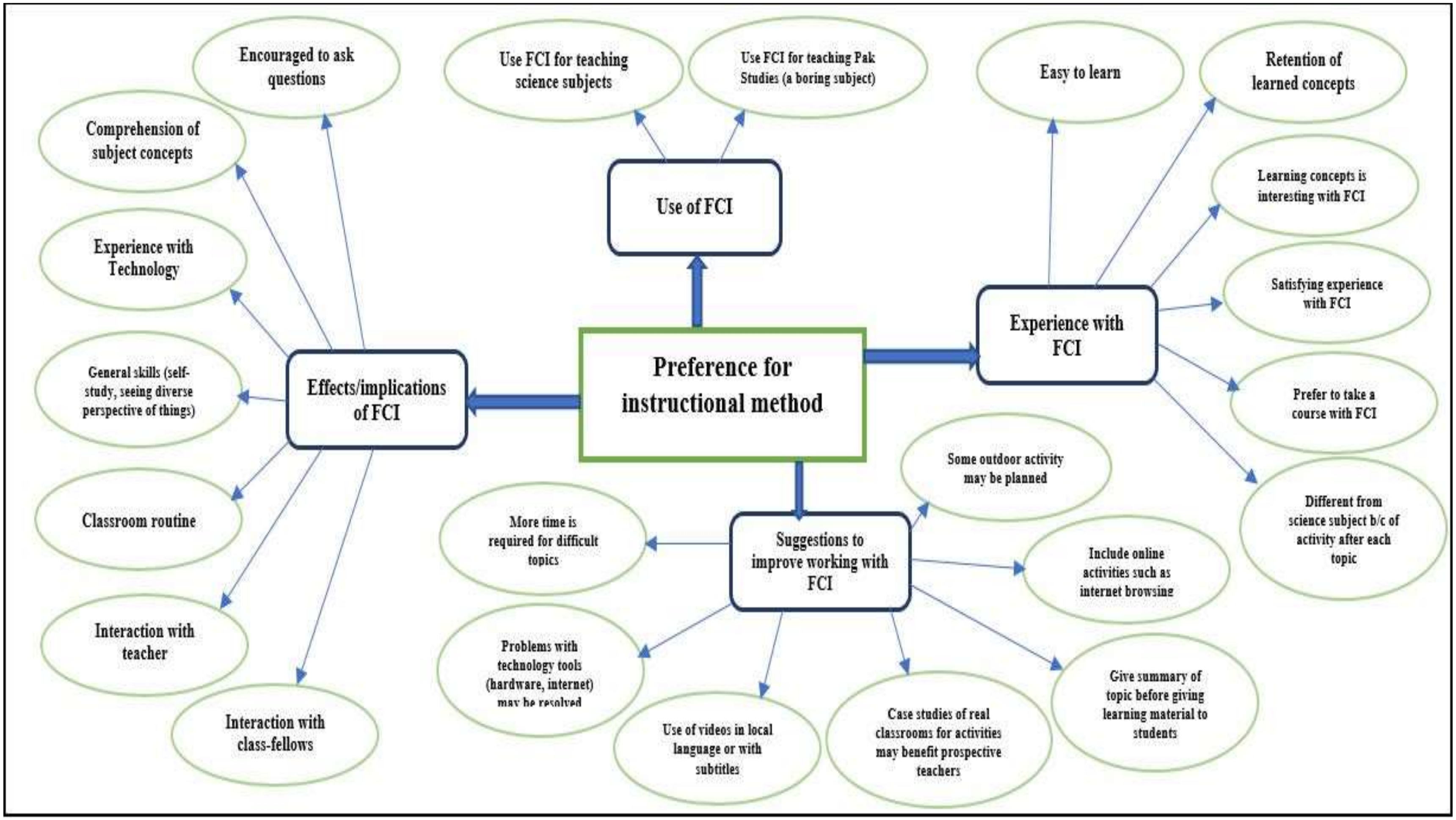


Figure 4.19 Highlights of Theme 'Preference for Instructional Method'

CHAPTER 05

SUMMARY, FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study involved mixed-methods research design with a pretest-posttest control group experimental research method to assess the effectiveness of Flipped Classroom Instruction (FCI) for nurturing reflective thinking skills of prospective teachers. The prospective teachers of a class of BS Ed. (04 year) from one institution participated in this research study. The prospective teachers with high, average and low achievement score range were allocated randomly either to control or experimental group. For this study, one course "Critical Thinking and Reflective Practices" was used to teach experimental group using Flipped Classroom Instruction (FCI) and control group through traditional instructional method. The experimental and control group were taught the same content; control group was taught through traditional method of instruction and experimental group through Flipped Classroom Instruction (FCI). There were two phases of the study. During first phase of the study, the course contents related to critical thinking was covered whereas second phase involved teaching of course topics related to critical thinking and reflective practices. The duration of first and second phases of the study was two months for each of the two phases. The total duration of the research study was four months. Reflective Thinking Skills Scale (RTSS) and academic achievement test was used as pretest and posttest during two phases of study by shuffling of test items. There were constructs and sub-constructs of both research instruments. Data were analyzed for each of the two phases and the whole study period. At the end of study, the prospective teachers of the experimental group recorded their learning experiences on a perception scale about Flipped Classroom Instruction (FCI) and participated in a focus group discussion related to it. Its findings elaborated the learning experiences and their perception of working in a Flipped Classroom. The results of the study have been presented for each phase, constructs of the research instruments and the whole study period.

5.2 Findings

5.2.1 Reflective Thinking Skills Scale (RTSS)

1. The tools used to obtain information about surroundings i.e., 'save in memory', 'write it in the diary', 'take its photograph', 'make an audio-recording' and 'record short video', the experimental group showed an increase of 8.7% in frequency of use of audio-recording and 4.4% increase in frequency of making short video in the posttest as compared to its reported use in pretest. The reported frequency of participants of experimental group in posttest showed a decrease in use of memory, diary and photographs as compared to pretest by 21.7%, 8.7% and 21.7%, respectively (as shown in table 4.1 and 4.2). The participants of control group reported increase in the use of making an audio-recording in posttest by 4.2% as compared to its reported frequency in pretest whereas they reported a decrease in use of memory, diary, taking a photograph and video recording in posttest by 4.2%, 20.8%, 20.9% and 4.1%, respectively as compared to its reported frequency in pretest (as shown in table 4.1 and 4.2).

2. For experimental group, there was statistically no significant difference between pretest-1 and posttest-1 mean scores ($z=-.411$, $p>.05$) on Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.19). There was also statistically non-significant difference between pretest-1 and posttest-1 mean scores of control group ($z=-.986$, $p>.05$) on Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.19).
3. There was statistically non-significant difference between posttest-1 and pretest-2 mean scores of experimental group ($z=-.017$, $p=.986$) on Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.20). There was statistically non-significant difference between posttest-1 and pretest-2 mean scores of control group ($z=-.457$, $p=.648$) on Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.20).
4. Statistically significant difference was observed between pretest-2 and pretest-2 mean scores of experimental group ($z=-2.327$, $p=.020$) with higher mean scores of posttest-2 (mean score=203.78) on Reflective Thinking Skills Scale (RTSS) for second phase of the study (table 4.21). For control group, statistically non-significant difference was found between pretest-2 and posttest-2 ($z=-1.343$, $p=.179$) on Reflective Thinking Skills Scale (RTSS) for second phase of the study (table 4.21).
5. Statistically significant difference was observed between pretest-1 and posttest-2 mean scores of experimental group ($z=-2.191$, $p=.028$) with higher mean scores of posttest-2 (mean score=203.78) on Reflective Thinking Skills Scale (RTSS) for the

whole study duration (as shown in table 4.22). Statistically non-significant difference was found between pretest-1 and posttest-2 mean scores of control group ($z=-.152$, $p=.879$) on Reflective Thinking Skills Scale (RTSS) for the whole study duration (as shown in table 4.23). After applying mixed between-within ANOVA, statistically significant difference was found across the four time points [$F(2.56, 115.29)= 4.830$, $p< .01$, partial eta square=.097] and statistically non-significant difference between groups [$F(1,45)=1.703$, $p>.05$, partial eta square= .036] on score on Reflective Thinking Skills Scale (RTSS). Statistically non-significant interaction was observed between time and group [$F(2.56, 115.29)=1.209$, $p>.05$, partial eta square= .026] (as shown in table 4.44). Following up the difference for time indicated statistically non-significant difference among pretest-1, posttest-1, pretest-2 and posttest-2 (i.e., for time variable) for control group. However, statistically significant difference was found between posttest-1 and posttest-2 [Mean difference=11.565, $p< .05$], and pretest-2 and posttest-2 [Mean Difference= 14.043, $p< .05$] for experimental group. However, mean scores of control and experimental group gradually decreased over time for pretest-1, posttest-1 and pretest-2; both groups showed an improvement in posttest-2 scores as shown in table 4.43.

6. Statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group ($z=-.553$, $p=.580$) on observation subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.24). Statistically non-significant difference was found between pretest-1

and posttest-1 mean scores of control group (z=-1.602, p=.109) on observation subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.23).

7. Statistically significant difference was observed between posttest-1 and pretest-2 mean scores of experimental group (z=-.175, p=.861) on observation subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.24). Statistically non-significant difference was found between posttest-1 and pretest-2 mean scores of control group (z=-.262, p=.793) on observation subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.24).
8. Statistically significant difference was found between pretest-2 and posttest-2 mean scores of experimental group (z=-2.422, p=.015) on observation subscale of Reflective Thinking Skills Scale (RTSS) with higher mean score on posttest-2 (mean score=49.78) for second phase of the study (table 4.26). Statistically significant difference was found between pretest-2 and posttest-2 mean scores of control group (z=-2.015, p=.044) on observation subscale of Reflective Thinking Skills Scale (RTSS) with higher mean score on posttest-2 (49.04) for second phase of the study (table 4.25).
9. Statistically non-significant difference was found between pretest-1 and posttest-2 mean scores of experimental group (z=-1.632, p=.103) on observation subscale of Reflective Thinking Skills Scale (RTSS) for whole study duration (as shown in table 4.26). Statistically non-significant difference was observed between pretest-1

and posttest-2 mean scores of control group (z=-.594, p=.552) on observation subscale of Reflective Thinking Skills Scale (RTSS) for whole study duration (as shown in table 4.26). The output of mixed between-within ANOVA depicted a statistically significant difference across four time points [F(3, 135)= 6.012, p< .05, partial eta square=.118] and statistically non-significant difference between groups [F(1,45)=.021, p>.05, partial eta square= .000] on score on observation subscale of RTSS. Statistically non-significant interaction was observed between time and group [F(3, 135)=.311, p>.05, partial eta square= .007] (as shown in table 4.46). Following up the difference for time indicated statistically non-significant difference among pretest-1, posttest-1, pretest-2 and posttest-2 (i.e., for time variable) for control group. Statistically significant difference was observed between posttest-1 and posttest-2 [Mean difference=3.304, p< .05], and pretest-2 and posttest-2 [Mean Difference= 4.435, p< .05] for experimental group. However, mean scores of control and experimental group gradually decreased over time for pretest-1, posttest-1 and pretest-2; both of the groups showed an improvement in posttest-2 scores as shown in table 4.45.

10. Statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group (z=-.541, p=.589) on communication subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.27). Statistically non-significant difference was found between pretest-1 and posttest-1 mean scores of control group (z=-.618, p=.537) on communication

subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.27).

11. Statistically non-significant difference was found between posttest-1 and pretest-2 mean scores of experimental group (z=-.662, p=.508) on communication subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.28). Statistically non-significant difference was observed between posttest-1 and pretest-2 mean scores of control group (z=-.506, p=.613) on communication subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.28).
12. Statistically non-significant difference was found between pretest-2 and posttest-2 mean scores of experimental group (z=-1.323, p=.186) on communication subscale of Reflective Thinking Skills Scale (RTSS) for second phase of the study (table 4.29). Statistically non-significant difference was observed between pretest-2 and posttest-2 mean scores of control group (z=-.429, p=.668) on communication subscale of Reflective Thinking Skills Scale (RTSS) during first phase of the study (table 4.29).
13. Statistically non-significant difference was observed between pretest-1 and posttest-2 mean scores of experimental group (z=-.383, p=.702) on communication subscale of Reflective Thinking Skills Scale (RTSS) for the whole study duration (as shown in table 4.30). Statistically non-significant difference was found between pretest-1 and posttest-2 mean scores of control group (z=-.573, p=.566) on communication subscale of Reflective Thinking Skills Scale (RTSS) for the whole

study duration (as shown in table 4.30). After applying mixed between-within ANOVA, there was statistically non-significant difference across four time points [F(3, 135)= 1.586, p> .05, partial eta square=.034] and statistically non-significant difference between groups [F(1,45)=1.968, p>.05, partial eta square= .042] on score on communication subscale of RTSS. Statistically non-significant interaction was observed between time and group [F(3, 135)=.284, p>.05, partial eta square= .006] (table 4.48). However, mean score of control and experimental group gradually decreased over time for pretest-1, posttest-1 and pretest-2; both groups showed an improvement in posttest-2 scores as shown in table 4.47.

14. Statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group (z=-.277, p=.782) on judgment subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.31). Statistically significant difference was observed between pretest-1 and posttest-1 mean scores of control group (z=-.674, p=.501) on judgment subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.31).
15. Statistically non-significant difference was observed between posttest-1 and pretest-2 mean scores of experimental group (z=-.150, p=.881) on judgment subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.32). Statistically non-significant difference was found between posttest-1 and pretest-2 mean scores of control group (z=-.316, p=.752) on judgment subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.32).

16. Statistically significant difference was found between pretest-2 and posttest-2 mean scores of experimental group (z=-1.995, p=.046) on judgment subscale of Reflective Thinking Skills Scale (RTSS) with a higher mean score on posttest-2 (mean score= 35.91) for second phase of the study (table 4.33). Statistically non-significant difference was observed between pretest-2 and posttest-2 mean scores of control group (z=-.963, p=.336) on judgment subscale of Reflective Thinking Skills Scale (RTSS) for second phase of the study (table 4.33).
17. Statistically significant difference was found between pretest-1 and posttest-2 mean scores of experimental group (z=-2.087, p=.037) on judgment subscale of Reflective Thinking Skills Scale (RTSS) with a higher mean score on posttest-2 (mean score= 35.91) for the whole study duration (as shown in table 4.34). Statistically non-significant difference was observed between pretest-1 and posttest-2 mean scores of control group (z=-.228, p=.820) on judgment subscale of Reflective Thinking Skills Scale (RTSS) for whole study duration (as shown in table 4.34). The output of mixed between-within ANOVA depicted statistically non-significant difference across the four time points [F(3, 135)= 2.532, p> .05, partial eta square=.053] and statistically no significant difference between groups [F(1,45)=1.553, p>.05, partial eta square= .033] on score on judgment subscale of RTSS. Statistically non-significant interaction was found between time and group [F(3, 135)=.745, p>.05, partial eta square= .016] (table 4.50). However, mean scores of control and experimental group were relatively same over time for pretest-

1, posttest-1 and pretest-2; the experimental group showed an improvement in posttest-2 scores as shown in table 4.49.

18. Statistically non-significant difference was found between pretest-1 and posttest-1 mean scores of experimental group (z=-.836, p=.403) on team-working subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.35). Statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of control group (z=-.087, p=.931) on team-working subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (as shown in table 4.35).
19. Statistically non-significant difference was found between posttest-1 and pretest-2 mean scores of experimental group (z=-.122, p=.903) on team-working subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.36). Statistically non-significant difference was observed between posttest-1 and pretest-2 mean scores of control group (z=-1.352, p=.177) on team-working subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.36).
20. Statistically significant difference was found between pretest-2 and posttest-2 mean scores of experimental group (z=-1.996, p=.046) on team-working subscale of Reflective Thinking Skills Scale (RTSS) with a higher mean score on posttest-2 (mean score= 40.35) for second phase of the study (table 4.37). Statistically non-significant difference was observed between pretest-2 and posttest-2 mean scores of control group (z=-.587, p=.557) on team-working subscale of Reflective

Thinking Skills Scale (RTSS) for second phase of the study (as shown in table 4.37).

21. Statistically non-significant difference was observed between pretest-1 and posttest-2 mean scores of experimental group (z=-1.603, p=.109) on team-working subscale of Reflective Thinking Skills Scale (RTSS) for whole study duration (as shown in table 4.38). Statistically non-significant difference was found between pretest-1 and posttest-2 mean scores of control group (z=-.245, p=.807) on team-working subscale of Reflective Thinking Skills Scale (RTSS) for whole study duration (as shown in table 4.38). The result of mixed between-within ANOVA depicted statistically non-significant difference across four time points [F(3, 135)= 2.152, p> .05, partial eta square=.046] and statistically no significant difference between groups [F(1,45)=1.772, p>.05, partial eta square= .038] for score on team-working subscale of RTSS. Statistically non-significant interaction was observed between time and group [F(3, 135)=1.44, p>.05, partial eta square= .031] (table 4.52). However, mean score of control group was relatively same by the end of posttest-2 whereas experimental group showed an improvement in posttest-2 scores as shown in table 4.51.

22. Statistically non-significant difference was observed between pretest-1 and posttest-1 mean scores of experimental group (z=-.505, p=.614) on decision-making subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.39). Statistically non-significant difference was found between pretest-1 and posttest-1 mean scores of control group (z=-.782, p=.434) on

decision-making subscale of Reflective Thinking Skills Scale (RTSS) for first phase of the study (table 4.39).

23. Statistically non-significant difference was found between posttest-1 and pretest-2 mean scores of experimental group (z=-.024, p=.981) on decision-making subscale of Reflective Thinking Skills Scale (RTSS) for the gap period between two phases of the study (table 4.40). Statistically significant difference was observed between posttest-1 and pretest-2 mean scores of control group (z=-1.969, p=.049) on decision-making subscale of Reflective Thinking Skills Scale (RTSS) with higher mean score on posttest-1 (mean score=36.50) for the gap period between two phases of the study (table 4.40).
24. Statistically significant difference was found between pretest-2 and posttest-2 mean scores of experimental group (z=-2.474, p=.013) on decision-making subscale of Reflective Thinking Skills Scale (RTSS) with a higher mean score on posttest-2 (mean score= 36.04) for second phase of the study (table 4.41). Statistically non-significant difference was found between pretest-2 and posttest-2 mean scores of control group (z=-.412, p=.681) on decision-making subscale of Reflective Thinking Skills Scale (RTSS) for second phase of the study (table 4.41).
25. Statistically non-significant difference was found between pretest-1 and posttest-2 mean scores of experimental group (z=-.989, p=.323) on decision-making subscale of Reflective Thinking Skills Scale (RTSS) for whole study duration (as shown in table 4.42). Statistically non-significant difference was found between pretest-1 and posttest-2 mean scores of control group (z=-1.701, p=.089) on decision-making

subscale of Reflective Thinking Skills Scale (RTSS) for the whole study duration (as shown in table 4.42). After applying mixed between-within ANOVA, it was found statistically non-significant difference across four time points [$F(3, 135)= 2.253$, $p> .05$, partial eta square=.048] and statistically non-significant difference between groups [$F(1,45)=2.472$, $p>.05$, partial eta square= .052] on score for decision-making subscale of RTSS. Statistically non-significant interaction was found between time and group [$F(3, 135)=1.633$, $p>.05$, partial eta square= .035] (table 4.54). The mean scores of control and experimental group gradually decreased during posstest-1 as compared to pretest-1 mean scores but posttest-2 mean scores of experimental group improved as compared to its pretest-2 mean score (table 4.53).

26. Statistically non-significant difference was observed between three academic achievement subgroups within experimental group on pretest-1 ($H(2) =1.004$, $p>.05$), posttest-1 ($H(2) =2.970$, $p>.05$), pretest-2 ($H(2) =1.913$, $p>.05$) and posttest-2 mean scores ($H(2) =2.912$, $p>.05$) during first and second phase of the study (tables 4.55, 4.56, 4.57 and 4.58, respectively). Statistically non-significant difference was found among various academic achievement subgroups within control group on pretest-1 ($H(2)=2.082$, $p>.05$), posttest-1 ($H(2)=5.386$, $p>.05$) and pretest-2 mean scores ($H(2)=1.329$, $p>.05$) during first and second phase of the study (tables 4.59,4.60 and 4.61). Statistically significant difference was found among three academic achievement subgroups of control group ($H(2)=6.211$, $p<.05$) with higher posttest-2 mean score of high achievers group (mean score=

221.33), as given table 4.62. Follow-up test showed a statistically significant difference between high achievers and low achievers (z=-.2.249, p=.024) of control group on posttest-2 of RTSS with higher mean score of high achiever group (mean score=221.33) as given in table 4.64. Statistically significant difference was found between high achievers and average group (z=-.2.354, p=.019) of control group on posttest-2 of RTSS with higher mean score of high achiever group (mean score=221.33) as shown in table 4.65.

5.2.2 Academic Achievement Test

27. Statistically significant difference was found between pretest-1 and posttest-1 mean scores of experimental group for first phase of the study for interpretation (z=-4.153, p<.05) and organization (z=-3.763, p<.05) of short-answer questions (as shown in table 4.69) at remembering level. Table 4.69 also indicated statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group at interpretation (z=-2.236, p<.05) and organization (z=-2.00, p<.05) of restricted response items at remembering level. For elaboration of restricted response items at remembering level, there was no statistically significant difference (z=-1.732, p>.05) between pretest-1 and posttest-1 mean scores of experimental group (table 4.69). Statistically significant difference was found between pretest-2 and posttest-2 mean test scores of experimental group on interpretation (z=-4.209, p<.05) and organization (z=-4.125, p<.05) of short-answer questions at remembering level for second phase of the study (table 4.70). Table 4.70 also indicated statistically significant difference between pretest-2 and

posttest-2 mean test scores of experimental group on interpretation ($z=-4.167$, $p<.05$), organization ($z=-3.720$, $p<.05$) and elaboration ($z=-3.747$, $p<.05$) of restricted response items at remembering level. Table 4.71 displayed statistically significant difference between pretest-1 and posttest-2 of experimental group on interpretation ($z=-4.213$, $p<.05$) and organization ($z=-3.215$, $p<.05$) of short answer questions at remembering level. Statistically significant difference was found between pretest-1 and posttest-2 of experimental group on interpretation ($z=-4.247$, $p<.05$), organization ($z=-3.816$, $p<.05$) and elaboration ($z=-3.816$, $p<.05$) of restricted response items at remembering level.

28. Table 4.69 also showed statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group at interpretation ($z=-2.236$, $p<.05$) and organization ($z=-2.070$, $p<.05$) of short-answer questions, and interpretation ($z=-2.121$, $p<.05$) and organization ($z=-2.00$, $p<.05$) of restricted response items at understanding level. However, statistically non-significant difference was found between pretest-1 and posttest-1 mean scores of experimental group on elaboration ($z=-1.732$, $p>.05$) of restricted response items at understanding level, as shown in table 4.69. Table 4.70 also showed statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-3.358$, $p<.05$) and organization ($z=-3.201$, $p<.05$) of short-answer questions, interpretation ($z=-4.160$, $p<.05$) and organization ($z=-3.961$, $p<.05$) and elaboration ($z=-3.920$, $p<.05$) of restricted response items at understanding level. Table 4.71 indicated statistically significant difference between pretest-1 and posttest-2 of

experimental group on interpretation ($z=-4.041$, $p<.05$) and organization ($z=-3.834$, $p<.05$) of short answer questions at understanding level. Statistically significant difference was observed between pretest-1 and posttest-2 of experimental group on interpretation ($z=-4.164$, $p<.05$), organization ($z=-3.969$, $p<.05$) and elaboration ($z=-4.006$, $p<.05$) of restricted response items at understanding level.

29. Table 4.69 indicated statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-2.530$, $p<.05$) and organization ($z=-2.121$, $p<.05$) of short-answer questions, and on interpretation ($z=-3.189$, $p<.05$) and organization ($z=-3.638$, $p<.05$) and elaboration ($z=-3.162$, $p<.05$) of restricted response items at applying level. Table 4.70 indicated statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-3.758$, $p<.05$) and organization ($z=-3.520$, $p<.05$) of short-answer questions, and interpretation ($z=-4.238$, $p<.05$), organization ($z=-4.239$, $p<.05$) and elaboration ($z=-4.239$, $p<.05$) of restricted response items at applying level. Table 4.71 depicted a statistically significant difference between pretest-1 and posttest-2 of experimental group on interpretation ($z=-3.787$, $p<.05$) and organization ($z=-3.542$, $p<.05$) of short answer questions at applying level. Statistically significant difference was found between pretest-1 and posttest-2 of experimental group on interpretation ($z=-4.246$, $p<.05$), organization ($z=-4.249$, $p<.05$) and elaboration ($z=-4.248$, $p<.05$) of restricted response items at applying level, as given table 4.71.

30. Table 4.69 showed statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group on organization of short-answer questions ($z=-3.192$, $p<.05$) and restricted response items ($z=-3.626$, $p<.05$), and interpretation ($z=-3.704$, $p<.05$) and elaboration ($z=-2.673$, $p<.05$) of restricted response items at analyzing level. Statistically non-significant difference was found between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-1.771$, $p>.05$) of short answer question at analyzing level. Table 4.70 showed statistically significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation ($z=-4.298$, $p<.05$) and organization ($z=-3.360$, $p<.05$) of short-answer questions, and interpretation ($z=-4.232$, $p<.05$), organization ($z=-4.230$, $p<.05$) and elaboration ($z=-4.238$, $p<.05$) of restricted response items at analyzing level. Table 4.71 also indicated statistically significant difference between pretest-1 and posttest-2 of experimental group on interpretation of short answer question ($z=-4.247$, $p<.05$) and restricted response items ($z=-4.232$, $p<.05$), and organization ($z=-4.230$, $p<.05$) and elaboration ($z=-4.238$, $p<.05$) of restricted response items at analyzing level. Statistically non-significant difference was found between pretest-1 and posttest-2 of experimental group on organization of short answer question ($z=-1.290$, $p>.05$) at analyzing level, as given in table 4.71.
31. Statistically significant difference was found between pretest-1 and posttest-1 mean scores of experimental group on interpretation ($z=-3.378$, $p<.05$) and organization ($z=-3.464$, $p<.05$) of short answer questions at evaluating level, as given in table

4.69. However, statistically non-significant difference was found between pretest-1 and posttest-1 mean scores of experimental group on interpretation (z=-1.732, p>.05), organization (z=-1.732, p>.05) and elaboration (z=-.000, p>.05) of restricted response items at evaluating level, as shown in table 4.69. Statistically significant difference was observed between pretest-2 and posttest-2 mean test scores of experimental group on interpretation (z=-3.826, p<.05) and organization (z=-4.144, p<.05) of short answer questions, and interpretation (z=-3.630, p<.05), organization (z=-3.535, p<.05) and elaboration (z=-3.493, p<.05) of restricted response items at evaluating level, as given in table 4.70. The difference was significant between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.591, p<.05) and organization (z=-3.614, p<.05) of short answer question at evaluating level, as given in table 4.71. The difference was significant between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.611, p<.05), organization (z=-3.508, p<.05) and elaboration (z=-3.487, p<.05) of restricted response items at evaluating level.

32. Table 4.69 indicated statistically significant difference between pretest-1 and posttest-1 mean scores of experimental group on interpretation (z=-3.906, p<.05) of short answer questions at creating level. The difference was non-significant between pretest-1 and posttest-1 mean scores of experimental group on organization of short answer questions (z=-3.603, p>.05), and organization (z=-1.732, p>.05), interpretation (z=-1.732, p>.05) and elaboration (z=-.000, p>.05) of restricted response items at creating level, as shown in table 4.69. Table 4.70

indicated significant difference between pretest-2 and posttest-2 mean test scores of experimental group on interpretation (z=-4.050, $p<.05$) and organization (z=-4.221, $p<.05$) of short answer questions, and interpretation (z=-3.630, $p<.05$), organization (z=-3.535, $p<.05$) and elaboration (z=-3.493, $p<.05$) of restricted response items at creating level. The difference was significant between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.101, $p<.05$) and organization (z=-3.603, $p<.05$) of short answer question at creating level, as given in table 4.71. Table 4.71 displayed significant difference between pretest-1 and posttest-2 of experimental group on interpretation (z=-3.611, $p<.05$), organization (z=-3.508, $p<.05$) and elaboration (z=-3.487, $p<.05$) of restricted response items, and organization and elaboration of restricted response items at creating level.

33. The gain scores of experimental and control groups on short answer questions were compared for first phase of the study by applying Mann-Whitney U test (table 4.66). The mean rank of experimental group was higher than control group on short answer questions for interpretation at remembering, understanding, analyzing and evaluating except applying and creating levels where the control group had higher mean rank than experimental group. However, difference was non-significant between gain scores of control and experimental group for interpretation at applying (U=207, $p>.05$), analyzing (U=261, $p>.05$), evaluating (U=189, $p>.05$) and creating level (U=267, $p>.05$) except remembering (U=155,$p<.05$) and understanding (U=216,$p<.05$) levels. The mean rank of experimental group was higher than control group on short answer questions for organization at

remembering, understanding, analyzing, evaluating and creating levels except applying level where control group had higher mean rank for gain score. The difference between gain scores of control and experimental group was non-significant for organization at applying ($U=206,p>.05$), analyzing ($U=236.50,p>.05$), evaluating ($U=237,p>.05$) and creating level ($U=237,p>.05$) except at remembering ($U=185, p<.05$), understanding ($U=216,p<.05$) levels.

34. The gain scores of experimental and control groups on restricted response items were compared for first phase of the study by applying Mann-Whitney U test, as shown in table 4.66. The mean rank of experimental group was higher than control group on restricted response items for interpretation at remembering, understanding, applying, analyzing, evaluating and creating levels. The difference was significant between gain scores of control and experimental group on restricted response items for interpretation at remembering ($U=216, p<.05$), understanding ($U=216, p<.05$), applying ($U=84, p<.05$) and analyzing ($U=84, p<.05$), except for evaluating ($U=240, p>.05$) and creating level ($U=240,p>.05$) level where statistically non-significant difference was found between two groups. The mean rank of experimental group was higher than that of control group on restricted response items for organization at remembering, understanding, applying, analyzing, evaluating and creating levels. The difference was significant between gain scores of control and experimental group on restricted response items for organization at remembering ($U=228, p<.05$), understanding ($U=228,p<.05$), applying ($U=108,p<.05$) and analyzing ($U=96,p<.05$) levels whereas the difference

was non-significant between gain scores of control and experimental group for evaluating ($U=240, p>.05$) and creating ($U=240,p>.05$) level. The mean rank of experimental group was higher than that of control group on restricted response items for elaboration at remembering, understanding, applying and analyzing levels whereas there was no change in gain scores of control and experimental group at evaluating and creating levels. The difference was non-significant between gain scores of control and experimental group on restricted response items for elaboration at remembering ($U=240, p>.05$) and understanding ($U=240, p>.05$), evaluating ($U=276, p>.05$) and creating level ($U=276, p>.05$). The difference was significant between gain scores of control and experimental group on restricted response items for elaboration at applying ($U=156, p<.05$) and analyzing ($U=168, p>.05$) levels.

35. The gain scores of experimental and control group on short answer questions were compared for second phase of the study by applying Mann-Whitney U test, as shown in table 4.67. The mean rank of experimental group was higher than control group on short answer questions for interpretation at applying, analyzing and evaluating levels except for remembering, understanding, and creating levels where the control group had higher mean rank than experimental group. However, difference was non-significant between gain scores of control and experimental group for interpretation at remembering ($U=214.50,p>.05$) and understanding ($U=226.50,p>.05$), applying ($U=251.50, p>.05$), analyzing ($U=254, p>.05$), evaluating ($U=205.50, p>.05$) and creating level ($U=263.50, p>.05$). The mean rank

of experimental group was higher than control group on short answer questions for organization at evaluating and creating levels. The mean rank of control group was higher than experimental group at remembering, understanding and applying levels except analyzing level where control and experimental group had same mean rank for gain score. The difference was non-significant between gain scores of control and experimental group for organization at remembering (U=247.50, p>.05), understanding (U=253,p>.05), applying (U=263,p>.05), analyzing (U=276.50,p>.05), evaluating (U=242,p>.05) and creating level (U=270,p>.05) levels.

36. The gain scores of experimental and control group on restricted response items were compared for the second phase of the study by applying Mann-Whitney U test, as shown in table 4.67. The mean rank of experimental group was higher than control group on restricted response items for interpretation at remembering, understanding, applying, analyzing, evaluating and creating levels. Statistically significant difference was found between gain scores of control and experimental group on restricted response items for interpretation at remembering (U=189, p<.05), analyzing (U=140.50, p<.05), evaluating (U=166.50, p<.05) and creating level (U=166.50,p>.05) level except for understanding (U=200, p<.05), applying (U=200, p<.05) where statistically non-significant difference was found between two groups. The mean rank of experimental group was higher than that of control group on restricted response items for organization at remembering, understanding, applying, analyzing, evaluating and creating levels. Statistically significant

difference was found between gain scores of control and experimental group on restricted response items for organization at analyzing (U=137, p<.05), evaluating (U=163, p<.05) and creating (U=163,p<.05) levels except at remembering (U=249.50, p>.05), understanding (U=245.50,p>.05) and applying (U=207,p>.05) levels whereas statistically non-significant difference was observed between gain scores of control and experimental group. The mean rank of experimental group was higher than control group on restricted response items for elaboration at remembering, understanding, applying, analyzing, evaluating and creating levels. Statistically non-significant difference was observed between gain scores of control and experimental group on restricted response items for elaboration at remembering (U=231, p>.05) and understanding (U=229.50, p>.05) and applying (U=190, p>.05) levels. Statistically significant difference was noticed between gain scores of control and experimental group on restricted response items for elaboration at analyzing (U=115, p<.05), evaluating (U=145, p<.05) and creating level (U=145, p<.05) levels.

37. The gain scores of experimental and control group on short answer questions were compared for the whole study duration by applying Mann-Whitney U test (table 4.68). The mean rank of experimental group was higher than control group on short answer questions for interpretation at remembering, understanding, applying, analyzing, evaluating and creating levels. However, statistically non-significant difference was found between gain scores of control and experimental group for interpretation at remembering (U=273.50,p>.05), understanding (U=257,p>.05),

applying (U=241.50,p>.05), analyzing (U=230.50,p>.05), evaluating (U=192,p>.05) and creating level (U=254.50,p>.05). The mean rank of experimental group was higher than control group on short answer questions for organization at remembering, understanding, analyzing, evaluating and creating levels except applying level where control group had higher mean rank for gain score. Statistically non-significant difference was found between gain scores of control and experimental group for organization at remembering (U=245, p>.05), understanding (U=251,p>.05), applying (U=272.50,p>.05), analyzing (U=215,p>.05), evaluating (U=217,p>.05) and creating level (U=203,p>.05).

38. The gain scores of experimental and control group on restricted response items were compared for the whole study duration by applying Mann-Whitney U test, as shown in table 4.68. The mean rank of experimental group was found to be higher than control group on restricted response items for interpretation at remembering, understanding, applying, analyzing, evaluating and creating levels. Statistically significant difference was found between gain scores of control and experimental group on restricted response items for interpretation at remembering (U=182, p<.05), analyzing (U=140.50, p<.05), evaluating (U=171.50, p<.05) and creating level (U=171.50,p<.05). Statistically non-significant difference was found between gain scores of control and experimental group on restricted response items for interpretation at understanding (U=193, p>.05) and applying (U=192, p>.05) levels. The mean rank of experimental group was higher than control group on restricted response items for organization at remembering, understanding,

applying, analyzing, evaluating and creating levels. Statistically non-significant difference was observed between gain scores of control and experimental group on restricted response items for organization at remembering (U=242, p>.05), understanding (U=238,p>.05) and applying (U=198,p>.05) levels. Statistically significant difference was found between gain scores of control and experimental group on restricted response items for organization at analyzing (U=137,p<.05), evaluating (U=168,p<.05) and creating level (U=168,p<.05). The mean rank of experimental group was higher than control group on restricted response items for elaboration at remembering, understanding, applying, analyzing, evaluating and creating levels. Statistically non-significant difference was found between gain scores of control and experimental group on restricted response items for elaboration at remembering (U=228.50, p>.05) and understanding (U=224.50, p>.05) levels. Statistically significant difference was observed between gain scores of control and experimental group on restricted response items for elaboration at applying (U=181, p>.05), analyzing (U=115, p<.05), evaluating (U=148.50, p<.05) and creating level (U=148.50, p<.05).

5.2.3 Perception About Learning Experiences With Flipped Classroom Instruction (FCI)

39. Technology tool 'personal computer' was used for course activities by 73.9% participants of experimental group for two to four hours, 17.4% participants for five to seven hours and 8.7% participants for one hour or less than one hour per week, as given in table 4.71. Time duration for using 'Internet' per week was two to four hours for 34.8% participants, five to seven hours for 30.4% participants, one hour

or less than one hour for 21.7% participants and eight hours or more for 13% participants of experimental group for course activities, as shown in table 4.71. Phone calls were used for course activities by 60.9% participants for one hour or less than one hour, 21.7% participants for five to seven hours and 17.4% participants for two to four hours per week, according to table 4.71. Text messages were used for course activities by 56.5% participants for one hour or less than one hour, 21.7% participants for two to four hours and 21.7% participants for five to seven hours per week, as shown in table 4.71. WhatsApp was used for course activities by 30.4% participants for one hour or less than one hour, 30.4% participants for two to four hours, 26.1% participants for five to seven hours and 13% participants for eight hour or more per week, as given in table 4.71. Keeping in view the above-mentioned percentages, majority of the participants using personal computer (73.9%), internet (34.8%) and WhatsApp (30.4%) utilized these tools for two to four hours per week on average for course activities, as shown in table 4.71. Majority of the participants using text messages (56.5%) and phone calls (60.9%) utilized these tools for one hour or less than one hour per week on average for course activities, as shown in table 4.71.

40. While analyzing the use of technology tools for high, low and average academic groups, majority of high achievers (66.7%), average (73.3%) and low achievers (80%) used personal computer for two to four hours per week for course activities, as shown in table 4.72. For "internet", 33.3% high achievers were using it for two to four hours, 33.3% for five to seven hours and 33.3% for eight hours or more per

week for course activities whereas 33.3% average group members were using internet for two to four hours and 33.3% average group members were using it for five to seven hours, as shown in table 4.72. The low achiever group members were using internet with 40% participants for two to four hours and 40% participants for one hour or less than one hours per week for course activities, as shown in table 4.72. Phone calls were used for course activities by high achiever group (33.3%), average group (66.7%) and low achiever group (60%) for one hour or less than one hour per week, as shown in table 4.72. Text messages were used for course activities by high achiever group (66.7%), average group (53.3%) and low achiever group (60%) for one hour or less than one hour per week, as given in table 4.72. WhatsApp was used for course activities by high achiever group (66.7%) for one hour or less than one hour and low achiever group (60%) for two to four hours per week for course activities, as shown in table 4.72. WhatsApp was used by average for course activities with 26.7% participants for five to seven hours, 26.7% participants for two to four hours and 26.7% participants for one hour or less than one hour per week, as shown in table 4.72.

41. For construct 'instruction of subject concepts', and its two sub-constructs 'understanding subject concepts' and 'lesson structure', the mean scores of experimental group members were 6.02 (SD=.53), 5.93 (SD=.54) and 6.11 (SD=.66), as shown in table 4.73. Keeping in view this response, the prospective teachers of experimental group had a positive experience about learning of subject concepts through Flipped Classroom Instruction (FCI). The analysis of focus group

discussion revealed that five participants reported that their positive course expectations were fulfilled while working in Flipped Classroom instruction (FCI) and nine participants had positive course experiences which were different from their course expectations. Due to the involvement of prospective teachers during class time in this course, they could not notice the passing of class time as compared to different experience with other courses. The new class routine with provision of learning material in the form of notes and videos before class time, an online quiz during class time, an interactive class activity based on that learning material and writing a reflective journal at the end of class, was interesting for prospective teachers of experimental group; however, different participants liked one or another aspect such as majority participants liked the easy and detailed notes with relevant examples, three participants liked the notes supplemented by video and another saved the time by just watching video instead of reading notes. The class activity was new and yet difficult for students in the start but with the guidance of teacher within- and out-of- class time, they tackled it gradually and successfully. While learning subjects through Flipped Classroom Instruction (FCI), the prospective teachers progressed towards becoming independent learners by studying and searching for material on their own and depending less on others. They felt responsibility to finish reading material and understand the subject concepts for every class because it was a prerequisite for successfully completing the class activity. Class activities were recognized by prospective teacher as helpful for learning and clarifying subject concepts, and some general skills such as cooperation, questioning skill and using technology for searching new information. Statistically non-significant difference ($H(2) = 2.416$, $p > .05$) was found among mean scores of high achievers ($M = 6.28$, $SD = .24$), average ($M = 5.9$, $SD = .56$) and low achievers ($M = 6.22$, $SD = .49$) groups on construct 'instruction of subject concepts' (table 4.74). Statistically non-significant difference was found among high achievers, average and low achievers group on sub-constructs 'understanding subject concepts' ($H(2) = 2.701$, $p > .05$) and 'lesson structure' ($H(2) = 1.183$, $p > .05$), as shown in table 4.76.

42. For construct 'utilization of technology resources', and its two sub-constructs 'access to technology resources' and 'ease of using technology resources', the mean scores of experimental group members were 6.15 ($SD = .53$), 6.13 ($SD = .59$) and 6.17 ($SD = .76$), as given in table 4.73. Keeping in view the mean scores of prospective teachers on construct 'utilization of technology resources', it was found that they had positive experience with technology resources while working with Flipped Classroom Instruction (FCI). While analyzing focus group discussion of prospective teachers related to technology resources, it was reported that all the students had android phone and only two prospective teachers had no access to internet at their home. As there was a continuous availability of internet in classroom so the students especially the ones with no internet access at home, downloaded learning material for next lesson before leaving class; they also got a hard copy of the notes for learning material. As the members of experimental group were familiar at a very basic level with computers during their school time, so it

was not a new thing for them. However, they learnt to use it for learning purpose first time e.g., attempting online quiz and search new information through internet. The use of technology resources for this course helped experimental group members to maintain interest (as reported by five participants), keep focused (as reported by two participants), make them curious (as reported by one participant) and understand concepts in a better way (as reported by seven participants). Reflective journals, as reported by two participants, were useful to provide suggestions for course and know students' opinion about teaching-learning process. There were some issues faced while using technology resources during the research study, as mentioned by members of experimental group. There were two classes of the selected course in every week and there was no electricity for half an hour in second class. The time period with no electricity, was productively used for some class activity or class discussion and/or resolving some class problem. Besides electricity, there was an issue of internet speed and the technical issue while using personal computers and difficulty to understand video content because of English language accent faced in the beginning classes, as reported by seven, four and one participant(s), respectively. For resolving these problems, strategies such as use of multiple devices of internet, use of mobile phone in place of personal computers (PCs), sharing/using personal computers which were available, and supplementing class notes with instructional video(s) for a lesson were adopted. There was a statistically significant difference found ($H(2) = 6.934$, $p < .05$) among mean scores of high achievers ($M = 6.47$, $SD = .09$), average ($M = 6.00$, $SD = .42$) and low achievers (M= 6.40, SD= .81) groups on construct 'utilization of technology resources', as given in table 4.74. A post-hoc test (i.e., Mann-Whitney U test) in table 4.75 showed statistically significant difference (U= 3.00, P<.05) between average (M=6.00, SD=.42) and higher achievers (M=6.47, SD=.09) group on construct 'utilization of technology resources'. Statistically non-significant difference was found among high achievers, average and low achievers group on sub-constructs 'ease of using technology resources' (H(2) =2.165, p>.05), as shown in table 4.76. There was statistically significant difference among high achievers (M=6.44, SD=.19), average (M=5.91, SD=.58) and low achievers (M=6.60, SD=.43) group on sub-construct 'access to technology resources' (H(2) =7.681, p<.05), as shown in table 4.76. Mann-Whitney was applied as a post-hoc test for sub-construct 'access to technology resources', and found a statistically significant difference (U= 11.00, p<.05) between low achievers (M=6.13, SD=.50) and average (M=6.00, SD=.50) groups (table 4.77).

43. The experimental group on construct 'classroom environment', its two sub-constructs 'learning environment' and 'effort for learning' had mean score 5.87 (SD=.55), 6.34 (SD=.42) and 5.39 (SD=1.06) respectively (table 4.73). The quantitative response of prospective teachers about construct 'classroom environment' and its two sub-constructs led to the finding that they had a positive experience regarding classroom environment while working with Flipped Classroom Instruction (FCI). The responsibilities of prospective teachers were to read learning material before class time, complete online quiz and class activity

during class time and fill a class feedback form after the class ends. For performing an activity, it was necessary to obtain 90% marks in online quiz, as mentioned by one participant; however, class quiz can be attempted for more than one time to meet the criteria. Reading and understanding notes were compulsory to perform the class activity, as mentioned by one participant. Another participant added that if s/he could not study the notes at home, s/he read it in college/class time or take help from class fellow(s). Since all the class activities were related so, the prospective teachers were completing their daily work regularly without leaving any topic/course component incomplete or unattended, as mentioned by six participants. Another experience was timely provision of needed support when a student teacher faces a problem. When a student came to class after missing one class, s/he would get the required learning material and the support from teacher and peers. Three participants described this course experience as interesting, one participant called it a good experience, two found it a non-boring experience and three explained about class activities as easy and short. Statistically non-significant difference was found among high achievers, average and low achievers group for sub-constructs 'learning environment' ($H(2) = .760$, $p > .05$) and 'effort for learning' ($H(2) = .232$, $p > .05$) (table 4.74). Statistically non-significant difference ($H(2) = .210$, $p > .05$) was observed among mean scores of high achievers ($M = 5.67$, $SD = .82$), average ($M = 5.93$, $SD = .54$) and low achievers ($M = 5.82$, $SD = .53$) groups on construct 'classroom environment', as shown in table 4.76.

44. For constructs 'social interaction', and its two sub-constructs 'access to teacher/peers' and 'interactive activities', the mean score of experimental group members were 6.15 (SD=.42), 6.07 (SD=.48) and 6.22 (SD=.46), as shown in table 4.73. The prospective teachers were in contact with their teacher during class time through face-to-face interaction and after class time through WhatsApp and cell phone, as mentioned by two participants. The prospective teachers shared their problems, asked questions and discuss their difficulties with their teacher. Nine prospective teachers described their interaction with their teacher as cooperative. While adding into 'learning support from teacher', the participants mentioned about the prepared lecture of topic as helpful thing, three participants referred to detailed explanation of a topic and another participant highlighted the constructive feedback during class presentation. while discussing interaction among class fellows, the participants mentioned a lot of within and out of class opportunities to facilitate each other e.g., ten participants mentioned class activities, two participants referred to out of class discussion, one mentioned about WhatsApp group, another participant about class presentation; two participants highlighted peer support to understand a concept and another about helping shy student to contribute to the group activity. However, there was some gender wise distribution for group class activity because the participants were free to choose their group participants and there is a socio-cultural perspective; the participants preferred to go to the groups with participants from the same gender. While talking about competition among participants, they mentioned that they were competing with each other to finish the

assigned task very well or earlier than our class fellows in groups or even individually. Statistically non-significant difference was found ($H(2) = 2.276$, $p > .05$) among mean scores of high achievers ($M = 6.40$, $SD = .18$), average ($M = 6.06$, $SD = .41$) and low achievers ($M = 6.23$, $SD = .52$) groups on construct 'social interaction' (table 4.74). Statistically non-significant difference was observed among high achievers, average and low achievers group on sub-constructs 'access to teacher/peers' ($H(2) = 1.267$, $p > .05$) and 'interactive activities' ($H(2) = 2.072$, $p > .05$) (table 4.76).

45. The experimental group members on construct 'preference for instructional method' had mean score 5.28 ($SD = .42$), as shown in table 4.73. Instructional videos because of English language used in it, were difficult to understand for two participants of the study. For this purpose, videos with subtitles and detailed notes were provided with every course topic. Due to new experience with Flipped Classroom, the prospective teachers took some time to adjust to FCI in the start of the study. But when they get used to it, they felt the change in themselves regarding comprehension of subject concepts, general skills, technology experiences and interaction with their teacher and class fellows, and classroom routine. While describing about their course experiences with Flipped Classroom Instruction (FCI), twelve participants called it a satisfying and exciting experience, six participants highlighted it as interesting method for a course, one called it a memorable method for course concepts and five participants call it a useful method for grooming thinking skills of a person. The participants recommended the use of

FCI for science subjects and Pakistan Studies. They recommended using online class activities and including some case studies from real-life classrooms in a Flipped Classroom. The difference (H(2) =.647, p>.05) was non-significant among mean scores of high achievers (M= 5.13, SD= .30), average (M= 5.29, SD= .36) and low achievers (M= 5.36, SD= .67) groups on construct 'preference for instructional method', as shown in table 4.74.

46. As shown in table 4.78, the feature of Flipped Classroom Instruction (FCI) rated by 47.8% participants as interesting was "online assessment through quiz" with "access to online course materials (marked by 43.5% participants)" and "interaction with teacher during class time (marked by 43.5% participants)" as second highest components. The component "classroom activity-group activity" was marked as interesting by 39.9% participants. The three features of Flipped Classroom Instruction (FCI) rated as interesting by 39.1% participants were "classroom interaction", "communication through Google Classroom" and "communication through WhatsApp". "Classroom activity-individual assignment" was rated as interesting by 34.8% participants. The four features of Flipped Classroom "communication through mobile phone", "communication through email", "assessment for feedback at the end of class" and "e-portfolio" were rated as interesting by 21.7%, 17.4%, 13% and 4.3% participants, respectively.
47. Table 4.78 showed the statistics for features of Flipped Classroom Instruction (FCI) rated as liked by the participants. The feature ‘communication through WhatsApp’ was liked by 52.2% participants. The features liked by 43.5% participants included

access to online course materials and interaction with teacher during class time. "Classroom interaction" and "assessment for feedback at the end of a class" were liked by 39.1% participants. The feature "online assessment through quiz" was liked by 34.8% participants whereas "communication through Google Classroom", "communication through mobile phone" and "classroom activity-group work" were liked by 26.1% participants. Three features "communication through email", "classroom activity-individual assignment" and "e-portfolio" were liked by 21.7%, 17.4% and 4.3% participants. Figure 4.13 displayed the statistics for various features of Flipped Classroom Instruction (FCI) liked by participants of the experimental group.

48. According to the statistics given in table 4.78, the feature of Flipped Classroom Instruction (FCI) found challenging by 34.8% participants was classroom interaction whereas "access to online course materials" and "online assessment through quiz" were rated as challenging by 30.4% participants. The features "communication through Google Classroom" and "classroom activity-individual assignment" were found challenging by 26.1% participants. "Classroom activity-group work" was challenging for 21.7% participants and "assessment for feedback at the end of a class" was perceived as challenging by 13% participants. The features "communication through WhatsApp", "communication through mobile phone", "e-portfolio" and "interaction with teacher during class time" were found challenging by 8.7% participants whereas 4.3% participants found "communication through email" as a challenging feature of Flipped Classroom Instruction (FCI).

Figure 4.14 showed the statistics for various features of Flipped Classroom Instruction (FCI) rated as challenging by participants of the experimental group.

5.3 Discussion

The present research study aimed to fill the gaps in the literature in the following categories of understanding: (i) Flipped Classroom as an active learning method of instruction effective for judgment, decision-making and team-working skills for reflective thinking of prospective teachers, (ii) Flipped Classroom as beneficial for grooming higher order thinking skills, with respect to cognitive domain, of prospective teachers and (iii) perception of prospective teachers about their learning experiences with Flipped Classroom Instruction.

5.3.1 Reflective Thinking Skills Scale (RTSS)

The results of the study showed that reflective thinking can be improved through instructional method. The results were in congruence with research studies in the field such as Zahid and Khanam (2019), Umam, Nusantara, Parta, Hidayanto & Mulyono (2019), Hsia & Hwang (2020), Hung (2015), Chen, Hwang and Chang (2019), Fauzi, M., Shahnaz, S., Hussain,R. & Maznah, R. (2016). All these research studies found a positive effect of flipped classroom on reflective capacity of learners at university level.

In an experimental study of six weeks duration, Tican and Taspinar (2015) found that the reflective thinking skills of student teachers can be developed and improved through reflective thinking-based activities. Weber (2013), and Arrastia, Rawls, Brinkerhoff and Roehrig (2014) found an improvement in reflective thinking skills of prospective teachers over a span of one semester. However, in case of Arrastia, Rawls, Brinkerhoff and Roehrig (2014), 35% prospective teachers were engaged in deeper level of reflection because the student teachers were not involved in field experiences during the time of research study. The student teachers were able to reflect critically about various aspects of teaching and student learning in year-long study on action research by prospective teachers (Hagevik, Aydeniz, & Rowell, 2012).

During the study, the student teachers of experimental group were involved in class activities where they were working to apply the concepts they learnt before the class time. It was also recommended by Arrastia, Rawls, Brinkerhoff and Roehrig (2014) that in order to facilitate prospective teachers for deep reflection, teacher education instructional experiences should challenge prospective teachers for application of relevant skills, and techniques and strategies with scaffolding from teacher educators to support their reflection.

The difference between pretest and posttest for experimental group was non-significant on RTSS during first phase of study. However, the pretest and posttest during second phase of the study were different significantly on RTSS. The instructional effects of flipped classroom become evident after a period of time (Zhu & Xie, 2018).

The pretest-1 and posttest-2 of experimental group on Reflective Thinking Skills Scale (RTSS) for the study period differed significantly. This finding was also supported from the literature. The pre-service teachers utilized their reflective thinking skills in better way when they were engaged in peer interaction and Google Docs for documenting their reflection. During the study, the participants were encouraged to ask questions and make suggestions without altering the text. The participants were discussing their existing knowledge to find its link with new knowledge (Abdul Rabu & Badlishah, 2020). Blog (Bener & Yildiz, 2019) and e-portfolio (Roberts, Maor, & Herrington, 2016) are effective for engagement of preservice teachers in reflective thinking. It can also improve the quality of writing of university students (Novakovich, 2015). However, a strong pedagogy to engage students at a deeper level is helpful for maximum benefits in this regard (Roberts, Maor, & Herrington, 2016).

Video-based training was helpful for improving monitoring skill such as noticing student interactions because moderate increase in learning among student teachers was found in a study by Kaendler, Wiedmann, Leuders, Rummel and Spada (2016). Citraningrum and Sudargo (2019) found that prospective teachers improved their reflective ability when they worked in virtual practicum for invertebrate Zoology in a way that they were able to relate knowledge to their everyday life. The study result was also supported by these research studies.

The prospective teachers of experimental group showed a non-significant decrease in the mean score on pretest-1 and posttest-1 Reflective Thinking Skills Scale (RTSS). The reason for this decrease may be that the instructional experience with Flipped Classroom was new for prospective teachers. During second phase, they were more familiar with the instructional method (Tufail, 2019).

It showed that there was no significant change in mean scores of experimental group for the gap period between phase 1 and phase 2 of the study. Therefore, the gap period exerted no effect on dependent variable for experimental group.

In a study by Vaughan (2014), it was found that that students showed a higher level of reflection and inquiry in their coursework. So, it can be inferred that prospective teachers had ample time to grasp and process new knowledge because they were learning new material beyond understanding level. The student teachers worked on group activity because they have already understood the material before class time. However, it was a challenge for prospective teachers to engage in class activity as the focus was on how to do it instead of what to do.

The prospective teachers of experimental group showed an improvement in their observation, judgment and decision-making skills during second phase of the study. It was also supported by the literature such as Kaendler, Wiedmann, Leuders, Rummel and Spada (2016), and Tsingos-Lucas, Bosnic-Anticevich, Schneider and Smith (2016). Tsingos-Lucas, Bosnic-Anticevich, Schneider and Smith (2016), in a study on second-year undergraduate pharmacy curriculum, found that students showed an improvement in their reflective thinking capacity when reflective thinking activities were integrated into the course. A better reflective thinking ability can assist students to take decisions and judgments in a better and informed manner, thereby improving their teaching practice.

It was statistically non-significant difference among academic achievement subgroups of experimental group on Reflective Thinking Skills Scale (RTSS). On the contrary, the analysis of control group showed a difference among academic achievement sub-groups on RTSS. It may be inferred that flipped classroom provide individualized support to every student thus minimizing the difference which may occur due to academic performance of the students. Lage, Platt, and Treglia (2000) found that the flipped classroom contributes positively to serve different kinds of students for learning.

5.3.2 Academic Achievement Test

Palmer, Osborn and Strelan (2020), after a meta-analysis of 198 research studies in different disciplines at tertiary, secondary and primary school level, found that flipped classroom affected students' performance in moderate positive manner. Hung (2015), in a study about learners of first-year communicative English language majors, confirmed the study result of Davies, Dean, and Ball (2013) about the association of flipped classroom with better academic performance as compared to regular classrooms. The pretest and posttest scores comparison of experimental group showed an improvement in remembering understanding and applying during first phase whereas there was an improvement in analyzing, evaluating and creating levels during second phase of the study. Statistically significant difference was noticed between experimental and control group for gain scores on remembering, understanding and applying level during first phase whereas this difference was noted for gain scores on analyzing, evaluating and creating level during second phase of the study.

There was no statistically significant difference between gain scores of experimental and control groups during first phase of the study for applying, analyzing, evaluating and creating levels except remembering and understanding level. Based on academic achievement scores of both groups, it can be noticed that performance on higher order level improved during second phase of the study. The possible reason may be that the instructional effects of Flipped classroom become evident after a period of time (Zhu

& Xie, 2018). Turan & Goktas (2016) reported higher learning achievements and lower cognitive loads of students taught with flipped classroom than those with traditional model in higher education settings. Mellati, M. & Khademi, M. (2019) found that the group taught through Flipped Classroom outperformed the groups taught through MOOCs and conventional teaching method. Kazanidis, Pellas, Fotaris & Tsinakos (2018) found significant difference between academic performance of control and experimental group at undergraduate level with experimental group performing better in instructional media design course.

The study results showed an improvement in the academic performance of student teachers of experimental group. This finding was congruent with other research studies conducted at undergraduate level. Little (2015) found that students after studying through Flipped Classroom module showed higher percentage scores and grades as compared to their previous performance when the module was taught in traditional mode. Talley & Scherer (2013) found that flipped course with use of self-explanation and practice testing methods can contribute to improve academic performance of students. Yough, Merzdorf, Fedesco and Cho (2017) found significantly higher performance of preservice teachers in the flipped classroom for many objective learning outcomes. Sun and Wu (2016) found positive effect of flipped classroom on learning achievement for a freshman Physics course in a national university. Flores, del-Arco, and Silva (2016), after comparing the academic result of students from three different batches, found that the flipped classroom model caused the improvement of academic performance of students. Yilmaz & Keser (2016) found that podcasts supported with reflective activities contributed positively to academic success of students.

Graham (2015), in a research study on Flipping a biochemistry course, found an improvement in the interaction of students with the course material and the exam performance also significantly improved for low achievers and female students. However, Leatherman & Cleveland (2019) observed statistically non-significant difference between exam performance of students in active non-flipped and flipped Genetics course. It may be suggested to assess the academic progress of students studying through lecture-based traditional classroom, active traditional classroom and active-flipped classroom.

The possible explanation of FCI is that the improved academic achievement of experimental group may be ascribed to use of out-of-class time for processing of the learning material and within-class time for using the learned concepts in class activities. According to Koh (2019), pre-class readings and resources with self-assessment or feedback were effective source for learning objectives. Self-assessment through application and remediation helped students to demonstrate a consistent improvement in learning outcomes (Koh, 2019).

5.3.3 Perception About Learning Experiences With Flipped Classroom Instruction

The analysis of responses of prospective teachers (experimental group) on perception scale and focus group discussion showed that the prospective teachers had positive course expectations which were fulfilled while working in Flipped Classroom (FC). Further, they had a positive experience with learning of subject concepts through Flipped Classroom Instruction (FCI). Butt (2014), in semester long study for actuarial studies course at undergraduate level, found that students' perception was more positive about learning through Flipped Classroom after attending the course as compared to their responses before attending that course.

While learning subjects through Flipped Classroom Instruction (FCI), the prospective teachers felt responsibility to understand the subject concepts for every class and worked on class activities for applying the concepts. Flipped classroom is very helpful for students who take some time to grasp a concept (Nwosisi, Ferreira, Rosenberg & Walsh, 2016). Qualitative data collected by Nwosisi, Ferreira, Rosenberg and Walsh (2016) indicated that 94% students liked Flipped classroom and 72% students perceived it to be helpful for learning the material in a better way. Butt (2014), in a research study, found that the positive responses of students about their learning experiences with Flipped Classroom were related to application of concepts in class, interactivity of the class and deep learning experiences of students.

During the study, if a prospective teacher could not study the learning material at home, came to class after missing one class or faced a problem in the learning process, s/he would get the required learning material and support from teacher and peers. Flores, del-Arco, and Silva (2016) witnessed from the responses of students that Flipped classroom model helped the students to integrate course concepts. It also promoted the participation and communication among students and teacher. Student-content and student-teacher interaction in online courses served as a source to fulfill students' expectations (Nwankwo, 2015). The learners enjoyed group activities because they can help each other and learn from each other. They also had teacher's support available when needed (Jensen, Kummer & Godoy, 2015).

The students perceived that they learnt better because of teacher and peer interaction as compared to activity itself, supported by Jensen, Kummer and Godoy (2015), and Mellati, M. & Khademi, M. (2019). Students asked for help and support through WhatsApp and even when they were studying learning material before class time. This finding was supported by Jensen, Kummer and Godoy (2015). Murray, Koziniec and McGill (2015) found that students perceived quality interaction with their teacher and peers.

It was found that they had positive experience with technology resources while working with Flipped Classroom Instruction (FCI). All members of experimental group had android phone and only two students had no access to internet facility in their home. The use of technology resources for this course helped experimental group members to maintain interest, keep focused, make them curious and understand concepts in a better way. Dickenson (2015) found, in an experimental study, that majority of preservice teachers perceived instructional videos to be useful for course concepts and discussion in class. Students interacted with peers and teachers within and out of class time which affected their learning. Students also accessed the content where they were able to pause or replay the video. For learner-technology interaction, they perceived themselves to be independent learners and information seekers (Zainuddin, 2018).

The prospective teachers found the course experiences especially class activities as interesting and useful experience. The participants mentioned that the activities were helpful to understand a concept. It was also found by Jensen, Kummer and Godoy (2015) that the students after studying in Flipped Classroom perceived assignments and class activities contributing to their learning. According to Graham, McLean, Read, Suchet-Pearson and Viner (2017), short, interesting and a variety of class activities may engage learners. While working on a class activity, the student will engage more when they are held accountable for their work (Graham, McLean, Read, Suchet-Pearson & Viner, 2017).

During the study, the prospective teachers interacted with their teacher during class time for necessary support. They also interacted with their teacher after class through phone call, text message and WhatsApp. The continuous interaction with teacher was perceived useful by prospective teachers for their learning progress. Use of online and offline teaching opportunities give a number of opportunities for learning in diverse perspectives (Graham, McLean, Read, Suchet-Pearson & Viner, 2017).

Lage, Platt, and Treglia (2000) found that the flipped classroom contributes positively to the learning environment for different learner types. The analysis of prospective teachers with high, average and low achievement performance, showed that all the groups were perceiving Flipped Classroom (FC) as useful for their learning experiences. However, as far the access and use of technology resources were concerned, low achievement subgroup was very active.

Mellati, M. & Khademi, M. (2019) found that the responsibility of coming into class after preparing the learning material for that class, promoted students' active engagement in the course. They added that enough class time for learning problems of students, group work, brainstorming, immediate feedback from teacher and students were some of positive factors of FC highlighted by the students and teachers of the study. However, students perceived it more demanding because of studying learning material on their own before class time. It was also confirmed by the results of the present study. Green and Schlairet (2017) asserted, on the basis of a research study in a nursing undergraduate course, that Flipped Classroom helped students to progress from being "passive" to "active" learners, a finding confirmed by the present study. They added that students perceived themselves in a role to use the concepts of course in various experiences. Students moved from being reactive and subject-centered to reflective and more mature in pre-professional role. Activities and learning material should be arranged in a way that will serve multiple learning styles of students.

Nguyen, Yu, Japutra and Chen (2016), in a study of 2 weeks duration, found that students preferred a recorded good quality video over teacher's lecture. In flip teaching, students are doing independent work so they can approach a teacher as compared to traditional lecture where a teacher engages only with students who ask questions. So, the effective features of flip teaching were high quality videos, class activities, availability of teacher for questioning, its flexibility and convenience for learners. Shih and Tsai (2017) found that successful implementation of flipped classroom required an understanding among teacher and students. An active role of student within and out of class, an encouragement and guidance from teacher, and peer interaction for students are important. flipped classroom with project-based learning helped to enhance the motivation and interest of students, according to Shih and Tsai (2017); the possible reason may be the class activity where students were working, competing with and learning from each other.

Further, the student perceived about the important role of Flipped Classroom with project-based learning for improving critical thinking, problem-solving, communication, team-working and knowledge integration skills. According to Murray, Koziniec and McGill (2015), while shifting from traditional to flipped classroom, it requires a considerable effort that's why videos for study materials should be effective and accessible. Lectures can be used to understand a tutorial in a better way. The videos were less-consuming source to understand a topic according to students. And the videos with application-level content were preferred by students.

Hao and Lee (2016) advocated that taking courses with flipped classroom may help prospective teachers to deal with self-efficacy concerns about implementing it in their own classroom. Further, providing experiences of flipped classroom in different content areas, and theory of Flipped Classroom, would improve their technological pedagogical content knowledge about it. Hao and Lee (2016) found female prospective teachers more satisfied with collaborative learning environments and class activity as compared to male students.

5.4 Conclusion

1. There was a change in the use of tools by the experimental group for gathering information about their surroundings. There was a decrease in use of memory, diary-writing and taking photographs in the posttest-2 as compared to pretest-1. The response of experimental group showed an increased usage of video-making and audio-recording in posttest-2 as compared to pretest-1, as described in finding number 1. Based on the findings, Flipped Classroom Instruction (FCI) is effective for nurturing reflective thinking skills i.e., observation, judgment, team-working

and decision-making, whereas it was not found effective for communication sub-skill in this research study. However, this change in observation, judgment, team-working and decision-making skills was found during second phase of the study which depicted that it took some time for prospective teachers of experimental group to adjust and work in Flipped Classroom Instruction (FCI) before any statistically significant change in the above-mentioned skills.

2. By comparing the responses of control and experimental group on use of various tools for gathering information about their surroundings, it was found that there was a decrease in the use of memory, diary-writing and taking photographs in posttest-2 as compared to pretest-1 response for each respective group. There was an increase in use of audio-recording by control group (4.2%) whereas there was an increase in use of audio-recording (8.7%) and video-making (4.4%) by experimental group in posttest-2 as compared to its pretest-1 response. Based on these findings, improvement was observed on observation skill of reflective thinking skills of control and experimental group. There was no statistically significant change in communication skill of experimental and control group during this research study. However, the responses of experimental group showed that Flipped Classroom Instruction (FCI) was helpful in improving mean score on overall reflective thinking scale, judgment subscale, team-working and decision-making subscales.
3. As the content of the course was about critical thinking and reflective practices, Flipped Classroom Instruction (FCI) may complement the content of critical

thinking and reflective practices for grooming the reflective thinking skills i.e., judgment, decision-making and team-working skills. It can be concluded that content of the course and traditional instruction was equally effective for improving the observation skill of student teachers. It was also concluded that Flipped Classroom Instruction (FCI) and traditional instruction were not found effective to improve communication skill of prospective teachers given the content of course was about critical thinking and reflective practices.

4. It was concluded that there was a positive change in the test score of experimental group in the posttest-2 as compared to pretest-1 and pretest-2 mean scores on academic achievement test at remembering (finding number 27), understanding (finding number 28), applying (finding number 29), analyzing (finding number 30), evaluating (finding number 31) and creating (finding number 32) levels after studying through Flipped Classroom Instruction (FCI).
5. While comparing the performance of experimental and control group on academic achievement test, there was an improvement in performance in mean gain scores of both groups at remembering, understanding, applying and analyzing levels during first phase of the study. The experimental group had improved academic performance as compared to control group at analyzing, evaluating and creating levels for second phase of the study. For whole duration of the study, the experimental group performed better than control group on academic achievement test at analyzing, evaluating and creating levels. Keeping in view the findings, the

experimental group performed better on achievement test than control group at analyzing, evaluating and creating levels.

6. Based on responses of experimental group members for perception scale and focus group discussion (FGD), it was concluded that the course experience was interesting and different from other course experiences including instruction of subject concepts, utilization of technology resources, social interaction with teacher/peers, learning environment and preference for use of Flipped Classroom Instruction (FCI) for the courses. The prospective teachers of experimental group gradually shifted towards becoming independent learners i.e., they were searching learning material and studying it on their own so that they can successfully perform the class activity. They felt responsible for studying the learning material and understand it on their own. The interaction among peers and teacher was face-to-face, synchronous and asynchronous. The competition among peers was for performing better and completing class activity earlier than peers individually or in group form. The average group was sensitive to technology tools' issues and utilization of technology resources. The experimental group members felt a change in their thinking skills, comprehension of subject concepts and interaction with teacher/peers.

5.5 Recommendations

Following recommendations were made for teacher education institutions, teacher trainers and student teachers based on findings of the study.

1. As Flipped Classroom Instruction (FCI) was found effective to improve the judgment, decision-making and team-working skills of experimental group so, it can be employed by teacher educators for grooming the mentioned skills of student teachers. The management of teacher education institutions can facilitate teacher educators and prospective teachers in provision of relevant infrastructure for implementation of FCI. The teacher educators may be provided practical training for implementing FCI and dealing with arising issues during its implementation. By making aware and involving prospective teachers in the process of grooming their reflective thinking skills, they would be able to assess themselves for it. However, the training of teachers and prospective teachers for its successful implementation is important.
2. As the Flipped Classroom has structural differences with traditional classroom so, the students may take some time to adjust to the new class routine, as mentioned in the focus group discussion. Necessary support and encouragement from teacher educators may facilitate prospective teachers to learn and work successfully in a Flipped Classroom.
3. As the Flipped Classroom Instruction (FCI) was found effective to improve higher order thinking skills of prospective teachers, Flipped Classroom Instruction (FCI) can be integrated in all courses/ curriculum of teacher education programs for facilitating higher order thinking skills of prospective teachers. However, it takes some time to see a clear difference in academic performance of student teachers so, the teacher educator may provide constant support to them during the process in

case, there appears no immediate, clear and significant change in their higher order thinking skills.

4. The Flipped Classroom Instruction (FCI) has flexibility for delivery of study material, out-of-class interaction and classroom activities. It is recommended, on the basis of researcher's experiences, that the course component can be designed to serve students of different characteristics. For example, on basis of feedback from prospective teachers, the researcher was providing notes along with videos for study material at home and a summary of the concept at the start of the class. The prospective teachers preferred the videos for study material during pre-class time as compared to PowerPoint presentations and readings texts, as mentioned in the focus group discussion. So, the teachers may be trained to develop short videos for different topics of a course so that prospective teachers can use it. However, the videos may be supplemented by the subtitles so that language barrier and slow learning faced by some prospective teachers may not hinder their learning process.
5. The prospective teachers preferred group learning activities as compared to working alone on an activity, as mentioned by them during focus group discussion. Group activity helped them to support and learn from each other. On the basis of response of prospective teachers about group activity, it is recommended to plan group activities for a class for making effective use of class time. For this purpose, teacher educators may be trained for planning and carrying out group reflective activities for prospective teachers.

6. The prospective teachers of experimental group found Flipped Classroom Instruction interesting and useful for keeping them active and improving their thinking skills, their interaction with teacher and peers, comprehension and application of subject concepts. However, there were certain technical issues related to hardware, internet speed and electricity faced in the start of experiment. As a result, there were some adjustments made to deal with these problems. Keeping in view the problems and adjustments made to deal with those problems, it is recommended to use Flipped Classroom Instruction for course with a progressive mindset. Not everything works for every classroom. And the adoption of Flipped Classroom Instruction is not a product but a process to deal with problems faced in traditional classroom instruction related to improvement of reflective thinking skills and academic performance of student teachers. So, the teachers may be trained for using flipped classroom and tackling arising issues and problems during its implementation.
7. The use of online class activities and case studies of classrooms, as suggested by prospective teachers, may be used in the TE classrooms by teacher educators keeping in view the benefits and challenges associated with it. Curriculum developers may provide some alternative ways to introduce a variety of class activities within TE classrooms. It may assist prospective teachers to prepare themselves for teaching practice and classroom teaching in future.

5.5.1 Recommendations for Future Research

Following recommendations were made for conducting research work, in future, related to the research problem covered in this research study.

1. As the study was carried out for one semester, it is recommended to conduct the experimental study for longer duration i.e., two or three semesters, for analyzing and exploring the effect of FCI on reflective thinking (especially observation and communication skills) and academic performance of prospective teachers.
2. It is recommended for replicating this experimental study for other TE classrooms in the same and different geographical areas and contexts to support the findings of this research study. These experimental studies may be conducted for the same or similar courses of TE programmes to observe and determine a change in reflective thinking and academic performance of student teachers. It may help to add further evidence into the findings of this study.
3. The present study involved pretest-posttest for the role of Flipped Classroom Instruction on reflective thinking skills of prospective teachers. A study is recommended to use other data collection techniques such as observation and interview for exploring the phenomenon in detail.
4. The present research study can be conducted by adding larger group of male and female prospective teachers.
5. The effectiveness of Flipped Classroom Instruction (FCI) with same specifications as in this research study, may be explored for other courses of teacher education programmes at graduate and undergraduate levels for grooming of reflective

thinking skills, academic performance and course objectives of prospective and working teachers.

6. Flipped Classroom has many different ways and styles of delivery with various adaptations (Green & Schlairet, 2017). This research study utilized the active learning approach for flipping the classroom. The research studies, in future, may be conducted with other approaches and specific elements of Flipped Classroom Instruction to interpret its effects on various variables related to learning process of prospective teachers.
7. A research study can be carried out to assess the infrastructure required for implementation of FCI, on a large scale.
8. The implications of Flipped Classroom for prospective teachers with special needs and inclusive classroom may be explored in future research studies.

5.6 Limitations of the study

1. The study was limited to female prospective teachers enrolled in BS Ed. (Hons.) in Federal Teacher Education Institution, Islamabad, Pakistan because the sample of the study had only 04 male prospective teachers i.e., 2 prospective teachers in control group and 2 in experimental group.
2. In current study, classroom observation was not used.
3. The present study could not use Flipped Classroom Instruction for teaching of all subjects of teacher education programme.

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APPENDICES

APPENDIX A

Course outline of 'Critical thinking and Reflective Practice'

Approved by Higher Education Commission, Islamabad for BS Hons. (04 years)

Title of Course: Critical Thinking and Reflecting Practices

Credit Hours: 3

Learning Outcomes

After studying this course, the students will be able to:

- Differentiate between 'Good' and 'Bad' bent of mind.
- Ask and analyze thought provoking Questions.
- Understand the relationship of critical thinking with reading and writing.
- Foster rational motivation among the students.
- Apply critical thinking in different content areas.
- Develop the habit of contributive thinking.
- Understand the concept and role of reflection and reflective practice as a tool for raising critical consciousness.
- Use reflection as a tool of inquiry into practice.

Course Outline

Unit 01 Introduction

1.1 Introduction to the Fundamentals of Critical Thinking
1.2 Why Critical Thinking Matters?
1.3 Critical Thinking and the Process of Analysis
  1.3.1 Teaching Students to Think Theoretically
  1.3.2 Teaching Students to Think Empirically

Unit 02 Strategies and Techniques to Develop Critical Thinking

2.1 Brain Storming
2.2 Concept Mapping
2.3 Generalization and Testing the Limits
2.4 Venn Diagram
2.5 Logical Reasoning

Unit 03 Critical Thinking and Art of Questioning

3.1 Critical Thinking and Socratic Questioning

3.2 Teaching Students to Ask Good Questions & Follow up the Implications of Thought
3.3 Teaching Students to narrate, analyze, and evaluate their own and Others' "Points of View"
3.4 Open and Close ended Questions

Unit 04 Critical Thinking and its Applications

4.1 Interrogating the Text
4.2 Primary and Secondary Sources
4.3 Characteristics of Academic Text
4.4 Status of Evidence
4.5 Status of The Author
4.6 Comparing and Contrasting Different Sources

Unit 05 Introduction to Reflection

5.1 Meaning of reflection on practice/educational issues
5.2 Significance of reflection for teacher

Unit 06 Major Proponents of Reflective Practice

6.1 John Dewey
6.2 L. Stanhouse
6.3 D. Schon

Unit 07 Process and Techniques of Reflection

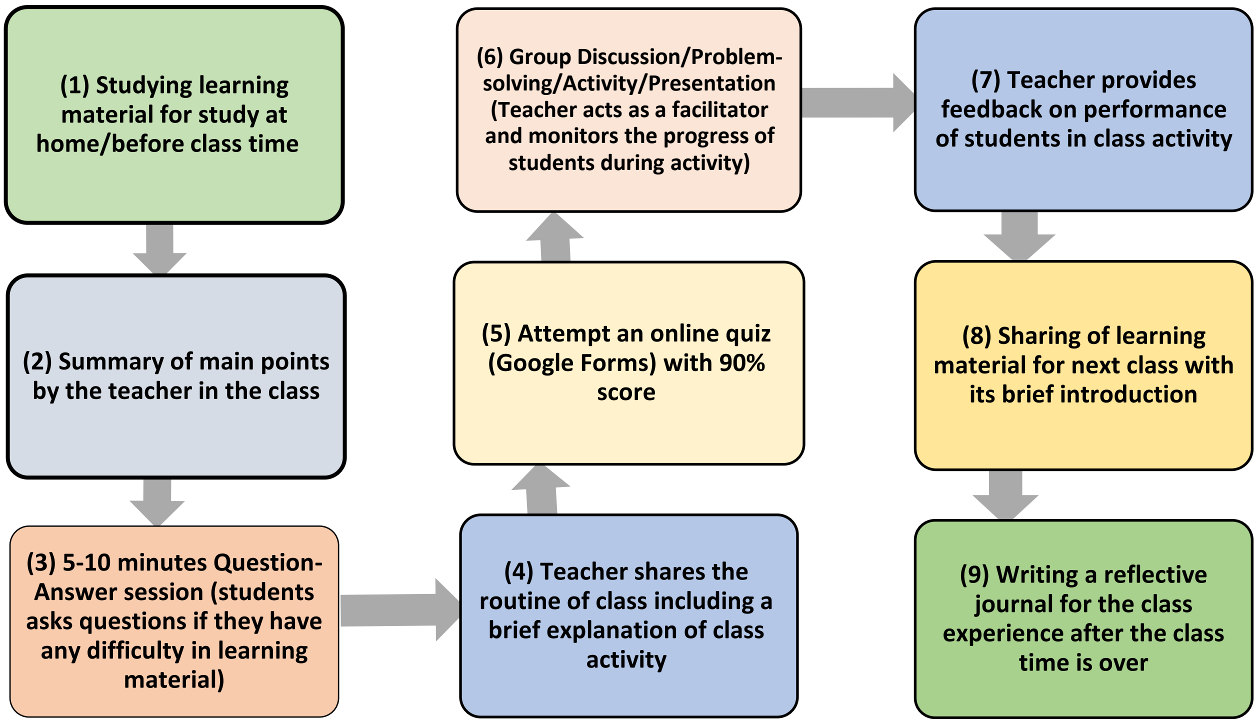
7.1 Process of reflection
7.2 Major techniques and strategies (critical incident analysis, keeping reflective journals, peer coaching, action research)
7.3 Skills for reflection

Unit 08 Application of skills and approaches to reflection

8.1 Systematic reflection throughout the coursework
8.2 Identify key questions for their own role as novice teachers
8.3 Understand the issues in becoming a reflective practitioner

APPENDIX B

CLASS ROUTINE



Appendix C
Reflective Thinking Skills Scale (RTSS) for Prospective Teachers

A. Which of the following tools you use to obtain information about your surroundings? Please tick the relevant one/ones from the following.

- ☐ Save in my memory
- ☐ Write it in my diary
- ☐ Take its photograph
- ☐ Make an audio recording
- ☐ Record a short video

Please read the following statements. Mark the response against each statement that best represents your opinion. Remember there is no right answer.

Always=5; Often=4; Sometimes=3; Rarely=2; Not at all=1

S#	Statements	Always	Often	Sometimes	Rarely	Not at All
RT1	I try to find details of an experience.					
RT4	I observe a situation to obtain information about it.					
RT5	I think about my behavior during a situation.					
RT6	I obtain information about reasons behind a situation.					
RT7	I relate my learning experiences with my past experiences.					
RT8	I welcome remarks from others about my point of view.					
RT 9	I am aware of my thoughts behind words.					
RT10	I form a point of view before having a learning experience.					
RT11	I try to find information to understand situation during a learning experience.					
RT12	I discuss my views about a learning experience with my colleagues.					
RT13	I can see learning experience from diverse perspectives.					
RT14	I think about my performance at workplace.					
RT15	I care about my behavior during a situation.					
RT16	I share my success with my colleagues.					
RT17	I can understand people from different/diverse backgrounds.					
RT18	I obtain views of my colleagues to understand a situation.					
RT20	I am aware of my emotions which influence my behavior.					
RT21	I share my feelings about a learning experience with my colleagues.					

S#	Statements	Always	Often	Sometimes	Rarely	Not at All
RT22	I listen to my colleagues to know about their points of view.					
RT23	I ask myself why I am interested in a particular learning experience.					
RT24	I set standards for my performance according to demands of a task.					
RT25	I discuss alternatives with my friends to improve performance.					
RT26	I search for evidence of an event before judging it.					
RT27	I can identify my weak points to improve them.					
RT28	I discuss learning experience with concerned people before judging it.					
RT29	I change my opinion only on the basis of reasons.					
RT30	I compare my point of view with comments of others about my performance.					
RT31	I set expectations for my performance.					
RT32	I think about reasons behind my behavior.					
RT33	I ask questions about my behavior in a situation.					
RT34	I try to know about underlying reason of my thoughts.					
RT35	I think about my own preferences for my career.					
RT37	I search for information to know a situation in detail.					
RT39	I try to resolve problems faced by my colleagues.					
RT40	I respect opinion of my colleagues.					
RT42	I try to understand point of view of my colleagues.					
RT43	I seek help from my colleagues when facing a difficult situation.					
RT44	I accept change after careful thinking about it.					
RT45	I tend to identify characteristics of a situation.					
RT47	I keep the purpose in my mind before taking a decision.					
RT48	I invite feedback from my colleagues to discuss my behavior.					
RT49	I like to work with my colleagues rather than working alone.					
RT50	I try to review my behavior after some time.					
RT51	I hold a pint of view if it is supported by evidence.					
RT54	I compare alternative ways of doing a task before selecting one of them.					

S#	Statements	Always	Often	Sometimes	Rarely	Not at All
RT56	I examine a situation before making any decision about it.					
RT57	I compare my individual performance with my group performance.					
RT59	I think about benefits of choosing a course of action before selecting it.					
RT61	I think about consequences of rejecting a course of action before rejecting it.					
RT62	I prefer to choose a course of action which fulfills my purpose.					

Gender:__________ Degree Program:______________ Semester:___________

Institution: _____________

Appendix D
Perception of Prospective Teachers about Their Learning Experiences in Flipped Classroom Instruction

Gender__________ Degree Program:______________ Semester:___________ Institution: _____________

How many hours do you use computer (PC) in one week for the course?

1. 01 hour or Less than 01 hour	**2.** 02 to 04 hours	**3.** 05 to 07 hours	**4.** 08 hours and more than 08 hour

How many hours do you use internet for the course in one week?

1. 01 hour or Less than 01 hour	**2.** 02 to 04 hours	**3.** 05 to 07 hours	**4.** 08 hours and more than 08 hour

How many hours do you use mobile phone call for the course in one week?

1. 01 hour or Less than 01 hour	**2.** 02 to 04 hours	**3.** 05 to 07 hours	**4.** 08 hours and more than 08 hour

How many hours do you use mobile phone-text messages for the course in one week?

1. 01 hour or Less than 01 hour	**2.** 02 to 04 hours	**3.** 05 to 07 hours	**4.** 08 hours and more than 08 hour

How many hours do you use WhatsApp for the course in one week?

1. 01 hour or Less than 01 hour	**2.** 02 to 04 hours	**3.** 05 to 07 hours	**4.** 08 hours and more than 08 hour

Please mark the response against each statement that best represents your opinion. Remember there is no right answer.
Definitely true=7; True=6; Somewhat true=5; Slightly true=4; Somewhat untrue=3 ; Untrue=2 ; Definitely untrue=1

S#	Statement	Definitely true	True	Somewhat true	Slightly true	Somewhat untrue	Untrue	Definitely untrue
P1.	I got motivation for learning from teaching style.							
P2.	The course was according to my expectations.							
P3.	In my opinion, I have understood the learning material of the course.							
P4.	Technology tools were available to me for using during class.							
P5.	I enjoyed working on learning activities during class time.							
P6.	I had enough opportunities to interact with my class fellows.							
P8.	I got continuous feedback on my performance.							
P9.	I participated in class discussion during the course.							
P10	I can apply concepts of the course in daily life situations.							
P11	I had to work harder to perform well in the course as compared to other courses.							

S#	Statement	Definitely true	True	Somewhat true	Slightly true	Somewhat untrue	Untrue	Definitely untrue
P12	I got stimulation to think after studying in the course.							
P13	Teacher's guidelines were very clear to understand.							
P14	I had support of my class-fellows during class activities.							
P15	Technology tools were up-to-date for the course.							
P16	The support provided in the course was enough to understand course concepts.							
P17	I liked to help my class fellows in understanding concepts of the course.							
P18	I preferred to work in group activity instead of individual assignment.							
P19	When I find a topic difficult, I worked until I understand it.							
P20	I got training in how to use technology for teaching.							
P22	Through technology tools, I could easily find the required information.							
P23	My teacher explained to me whenever I felt difficulty to understand a concept.							
P25	Access to technology resources helped me to understand course topic.							
P26	I have access to my teacher during the course.							
P27	The objectives of course were focused on during the class time.							
P28	I could relate classroom learning with my daily life experiences.							
P29	I enjoyed using technology tools during the course.							
P30	Assessment criteria was clearly communicated to me.							

S#	Statement	Definitely true	True	Somewhat true	Slightly true	Somewhat untrue	Untrue	Definitely untrue
P31	Flipped classroom instruction is very different from traditional teaching methods.							
P33	Teaching style of the course contributed in my professional growth.							
P34	I would have to work harder while using flipped classroom instruction in my classroom.							
P35	I am satisfied with teaching style of the course as compared to other courses.							
P36	I would use Flipped Classroom Instruction in my class to reduce my teaching responsibilities.							
P37	I would prefer to use flipped classroom instruction in my own classroom as a teacher.							

P38. Which part of the course was most interesting that helped you learning course concepts? Please tick the relevant one(s) from the following:

- ☐ Access to online course materials
- ☐ Classroom interaction
- ☐ Communication through Google Classroom
- ☐ Communication through Email
- ☐ Communication through WhatsApp
- ☐ Communication through mobile phone
- ☐ Online assessment through quiz
- ☐ E-portfolio
- ☐ Assessment for feedback at the end of a class
- ☐ Classroom activity-group work
- ☐ Classroom activity-individual assignment
- ☐ Interaction with Teacher during class time
- ☐ Any other________________________

P39. Which part of the course you liked most in the course? Please tick the relevant one(s) from the following:

- ☐ Access to online course materials
- ☐ Classroom interaction
- ☐ Communication through Google Classroom
- ☐ Communication through Email
- ☐ Communication through WhatsApp
- ☐ Communication through mobile phone
- ☐ Online assessment through quiz
- ☐ E-portfolio
- ☐ Assessment for feedback at the end of a class
- ☐ Classroom activity-group work
- ☐ Classroom activity-individual assignment

☐ Interaction with Teacher during class time ☐ Any other ______________________
P40. Which part of the course was most challenging (you felt difficult) in the course? Please tick the relevant one(s) from the following: ☐ Access to online course materials ☐ Classroom interaction ☐ Communication through Google Classroom ☐ Communication through Email ☐ Communication through WhatsApp ☐ Communication through mobile phone ☐ Online assessment through quiz ☐ E-portfolio ☐ Assessment for feedback at the end of a class ☐ Classroom activity-group work ☐ Classroom activity-individual assignment ☐ Interaction with Teacher during class time ☐ Any other ______________________

Do you possess personal computer at home? (i) Yes (ii) No

Do you possess android phone? (i) Yes (ii) No

Do you have internet at home?

(i) Yes, on mobile data (ii) Yes, PTCL Broadband (iii) No, not at all

Appendix E
Focus Group Interview Questions for Perception of Prospective Teachers about their learning experiences with Flipped Classroom Instruction (FCI)

S/ No	Questions
PI1.	What were your expectations of the course before the start of the semester?
PI2.	What was your level of interest keeping in view your expectations of the course?
PI3.	What are your experiences of this course? How did it differ from your course expectations?
PI4.	What were your experiences with Audio-Visual (AV) aids? How did it benefit your understanding of course topics? Did it serve the purpose of "critical thinking and reflective practice" course?
PI5.	What challenges did you face while using Audio-Visual (AV)? How did you overcome those challenges?
PI6.	Did you have enough social interaction with your colleagues? Did it promote cooperation or competition? Give reasons for your answers.
PI7.	How did you interact with your teacher during this course?
PI8.	Are you satisfied with the type of interaction you had with your teacher? Why or why not?
PI9.	What were your main responsibilities as a student during the course? Was it different from other courses?
PI10.	What are your views about assignment/quiz in the course?
PI11.	How did you find the learning material of the course? Did you learn to understand and apply the concept in assignment/quiz?
PI12.	What changes do you see in yourself after attending the course?
PI13.	Is there anything you missed during the course or you are just satisfied with it?
PI14.	What are your suggestions to improve the course methodology for future?
PI15.	Would you prefer to take another course with the same instructional method? Why or why not?

Appendix F
Feedback Form

Dear Student! Please fill out the form for today's class. Please answer all questions.	
1.	What was the topic of today's lesson?
2.	What did you learn today?
3.	What happened today?
4.	What are your feelings about it?
5.	What was good about today's class?
6.	What was bad about today's class?
7.	Any suggestion for coming class/classes?

Appendix G
Academic Achievement Test
Subject: Critical Thinking and Reflective Practices

Name:______________________________	Roll No: ____________________________________
Class: ______________________________	College: ____________________________________

1. *Carefully read the questions.*
2. *Be clear and precise while writing your answer.*
3. *If you cannot do a question, proceed ahead to attempt next questions.*
4. *If you still have time re6maining for test, then go back to questions you left out.*
5. *Make sure that your answers are readable.*

1. Short Answer Questions

Q1. Name the different types of Socratic questions given by R.W. Paul. (Knowledge)

____

____

____

Q2. Give one example of each type of Socrates question given by R.W. Paul. (Understanding)

____

____

____

Q3. Explain the steps involved in analyzing the impact of point of view. (Knowledge)

____

____

____

Q4. Name any three strategies that can help students for asking great questions. (Knowledge)

____

____

____

Q5. Give examples for the above mentioned three strategies that can help students for asking great questions. (Application)

____

____

____

Q6. What do you understand by reflection? (Knowledge)

____

____

____

Q7. What is a reflective journal? (Knowledge)

____

____

____

Q8. Enlist the general characteristics of an academic text. (Knowledge)

____

____

____

Give your answers keeping in view the situation described here.

1. **You are a teacher of class four. The students are busy in their classroom activity assigned by you. You noticed that one student "Anila" is not concentrating on the class activity and also disturbing other students. You know that she is a bright student but her behavior is not appropriate in this situation. What will you do so that Anila starts doing her own work instead of disturbing others? (Synthesis)**

   ____

   ____

   ____

2. Your are a teacher of class four. You have a well-planned lesson with you for today's class but the students have no mood to study. They are asking you for a game period. i. Would it be better to teach them in this situation? (synthesis)

____

____

____

ii. What would you do so to engage such students in learning who are not taking interest in your lesson? (evaluation)

____

____

____

3. You are a teacher of "Social Studies" for class seven. You have planned a group activity to groom social skills of students. Two students of your class are not comfortable for working in the group activity. How would you resolve this problem? (evaluation)

____

____

____

4. You developed a test for subject "English". After the test, one of the student "Nadia" says that the test was difficult. Most of the students of class agreed with her.

i. What do you think what is the actual problem? Also give reason for your answer. (analysis)

____

____

____

ii. Suggest methods for dealing with challenging situations relating to students' behaviour? (synthesis)

____

____

____

5. **The test scores of students in your subject "Mathematics" are very poor in first monthly test. You had a meeting with the Principal. And it was decided that two consecutive periods, instead of one period will be allocated for the rest of the year. What are the disadvantages of two consecutive periods for students? (analyze & evaluate)**

____

____

____

6. **A teacher "Mrs. Habiba" gave a test to her class and provided directions for attempting the test.**
   One student "Hamza" and three other students did not pay attention and missed the directions. So, they asked Mrs. Habiba to repeat the directions. Mrs. Habiba got frustrated in this situation. She ignored Hamza and three other students, and asked the class to start attempting the test.

   i. **Do you agree with the reaction of Mrs. Habiba that she ignored Hamza and other students? Why or why not? (analysis)**

   ____

   ____

   ____

   ii. **What would you do if you were a teacher in place of Mrs. Habiba? (synthesis)**

   ____

   ____

   ____

   iii. **What would you, as a teacher, do to prevent this situation from happening again? (evaluation)**

   ____

   ____

   ____

Be expressive in answering the following questions.

Q12. Enlist the steps involved in the process of reflection. Describe each step with the help of one example. (Knowledge+ Understanding)

Q13. Explain three contributions of John Dewey in the field of reflective practice and its application in classroom environment. (Understanding +Application)

Q14. How maintaining reflective journal is important for a teacher? (Application +Analysis)

Q15. How would you improve academic writing of your students keeping in view the general characteristics of academic text? (Analysis+ Evaluation +Synthesis)

Table 0.1. Levels of Response for Short Answer Questions

S#	Category	Beginning (1)	Developing (2)	Accomplished (3)	Exemplary (4)
1.	**Interpretation (Explaining the answer)**	Answer does not explain what is asked in the question.	Some sentences in the answer explain what is asked in the question; Answer demonstrate incomplete comprehension of the question.	Most of the sentences in the answer explain what is asked in the question.	Answer covers all the aspects of question asked; All of the sentences in the answer explain what is asked in the question.
2.	**Organization (Systematically arrange paragraphs of answer)**	Answer lacks systematic arrangement of sentences according to question.	Some sentences are in order in the answer but there is no organization among majority of the sentences in the answer according to question.	Sentences are in systematic order in the answer but organization among sentences needs to be strengthened according to question.	All the sentences are in systematic order in the answer according to question.

Table 2. Levels of Response for Restricted Response Items

S#	Category	Beginning (1)	Developing (2)	Accomplished (3)	Exemplary (4)
1.	**Interpretation (Explaining the answer)**	Answer does not explain what is asked in the question.	Some sentences in the answer explain what is asked in the question; Answer demonstrate incomplete comprehension of the question.	Most of the sentences in the answer explain what is asked in the question.	Answer covers all the aspects of question asked; All of the sentences in the answer explain what is asked in the question.

2.	**Organization (Systematically arrange paragraphs of answer)**	Answer lacks systematic arrangement of sentences according to question.	Some sentences are in order in the answer but there is no organization among majority of the sentences in the answer according to question.	Sentences are in systematic order in the answer but organization among sentences needs to be strengthened according to question.	All the sentences are in systematic order in the answer according to question.
3.	**Elaboration (Detail in the answer)**	answer with little or no specific details	General points for answering the question are discussed; but specific details are missing from the answer	Well written answer; most of the general and specific details required for answer are provided in it.	Well written and fully elaborated answer with all required general and specific details.

Appendix H
Answer Key for Academic Achievement Test
Subject: Critical Thinking and Reflective Practices

Name:_____________________________	Roll No: ___________________________________
Class: _____________________________	College: ___________________________________

6. *Carefully read the questions.*
7. *Be clear and precise while writing your answer.*
8. *If you cannot do a question, proceed ahead to attempt next questions.*
9. *If you still have time remaining for test, then go back to questions you left out.*
10. *Make sure that your answers are readable.*

1. **Short Answer Questions (each question carry 04 marks: 02 marks for content & 02 marks for organization of written answer)**

Q1. Name the different types of Socratic questions given by R.W. Paul.
Answer: Six types (1) Clarification questions (2) Questions about an initial question or issue (3) Assumption Questions (4) Reason and evidence questions (5) Origin and source questions (6) Implication and consequence questions (7) Viewpoint questions

Q2. Give one example of each type of Socrates question given by R.W. Paul.
Following are examples of 07 types of Socratic questions. ()
1: Clarification questions: What do you mean by…? Could you put that another way? What do you think is the main issue? Could you give us an example? Could you expand upon that point further?
2: Questions about an initial question or issue: Why is this question important? Is this question easy or difficult to answer? Why do you think that? What assumptions can we make based on this question? Does this question lead to other important issues and questions?
3: Assumption questions: Why would someone make this assumption? What is _______ assuming here? What could we assume instead? You seem to be assuming______. Do I understand you correctly?
4. Reason and evidence questions: What would be an example? Why do you think this is true? What other information do we need? Could you explain your reason to us? By what reasoning did you come to that conclusion? Is there reason to doubt that evidence? What led you to that belief?
5. Origin or source questions: Is this your idea or did you hear it from some place else? Have you always felt this way? Has your opinion been influenced by something or someone? Where did you get that idea? What caused you to feel that way?
6: Implication and consequence questions: What effect would that have? Could that really happen or probably happen? What is an alternative? What are you implying by that? If that happened, what else would happen as a result? Why?
7: Viewpoint questions: How would other groups of people respond this question? Why? How could you answer the objection that ______would make? What might someone who believed ______ think? What is an alternative? How are _____ and _____'s ideas alike? Different?

Q3. Explain the steps involved in analyzing the impact of point of view.
Steps 1) what is point of view or basic purpose of an argument of an author? 2) what descriptive details author is providing? 3) what other different points of view exist? 4) which evidence is provided? 5) which facts are missing?

Q4. Name any three strategies that can help students for asking great questions.
Any four of following strategies

1. Positive reinforcement for asking questions.
2. Guiding students about how to avoid errors in questioning.
3. Guiding students about framing questions keeping in mind the characteristics of good questions.
4. Thinking about a concept in terms of levels of cognitive domain of Bloom Taxonomy
5. Encouraging students for posting questions before the start of the lesson.
6. Ask a student to frame a question while other students try to answer it. If a question cannot be answered, that might mean that it is not a good question and needs to be clarified.
7. Telling students to use 5Ws and H (what, when, where, who, why and how) to begin their questions. Adding why to a question helps in searching for reason of an incident.
8. Ask students to read a text and formulate questions that can be answered by reading the text. Now guide students to formulate question involving analysis, synthesis and evaluation of information given in paragraph. You can provide stems for asking questions as given below:

How were __________ and _________ same?
What do you think would happen if____________?
What do you think caused __________ to happen?
What are the strengths (or weaknesses) of ___________?
Why do you say _______________?

9. Classroom discussion can also help students in framing good questions.

Q6. Give examples for the above mentioned three strategies that can help students for asking great questions.

1. listen, appreciate, clapping, encourage
2. asking one thing in one question, asking probing question, avoid asking complex question too early, questioning in non-offensive way
3. specific, open-ended and thought-provoking question, HOTS, challenge assumption and see things in unpredictable ways.
4. What is -------? Can you explain ----? How can you use-----? What are main elements of -------? How it can generate a useful outcome? What is worth of this contribution?
5. What do you expect to study in this lesson? What is the purpose of studying this lesson?
6. What, when, where, who, why and how
   How were __________ and _________ same?
   What do you think would happen if____________?

What do you think caused _________ to happen?
What are the strengths (or weaknesses) of __________?
Why do you say ______________?

Q7. What do you understand by reflection?

- A process that helps teachers think about what happened, why it happened, and what else could have been done to reach their goals.
- Reflection is what allows us to learn from our experiences. It is an assessment of where we have been and where we want to go next.
- Reflection involves paying attention and thinking about an action/event. It deals with the analysis of the event and studying it for personal learning and development. Reflective journal is a written record of daily reflection written by the prospective teacher to:
  - **i.** Think and learn from past
  - **ii.** Assessing what I am now
  - **iii.** Improving present and future on the basis of lessons learnt from reflection

Q9. What is a reflective journal?

Reflective journals are personal records of students' learning experiences. Students typically are asked by their instructors to record learning-related incidents, sometimes during the learning process but more often just after they occur. Entries in journals and learning logs can be prompted by questions about course content, assignments, exams, students' own ideas or students' thought processes about what happened in a particular class period. Journals and learning logs are then submitted to the instructor for feedback. Both paper-based and online journals or logs can be turned in before or after each class period or at any other designated time.

Q11. Enlist the general characteristics of an academic text.
Features of Academic Texts

1. COMPLEX -Written language has longer words, it is lexically more dense and it has a more varied vocabulary. -Written texts are shorter in volume and the language has more grammatical complexity, including more subordinate clauses and more passives.

2. FORMAL -should avoid colloquial words (such as words 'soda', 'pop', 'soft drink' and 'coke' is used generally for one thing in various regions; so it must be avoided. Avoid shouldn't, don't, write complete word) and expressions (Oh, Alas, Wow)

3. PRECISE -Facts are given accurately and precisely

4. OBJECTIVE -objective rather than personal has fewer words that refer to the writer or the reader main emphasis should be on the information that you want to give and the arguments you want to make, rather than you

5. EXPLICIT -it is the responsibility of the writer in English to make it clear to the reader how the various parts of the text are related

6. ACCURATE - uses vocabulary accurately -most subjects have words with narrow specific meanings

7. HEDGING -it is necessary to make decisions about your stance on a particular subject, or the strength of the claims you are making

8. RESPONSIBLE -you must be responsible for, and must be able to provide evidence and justification for, any claims you make. -You are also responsible for demonstrating an understanding of any source texts you use.

Give your answers keeping in view the situation described here.

7. **You are a teacher of class four. The students are busy in their classroom activity assigned by you. You noticed that one student "Anila" is not concentrating on the class activity and also disturbing other students. You know that she is a bright student but her behavior is not appropriate in this situation. What will you do so that Anila starts doing her own work instead of disturbing others? (Synthesis)**

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Irrelevant Answer/Don't know/ did not studied yet	Trying to control situation by gazing/staring at Anila or asking her complete work, ignore her, change activity/complete activity more than one time, try to keep her busy, ask question from her, make her group leader, collect copies from class, ask her to change her behavior, ask her to tell about your activity, ask her to control class, keep her busy through activities, ask her to	Trying to know the underlying cause of behavior and dealing with that cause by asking question about reason for this behavior, sitting next to her for asking question, asking her what's wrong & help her, discuss her problem and performance wit her, ask her problem if still behavior not resolved then change her seat, give attention to solve her problem, talk to her for problem, calling her in staff

	help others, ask her to work quickly, change her activity.	room for discussing problem and guide her, insist her to share her problem, (separate from others & guide her & focus on her behavior), ask her problem and arouse her interest in the activity.

8. You are a teacher of class four. You have a well-planned lesson with you for today's class but the students have no mood to study. They are asking you for a game period. Would it be better to teach them in this situation? (synthesis)

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Irrelevant Answer/Don't know/ did not studied yet/ having a session	Controlling the situation rather than seeking long-term solution • Start teaching using AV aids, • First teach then break, • Try to involve them study & give interesting examples, • Give students full game period,	Working on long-term benefit by inculcating student need and teaching demands • First overview of lesson then activity or homework • I will not teach them b/c they are not mentally prepared • Activity related to topic • Short game then study • Tell jokes/give them break

	• No lesson. don't teach them • Make lesson interesting • Teach them after changing their mood • Teach them through jokes/real-life examples • Motivate them for study • Ask questions to arouse their interest • Imp. Points of lesson then game	• 10 min break then study • Half game and half study period •

ii. What would you do so to engage such students in learning who are not taking interest in your lesson? (evaluation)

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Irrelevant Answer/Don't know/ did not studied yet/ having a session	Controlling the situation rather than seeking long-term solution • Ask to question & give them responsibility • Interesting lesson, QA • Activity if they still not engaged, punish them	Working on long-term benefit by inculcating student need and teaching demands • Activity based teaching • First activity then lecture

	• Read lesson then ask questions related to it • Ask them to take interest in class • More attention, individual activity • Inquire about their problem & change my teaching method • Ignore them • Ask students to share what they learnt, arousing their interest, motivate them & appreciate them for previous learning • Give examples & activity • Give them some break • Advise them/ask problem	• Activity/examples & imp. Of topic/interesting facts about topic • Ask question/activity • Individual differences/activity/AV aids • Teach lesson through video • 5/10 min. break/activity/game then study • Share a story related to lesson • Break/short story/joke/game/activity •

9. **You are a teacher of "Social Studies" for class seven. You have planned a group activity to groom social skills of students. Two students of your class are not comfortable for working in the group activity. How would you resolve this problem? (evaluation)**

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**

Irrelevant Answer/Don't know/ did not studied yet/didn't attempt question/punish them/arrange a lecture on multimedia	Controlling the situation rather than seeking long-term solution • Help them otherwise punish them • Keep both students in a separate group • Exchange both students in their groups • Give both students individual activity • Dialogue in place of group activity (it partially resolves the problem) • Question-answer with students • Give them some extra marks for participation in group activity • Ask them to give their point of view in the start or middle for interacting with class • Give them some responsibility such as group leadership, removing doubts of class fellows • Small activity irrelevant from course to give them opportunity to understand themselves • Separate them from group activity or ask them to coordinate with other students/group members • Tell them reason/advantages of group activity/ focus on their activities • advice/ask them to participate in group activity • Change group & advise them • Ignore or leave them to adjust in the situation • Change activity or group members • Separate task for group in which these two students are	Working on long-term goal/result by keeping in view students' need and teaching objectives • Give examples+ helping+ sharing their problems+ let them trust for getting help • Talk to them for their problems they have for group activity and give some types of activities in which they are comfortable/interested • Resolve this problem by solving students' problems (it depends on the problems of students) • Solve students' problems and give task in which they show interest • Ask them the problem and help them to groom their social skills • Engage and help them how to do it • Group them with average or genius students • Group them with their friends + encourage them to take part in activity • Story-telling for grooming their social skills • Activity for social skill in which they are comfortable • Create a friendly/comfortable environment & create feeling of friendship among group members • Ask for their problems and advise other group members to be helpful for these students & try to develop their interest

	included, allow them to share their ideas • Arrange class in interesting way • Ask their problem & group them together • Positive reinforcement • Listen to them+assign individual activity • Get views of all students if all agreed for group activity then both of these students have to do this activity	• Talk to them+separate both of these students+ allow them to sit with other students • Change my teaching method to develop their interest in lesson • Appreciate & guide them & solve their problem • Change their group, cooperate with these two students+ talk with them about benefits of group activity & try to engage them in activity

10. You developed a test for subject "English". After the test, one of the student "Nadia" says that the test was difficult. Most of the students of class agreed with her.

iii. What do you think what is the actual problem? Also give reason for your answer. (analysis)

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Don't know/ did not studied yet/didn't attempt question/Irrelevant answer i.e., change my teaching method, rearrange paper pattern, ask students to be ready for paper then solve problem of difficulty faced by them, ask them to solve problem, student was absent yesterday,	Addressing one aspect of a situation such as labelling a student or blaming the situation, teaching or testing problem. • Explain them the test • Student have not provided enough practice • Students not understood well • Lesson was not delivered clearly • Test was mismatch with intellectual level of students • Test topics needed more explanation • Unseen questions in test • Teacher must clarify their concepts before test • Students' needs were not fulfilled through my lecture	Thinking in diverse perspective keeping in view all possible options including lesson plans, students, teaching methodology, available resources, test and the present circumstances • Individual differences of students were not taken into account • Teaching style & test pattern were not in harmony; test questions were least stressed in lecture. • Find out problem by discussing whole test and issues faced • Look at all possible options such as "I did not teach well according to their level", "they did not understand

	• Not prepared well for test/they get confused • Language of test was difficult • Shortage of time • Did not pay attention on topics on which the test was based. • Unawareness of students about testing criteria • Teaching method • Incomplete preparation or their doubts were not clear • Change my teaching method • Test structure was difficult • Personal problem of Nadia • Lesson covered by test was difficult • Test was conceptual • Test did not match mental level of students • Teacher failed in explaining the topic • Test was tricky so needed more time to prepare • Students are not interested in topic/subject • Test was not according to understanding level of students • May be the test was out of course • Wrong teaching method • May be the test was different from my teaching pattern • Students did not pay attention during lecture or they felt difficulty in lecture • Student have prepared other chapters • They are not intelligent or hardworking students • Students were not ready to take test.	well" or "may be the problem is my teaching method". • No preparation of students/students did not understand well/test was difficult • No preparation of students/ students did not understand well • Level of students was ignored; test and lecture were not in harmony. • Test was difficult/questions were confusing/ students did not prepare. • The problem may be with teaching method; or the individual differences of students were taken into account. • Unclear topic; lack of guidance from teacher; irrelevant test • Test was confusing; students did not concentrate on questions; they need more time to prepare

	• Students don't know how to prepare • Not understood topic/did not attend class properly • Irrelevant concepts were included in test • Change my test on the spot/time of testing • Nadia did not understand nature of questions • Nadia disturbing other class fellows or any problem with Nadia • Students did not clarify or share their doubts during class	

iv. Suggest methods for dealing with challenging situations relating to students' behaviour? (synthesis)

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Don't know/ did not studied yet/didn't attempt question/Irrelevant answer i.e., "you know that you have to write to explain your point of view (POV) whether right or wrong", "decision-making", "groom social skills", "some students irritate so stand them up in front of class" "Punish them; ask them to come forward and share	Addressing one aspect of a situation such as punishing students or changing a test or explaining a test or oral test etc. or working on short-term solution to resolve this problem. • Explain them the test • Involve students in subject related activities • Activity to engage them • Motivate students' behavior (to study or interest in subject) • Ask questions in daily lectures so that the students do not confuse. • Ask for students' problems • Before test and during class, I can ask for their doubts to clarify	Thinking in diverse perspective keeping in view all possible options including lesson plans, students, teaching methodology, available resources, test and the present circumstances for long-term solution and avoiding this problem in future • Problem-solving method • Problem-solving method/discussion method • Action research to avoid mistakes in my teaching • Inducive + deductive teaching method + action research + group study method • Group study/discussion/problem solving

what you are doing?"	• Guide them properly; after test, a retest may be given. • Lecture with easy words+ presentation method • Use different teaching (method) according to topic • Change my teaching method to clarify lesson (Question-answer, cooperative learning, group study) + retest/situation-based teaching method • Change my teaching method and give them time to prepare • Easy test so that all students can attempt • Change students' behavior through punish or reward • Specific & interesting test for students • Make lecture interesting and teach them according to their mental level (mind) • Punish them/ignore them • Ask students to revise lesson and/or appreciate/+ postpone the test • Ask for students' problems and cooperate with them • Pointing out/observe/ eye contact with those students • Keenly observe the matters of students + ignore them to realize for their mistakes • Tell Naida to sit in front of class and read the lesson • Read loudly the test and tell them meaning of difficult words so that they can perform easily • Introduction of topic to create interest • Find out problem of Nadia and change her peer group	• Notice actual problem of student + arouse students' interest in activities • Thinking, reasoning and try to solve problem • Deal with student behavior + change my teaching technique • Question-answer, ask students about their problems, change my teaching method and revise lesson • Observe, analyze and evaluate • Tell them test pattern; ask them to prepare all topics; test according to level of students • Ask reasoning questions + clarify concepts of students • Solve students' problems • Motivate students, solve problem in different point of view/ apply strategies of teaching behavior • Ask for students' problems, give attention to their individual differences/change teaching method • Guide them for test pattern and ask for their problems/ambiguities before test • Change teaching method, align test with topic, ask for students' difficulty and arrange activity • Analyze situation then take decision to sort problem

	• All students have different technique to learn • Peer coaching and cooperative learning • Act according to the need of situation • Retest and/or take this test as for practice/ take presentations • Reteach topic • Experimental/ group study method • Reteach/retest/ oral test • Well-planned lesson • Advise them to do hard work • Easy notes • Write on blackboard/provide hard copy of notes • Clearly explain test, Question-Answer & retest • Polite behavior with students • It depends on classroom management skills • Friendly environment/group activity • Fulfill needs of all students through my lectures • Game/activity/special attention • Ask them to listen carefully/ try to understand their mindset and help them	

11. The test scores of students in your subject "Mathematics" are very poor in first monthly test. You had a meeting with the Principal. And it was decided that two consecutive periods, instead of one period will be allocated for the rest of the year. What are the disadvantages of two consecutive periods for students? (Analyze & evaluate)

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Don't know/ did not studied yet/didn't attempt	Addressing one aspect of a situation such as students getting bored or attention problem of student but	Thinking in diverse perspective for possible problems faced by student

question/Irrelevant answer	cannot relate it to wider situation faced by students such as other subjects. • There will be attention problem of students in second period. Their performance will slow down. • Students will be bored to take one subject for a long time/2 hours • Cannot concentrate/pay attention because of boredom • Lose interest • Tired • Not listen carefully • Students will not be active • Attention span of students is limited • Students will take math period • Passive behavior of students • Math is difficult subject + some students need special attention • Students will be dull/could not understand/mentally disturbed • No problem/disadvantage for students. It will be helpful to practice exercises after lecture in first period in relax mood/solve problems • No problem/disadvantage for students. Students can ask more questions+ teacher can focus more on subject matter • Lose potential • Students over-burdened • Students will face fatigue • Difficult for students •	and/or thinking in a strategic way for a problem for resolving it. • Students will be bored, feel stressed; other class performances of students might be disturbed. • Students will be bored until teaching strategy is changed • Other subjects will be affected. • Bored if they do not like mathematics or the teacher

12. A teacher "Mrs. Habiba" gave a test to her class and provided directions for attempting the test.

One student "Hamza" and three other students did not pay attention and missed the directions. So, they asked Mrs. Habiba to repeat the directions. Mrs. Habiba got frustrated

in this situation. She ignored Hamza and three other students, and asked the class to start attempting the test.

iv. **Do you agree with the reaction of Mrs. Habiba that she ignored Hamza and other students? Why or why not? (Analyze)**

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Don't know/ did not studied yet/didn't attempt question/Irrelevant answer i.e., ask questions about student preparation & give them time for preparation" "ask student to mention points"	Addressing one aspect of a situation such as fault of student or fault of teacher. The attempter is not thinking in a strategic way to relate things. • Disagree, the teacher should be kind & patient/teacher is a guide. • Agree it is the mistake of students/ because some students did not pay attention and their behavior is rude/ when they will be ignored, they will pay attention or take interest/ next time, they will be careful and don't waste time/ they may embarrass and give attention to class /they are disturbing or naughty student/they don't disturb class/they are misbehaving/they must pay attention/they may be teasing their teacher/students are attention seeker/ class was disturbed/time of test was wasted. • Repeat because every student is unique, so they or Hamza may not understand it/they may confuse although they know directions/one-time repeat is not a big issue. • Ask class whether all class understood or not then repeat. • It is teacher's responsibility/duty/job to ask them to pay attention & solve	Thinking in diverse perspective keeping in view all possible problems or looking at situation from classroom management perspective • Disagree. Mrs. Habiba described directions when the students did not even notice. Further, a teacher is a guide and counselor. • Disagree because some students cannot pick/understand first time. • Disagree. If some students did not pay attention, there might be some fault of teacher. • Disagree. It is the responsibility of teacher to gain their attention at the start.

	their problem/ repeat directions or satisfy students /a teacher us guide so repeat with a strict focus on students as they may not hear due to voice problem. • Disagree, she (Ms. Habiba) should cooperate or tolerate with class/a teacher should consider whole class/ give students one chance/ the teacher should behave justly or equally in the class and/or it is the duty of teacher to gain their attention and provide them directions. • Disagree our way is responsible for students' behavior/teacher is responsible for their diverted behavior/they will not understand it/ there are individual differences in class/ some personal problem may be there with students such as feeling not well or mentally disturbed/ they may suffer from inferiority complex and bad performance/students may feel uncomfortable; don't pay attention/ the students may take it seriously and lose interest in studies/they get discouraged and do not question next time. • There may be a voice problem but if we repeat, whole class will be frustrated. • Teacher motivate and better environment for all • Ignore to feel them ashamed, if still not then punish them/agree they must improve themselves	

v. What would you do if you were a teacher in place of Mrs. Habiba? (Synthesis)

Beginning (0 Marks)	Developing (01 Mark)	Accomplished (02 Marks)

Don't know/ did not studied yet/didn't attempt question/Irrelevant answer i.e., "delay test", "give time to students for preparation", "delay the test to cooperate with the whole class"	Addressing one aspect of a situation such as fault of student or fault of teacher. The attempter is not thinking in a strategic way to relate things. • Provide directions again. • Same as Ms. Habiba did. • Explain & involve all students/ask students to repeat/take all class together/explain to keep their interest well. • Give them time or positive reinforcement, guide them until they understand and overcome the confusion/friendly environment which make them feel guilty and get them on right track/give suggestions and clear points for students' understanding. • Ask them to leave sections they did not understand or confused about and repeat at the end again/ activity & ask questions/Write instructions on board • Control class so everybody listens/ control and repeat; if they have a problem/missing points, solve/explain it. • Repeat (politely or strictly) & guide them, it is my duty/ give them some activity to change their behavior/ask their problems/ask whether they are clear or not /warn (or ask strictly) them to pay attention or stay focused or listen next time and punish them next time/focus on misbehaving students/notice for different	Thinking in diverse perspective keeping in view all possible problems or looking at situation from classroom management perspective • Find reason for not listening of students. Then repeat then ask students that this should not happen in future/ you need to listen carefully in future. • Take control of class then announce directions or repeat

	angles of behavior/say I will not repeat it so listen carefully. • Repeat and angry/Ignore (because students must pay attention to what teacher say) and/or punish them and/or frustrated or Stand them in front of class then repeat or explain again and if behavior inappropriate keep out of class & ignore them/criticize if no effect then punish them. • Call them in my office and ask for their problem.	

vi. What would you, as a teacher, do to prevent this situation from happening again? (evaluate)

Beginning (0 Marks)	**Developing (01 Mark)**	**Accomplished (02 Marks)**
Don't know/ did not studied yet/didn't attempt question/Irrelevant answer i.e., "it is right of students to be clarified for points", "go to students & explain him suddenly", "prevent this situation", "I will not do as described above", "yes, I will prevent them from happening again", "change directions of test", "make average and easily understandable for students' interest "	Addressing one aspect of a situation such as fault of student or fault of teacher. The attempter is not thinking in a strategic way to relate things. • Same as Ms. Habiba did. • Explain & teach well; I will not get angry or frustrated/ involve every student from start/ speak loudly & ask them to pay attention/repeat (again and again) and guide/change directions. • Understand them individually/based on their individual differences, give them direction &, ask & solve problem/ask for reason behind their behavior then repeat. • Write/Repeat twice or thrice then excuse to repeat anymore/ go to students and explain to them separately/guide them	Thinking in diverse perspective keeping in view all possible problems or looking at situation from classroom management perspective • Repeat twice or write on board/speak verbally • Seek students' attention, provide directions twice or thrice and then ask for their questions • Identify common problems about this frustrating situation + teacher training • While directing try to get attention of all students + may provide instructions on the back of paper printed + write instruction on board

	• Repeat once then Ignore and/or ask for reasons behind their behavior for resolving/Give them responsibility to repeat/ask questions at the start • Strict behavior/Warn and don't repeat directions/ Ignore him/ Get attention of all students before announcing directions; if not attentive, ignore them or get them out of class/Punish such student and/or angry on them or give them task or repeat after students say sorry/ask student to sit in front row/separate Hamza and other students from each other/eye-to-eye contact if no effect then ignore/punish if not understood well • Take class as a whole and observe students who are talking or disturbing class/change their seats & ask questions/control such students • Call and point out to engage; announce directions loudly; ask them to be attentive • Ask/warn/insult them to be attentive and/or then repeat or don't repeat • Ask them to be silent & concentrate on their words	• Seek attention by asking questions then provide directions. • Read & write instructions • Seek attention, provide directions and write on blackboard. • Take care of individual differences and use easy words

Be expressive in answering the following questions. (each question carries 09 marks: 03 for interpretation [what is asked in question is answered or not], 03 for organization of written answer and 03 for elaboration/providing details in answer)

Q12. Enlist the steps involved in the process of reflection. Describe each step with the help of one example.

- **Stage 1: Selecting a critical incident to reflect upon:** Selecting an event; last midterm exam.
- **Stage 2: Observing and describing that experience:** Who? What? Where? When? Why? How?

- **Stage 3: Analysing that experience:** Break down event into its constituent parts such as Preparation, revision, attempting exam, my performance for above mentioned example and start to think particularly in terms of why and how.
- **Stage 4: Interpreting that experience:** When interpreting the experience, looking for is an explanation as to why this occurred. Here, you need to try to focus on the future, not just reliving the past. Was I successful? What strategies helped me to succeed? Where I failed?
- **Stage 5: Exploring alternatives:** The previous four stages have all been very inward looking - you have been exploring from within yourself. In this fifth stage, you now try to look at it from different viewpoints - in effect you try, as Jasper (2003) says, to step out of your skin. This is the stage where you to look at different ways of understanding the experience to the way that you experienced it previously. the purpose of this stage is to widen and deepen the experience by exploring other ways of looking at what has occurred. What alternative strategies could be adopted to prepare well for my midterm?
- **Stage 6: Framing action:** By this stage you should understand to some depth what occurred, why it occurred, and what other alternatives are available in dealing with it. There will probably be several different possibilities for action that you might take, and you have to choose, again from your experience and knowledge, what you consider to be the most suitable action to take. What should I to prepare and perform well in my next midterm?

Q13. Explain three contributions of John Dewey in the field of reflective practice and its application in classroom environment.

1. **Dewey concept of reflection** is given below:
   Reflection is a meaning making process that moves a learner from one experience into next with deeper understanding of its relationships with and connections to other experiences and ideas. Reflection is a systematic and disciplined way of thinking with its roots in scientific inquiry. Reflection needs to happen in community, in interaction with others. Reflection requires attitudes that value the personal and intellectual growth of oneself and of others i.e., it is a means to essentially moral ends.
2. Dewey was of the view that an experience is an interaction between oneself and the world.There are two kinds of experiences: educative and mis-educative experiences. **Mis-educative experiences** does not lead towards growth such as a child who learns how to manipulate his parents or others for what he wants from them. This child may become exceptionally talented manipulator but it does not leads towards his growth or good of society. Mis-educative experiences can also be one that leads someone into routine action. **Routine action** suggests that one acts without an awareness of the effect of one's action on the environment (environment incudes other people). **An educative experience** is the one that broadens the field of experience and knowledge, leads towards growth and intelligent action. **Intelligent action** is affected by experience at one end and one's goal or purpose at the other. However, educative experiences alone are not enough.
3. Reflecting on experience is done to make meaning out of experiences and connections among elements of an experience, between that experience and other experiences, between

that experience and the knowledge that one carries, and between that knowledge and the knowledge produced by thinkers other than oneself.

4. There are six phases of reflection which resemble the scientific method.
    i. An experience (keep in mind the definition of experience): Note or perceive a fact
    ii. Spontaneous interpretation of the experience: involuntary but sensible interpretation after experience. Are not thoughtful conclusions
    iii. Naming the problem(s) or the question(s) that arises out of the experience (locating the problem)
    iv. Generating possible explanations for the problem(s) or question(s) posed (synthesis of meaning derived from current with that drawn from previous experience)
    v. Turn explanations into full-blown hypotheses (spending enough time with data of experience that it emerges out in all its complexity)
    vi. Experimenting or testing the selected hypothesis (reflection must include action which is not definitive but an experiment/testing of one's theories)
5. To Dewey, reflective thinking fosters the development of three attitudes that further the “habit of thinking in a reflective way.” These three attitudes are:
    - **Open mindedness (freedom from prejudice to new ways of seeing and understanding)**
    - **Wholeheartedness or absorbed interest**
    - **Responsibility in facing consequences (Dewey, 1933, p. 33)**

Q14. How maintaining reflective journal is important for a teacher?

1. Journal writing is also a brilliant way not just to set goals (in all areas of your life) but also to refine and monitor them.
2. Writing a journal allows you to understand and see the patterns of your own thinking, emotions and actions.
3. Examine learning experiences and self-examination
4. Problem-solving and examining the effectiveness of tested solution for future actions
5. Personal and professional improvement
6. Learn from past
7. Improve future action
8. Examining and developing emotions and attitude

Q15. How would you improve academic writing of your students keeping in view the general characteristics of academic text?

Practice
Guidance
Reinforcement
Working on weak areas of each student
Specific topic
Clear purpose

Ask questions Reflective journal to monitor thoughts Search for relevant information Brainstorming Concept mapping and/or Venn diagram Provide evidence and detail of your point of view Know your audience Edit & proofread Clear guidelines Feedback Peer coaching Give them readings to read keenly for noticing various aspects of academic writing Ask students to self-assess their work after sharing with the marking criteria

Appendix I

Orientation for Prospective Teachers of Experimental group

Organizer: Researcher

Participants: Prospective Teachers of Experimental Group

Duration: 06 hours

Purpose of Orientation: To equip the prospective teachers of experimental group with the prerequisites of working with flipped classroom instruction.

Day	Contents
01	1. Explanation of study purpose, research objectives and the role of experimental group in this study 2. Introduction to Flipped Classroom (FCI) 3. Question & Answers session about FCI 4. Use of Personal Computer, Android phone and internet for FCI 5. Signing up for Gmail account 6. Enrollment of prospective teachers of experimental group in Google Classroom
02	1. Features of Google Classroom 2. Hands-on practice of prospective Teachers for exploring various features of Google Classroom and their use for this study 3. Accessing learning material (Video/PowerPoint Presentation/Notes) 4. Taking notes from a learning material (Video/PowerPoint Presentation/Notes) for personal use 5. WhatsApp Group for course-related communication
03	1. Online Quiz & its hands-on practice for prospective teachers of experimental group 2. Using Web search for different resources about a topic 3. Feedback form and its hand-on practice for prospective teachers of experimental group 4. Nature of class activity and the role of prospective teachers in it

Appendix J

Orientation for Prospective Teachers of Control Group

Organizer: Researcher **Participants:** Teacher of control group & Prospective Teachers of Control Group **Duration:** 01 hour **Purpose of Orientation:** To acquaint the prospective teachers of control group about the nature of the research study and their roles in it.	
Day	**Contents**
01	1. Explanation of purpose and research objectives of the study. 2. Role and importance of control group for the study 3. Method of instruction for prospective teachers of control group 4. Learning material for the course selected for the study 5. Responsibilities of prospective teachers of control group during the research study.

Appendix K

Summary of Hypotheses with the Status as 'Rejected' and 'Failed to reject'

S#	Objective	Hypotheses	Status	Data analysis technique
1.	**Objective 1** Assess the effectiveness of Flipped Classroom Instruction (FCI) for reflective thinking skills of prospective teachers of BS Ed. (Hons.).	**Table 4.19** **Ho1** There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.	failed to reject	Wilcoxon signed-rank test Z=-.411; p=.681
2.		**Table 4.20** **Ho2**There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers of experimental group for gap period between two phases of the study.	failed to reject	Wilcoxon signed-rank test Z=-.017; p=.986
3.		**Table 4.21** **Ho3** There was statistically no significant difference between mean scores on Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.	Rejected	Wilcoxon signed-rank test Z=-2.327.; p=.020
4.		**Table 4.22** **Ho4** There was statistically no significant difference between mean scores on	Rejected	Wilcoxon signed-rank test Z=-.2.191; p=.028

		Reflective Thinking Skills Scale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.		
5.		**Table 4.23** **Ho5** There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-.553; p=.580
6.		**Table 4.24** **Ho6** There was statistically no significant difference between mean scores on observation subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-.175; p=.861
7.		**Table 4.25** **Ho7** There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.	Rejected	Wilcoxon signed-rank test Z=-2.422; p=.015
8.		**Table 4.26** **Ho8** There was statistically no significant difference between mean scores on observation subscale of prospective teachers before and after being taught	Failed to reject	Wilcoxon signed-rank test Z=-1.632; p=.103

		through flipped classroom instruction for the whole study duration.		
9.		**Table 4.27** **Ho9** There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-.541; p=.589
10.		**Table 4.28** **Ho10** There was statistically no significant difference between mean scores on communication subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-.662; p=.508
11.		**Table 4.29** **Ho11** There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-1.323; p=.186
12.		**Table 4.30** **Ho12** There was statistically no significant difference between mean scores on communication subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.	Failed to reject	Wilcoxon signed-rank test Z=-.383; p=.702

13		**Table 4.31** **Ho13** There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-.277; p=.782
14		**Table 4.32** **Ho14** There was statistically no significant difference between mean scores on judgment subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-.150; p=.881
15		**Table 4.33** **Ho15** There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.	Rejected	Wilcoxon signed-rank test Z=-1.995; p=.046
16		**Table 4.34** **Ho16** There was statistically no significant difference between mean scores on judgment subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.	Rejected	Wilcoxon signed-rank test Z=-2.087; p=.037
17		**Table 4.35**	Failed to reject	Wilcoxon signed-rank test

		Ho17 There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.		Z=-.836; p=.403
18		**Table 4.36** **Ho18** There was statistically no significant difference between mean scores on team-working subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.	Failed to reject	Wilcoxon signed-rank test Z=-.122; p=.903
19		**Table 4.37** **Ho19** There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.	Rejected	Wilcoxon signed-rank test Z=-1.995; p=.046
20		**Table 4.38** **Ho20** There was statistically no significant difference between mean scores on team-working subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.	Failed to reject	Wilcoxon signed-rank test Z=-1.603; p=.109
21		**Table 4.39**	Failed to reject	Wilcoxon signed-rank test

		Ho21 There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during first phase of the study.		
22		**Table 4.40** **Ho22** There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers of experimental group for the gap period between first and second phase of the study.	Failed to reject	Wilcoxon signed-rank test
23		**Table 4.41** **Ho23** There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction during second phase of the study.	Rejected	Wilcoxon signed-rank test
24		**Table 4.42** **Ho24** There was statistically no significant difference between mean scores on decision-making subscale of prospective teachers before and after being taught through flipped classroom instruction for the whole study duration.	Failed to reject	Wilcoxon signed-rank test
25	**Objective 2**	**Table 4.43 & 4.44** **Ho25** There was statistically no significant difference between mean	Rejected	Repeated Measures of ANOVA

	Compare the effectiveness of Flipped Classroom and traditional instruction for grooming reflective thinking skills of prospective teachers after the experiment .	scores of prospective teachers of control and experimental group on Reflective Thinking Skills Scale across various periods of time during the study.		
26.		**Table 4.45 & 4.46** **Ho26** There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on observation subscale across various periods of time during the study.	Rejected	Repeated Measures of ANOVA
27.		**Table 4.47 & 4.48** **Ho27** There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on communication subscale across various periods of time during the study**.**	Failed to reject	Repeated Measures of ANOVA
28.		**Table 4.49 & 4.50** **Ho28** There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on judgment subscale across various periods of time during the study**.**	Failed to reject	Repeated Measures of ANOVA
29.		**Table 4.51 & 4.52** **Ho29** There was statistically no significant difference between mean	Failed to reject	Repeated Measures of ANOVA

	scores of prospective teachers of control and experimental group on team-working subscale across various periods of time during the study.		
30.	**Table 4.53 & 4.54** **Ho30** There was statistically no significant difference between mean scores of prospective teachers of control and experimental group on decision-making subscale across various periods of time during the study.	Failed to reject	Repeated Measures of ANOVA
31.	**Table 4.55** **Ho31** There was statistically no significant difference among pretest-1 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.	Failed to reject	Kruskal-Wallis test
32.	**Table 4.56** **Ho32** There was statistically no significant difference among posttest-1 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.	Failed to reject	Kruskal-Wallis test
33.	**Table 4.57** **Ho33** There was statistically no significant difference among pretest-2 mean scores of prospective teachers of academic achievement subgroups of	Failed to reject	Kruskal-Wallis test

		experimental group on Reflective Thinking Skills Scale.		
34.		**Table 4.58** **Ho34** There was statistically no significant difference among posttest-2 mean scores of prospective teachers of academic achievement subgroups of experimental group on Reflective Thinking Skills Scale.	Failed to reject	Kruskal-Wallis test
35.		**Table 4.59** **Ho35** There was statistically no significant difference among pretest-1 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.	Failed to reject	Kruskal-Wallis test
36.		**Table 4.60** **Ho36** There was statistically no significant difference among posttest-1 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.	Failed to reject	Kruskal-Wallis test
37.		**Table 4.61** **Ho37** There was statistically no significant difference among pretest-2 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.	Failed to reject	Kruskal-Wallis test
38.		**Table 4.62**	Rejected	Kruskal-Wallis test

		Ho38 There was statistically no significant difference among posttest-2 mean scores of prospective teachers of academic achievement subgroups of control group on Reflective Thinking Skills Scale.		Mann-Whitney U test as post-hoc further analysis Table 4.63 no difference between low & mediocre Table 4.64 difference b/w low & high Table 4.65 difference b/w mediocre & high
39.	**Objective 3** Investigate the effectiveness of Flipped Classroom Instruction (FCI) for the academic performance of prospective teachers in 'Critical Thinking and Reflective Practice' course.	**Table 4.66** **Ho39** There was statistically no significant difference between academic achievement of prospective teachers of experimental and control groups during first phase of the study.	Rejected	Mann-Whitney U test
40.		**Table 4.67** **Ho40** There was statistically no significant difference between academic achievement of prospective teachers of experimental and control group during second phase of the study	Rejected	Mann-Whitney U test
41.		**Table 4.68** **Ho41** There was statistically no significant difference between academic achievement of prospective teachers of	Rejected	Mann-Whitney U test

		experimental and control group for the whole study duration.		
42	**Objective 4** Interpret the effectiveness of Flipped Classroom as compared to the traditional instruction for academic progress of prospective teachers in 'Critical Thinking and Reflective Practice' course.	**Table 4.69** **Ho42** There was statistically no significant difference in academic achievement of prospective teachers of experimental group during first phase of the study.	Rejected	Wilcoxon-signed rank test
43		**Table 4.70** **Ho43** There was statistically no significant difference in academic achievement of prospective teachers of experimental group during second phase of the study.	Rejected	Wilcoxon-signed rank test
44		**Table 4.71** **Ho44** There was statistically no significant difference in academic achievement of prospective teachers of experimental group for the whole study duration.	Rejected	Wilcoxon-signed rank test
45	**Objective 5** To explore the lived experiences of prospective teachers of experimental group about effectiveness of flipped classroom instruction for their learning journey	**Table 4.75** **Ho45** There was statistically no significant difference among perception of prospective teachers of achievement subgroups of experimental group about their learning experiences with Flipped Classroom Instruction (FCI).	Rejected	Kruskal-Wallis test Mann-Whitney U test as post-hoc further analysis Table 4.78 -No difference between low & High achievers

				-Significant difference b/w low & mediocre - Significant difference b/w high & mediocre

Appendix K

Validity Certificates of Experts

Certificate of Validation of Research Tool

This is to certify that the research tool "Reflective Thinking Skills Scale" developed by Ms. Mubeshera Tufail (Registration # 558-PhD/EDU/F15) is found to be valid by me. However, there were some suggestions which can be incorporated to improve the tool.

Reflective Thinking Skills Scale is

a) Completely acceptable

b) Requires slight modification

c) Requires a lot of modification

d) Not acceptable

Signature of Expert: ______________

Name: Prof. Dr. Nasir Mahmood

Designation: Professor

Date: 30-09-2017

PROF. DR. NASIR MAHMOOD
Dean
Faculty of Education
Allama Iqbal Open University
Islamabad

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c) Requires a lot of modification

d) Not acceptable

Signature of Expert: ____________

Name: Dr. Zafar Iqbal

Designation: Assistant Professor

Date: 30-09-2017

Dr. Zafar Iqbal
Assistant Professor
Department of Distance Non-Formal & Continuing Education
Allama Iqbal Open University Islamabad

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c) Requires a lot of modification

d) Not acceptable

Signature of Expert: ____________

Dr. M. Athar Hussain
Assistant Professor
Early Childhood Education &
Elementary Teacher Education
AIOU, Islamabad

Name: Dr. Muhammad Athar Hussain

Designation: Assistant Professor.

Date: September 30, 2017.

Certificate of Validation of Research Tool

This is to certify that the research tool "Academic Achievement Test" constructed by Ms. Mubeshera Tufail (Registration # 558-PhD/EDU/F15) is found to be valid by me. However, there were some suggestions which can be incorporated to improve the tool.

Academic Achievement Test is

a) Completely acceptable

b) Requires slight modification

c) Requires a lot of modification

d) Not acceptable

Signature of Expert: ________________

Name: Dr. Muhammad Athar Hussain

Dr. Athar Hussain Assistant Professor Dept. of Secondary Teacher Education AIOU Islamabad

Designation: Assistant Professor.

Date: September 30, 2017

Certificate of Validation of Research Tool

This is to certify that the research tool "Academic Achievement Test" developed by Ms. Mubeshera Tufail (Registration # 558-PhD/EDU/F15) is found to be valid by me. However, there were some suggestions which can be incorporated to improve the tool.

Academic Achievement Test is:

a) Completely acceptable

b) Requires slight modification

c) Requires a lot of modification

d) Not acceptable

Signature of Expert: ____________

Name: Dr. Zafar Iqbal

Designation: Assistant Professor

Date: 30-09-2017

Dr. Zafar Iqbal
Assistant Professor

Certificate of Validation of Research Tool

This is to certify that the research tool "Academic Achievement Test" developed by Ms. Mubeshera Tufail (Registration # 558-PhD/EDU/F15) is found to be valid by me. However, there were some suggestions which can be incorporated to improve the tool.

Academic Achievement Test is:

a) Completely acceptable

b) Requires slight modification

c) Requires a lot of modification

d) Not acceptable

Signature of Expert: ______________

PROF. DR. [illegible]
Fa[illegible]
Allama [illegible] University
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Name: Prof. Dr. Nasir Mahmood

Designation: Professor

Date: 30-09-2017

PROF. DR. NASIR MAHMOOD
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Islamabad

Certificate of Validation of Research Tool

This is to certify that the research tool "Perception scale about Flipped Classroom Instruction (FCI)" and Questions of Focus Group Discussion developed by Ms. Mubeshera Tufail (Registration # 558-PhD/EDU/F15) is found to be valid by me. However, I have provided some suggestions which can be incorporated to improve the tool.

Perception scale about Flipped Classroom Instruction (FCI) and Questions of Focus Group Discussion are:

a) Completely acceptable

b) Requires slight modification

c) Requires a lot of modification

d) Not acceptable

Signature of Expert: ____________________

Name: Dr. Zafar Iqbal

Designation: Assistant Professor

Date: 30-09-2017

Dr. Zafar Iqbal
Assistant Professor

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Signature of Expert: ____________

Name: Prof. Dr. Nasir Mahmood

Designation: Professor

PROF. DR. NASIR MAHMOOD
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c) Requires a lot of modification

d) Not acceptable

Signature of Expert: Atim

Name: Dr. Muhammad Athar Hussain

Designation: Assistant Professor

Date: September 30, 2017

APPENDIX L
Conceptual Framework of the Study