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Pre-service Teachers' Perceptions and Experiences: Courses Based on the Active Learning Model and Environment

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An active learning environment is a technology-enriched and interactive physical space convenient for applying cooperative, active and engaged learning. It allows focus on engaging experiences for students and faculty. This study investigated pre-service teachers' perceptions and experiences in courses in an active learning environment. Eighty pre-service teachers participated in two separate courses designed according to active learning strategies in an active learning classroom. Findings indicated that participants' perceptions about the courses were positive for cognitive awareness, respectability, individual responsibility, cooperation and active participation. Further, their perceptions and experiences regarding the active learning model and environment were positive. Participants also expressed their views about using an active environment in the learning process and instructors conducting courses in these environments.

Introduction

Changes in the educational paradigm, aligned with twenty-first-century requirements, have created a need for education that is learning-oriented, student-centred, mastery-based, personalised, collaborative, and enjoyable (Reigeluth, 2012). With this shift student-centred learning methods have become prominent in teaching and learning processes. Student-centred learning approaches entail learning environments wherein, as a guide to learning activities, teachers prompt active student participation (Arends 2012; Hannafin et al. 1997; Land and Hannafin 2000). Students' changed needs as well as the need to apply knowledge have increased the importance of student-centred learning environments in higher education (Lea et al. 2003), but traditional teaching methods and one-size-fits-all approach are still frequently used (He, Gajski, Farkas & Warschauer 2015).

Educational systems' success is attributed to teachers assisting students to deal with various, rapid twenty-first century changes and increased complexity (Seferoğlu 2010). Constructivist and student-centred learning approaches require teachers to organise learning environments that guide students, rather than using traditional teaching approaches. This situation reveals the need for courses and professional instructor development based on student-centred approaches (Biggs & Tang 2011).

Additionally, pre-service teachers transfer their knowledge, experience, attitudes and affective gains to their future professional life. In other words, pre-service teachers teach the way that they have learned (Yıldırım 2000). Therefore, pre-service teacher education programs should enhance their competence in knowledge and application of student-centred, constructivist approaches when, for instance, planning learning activities, course design, and classroom management (Çandar and Şahin 2013). Thus, higher education's teaching and learning processes, particularly teacher education programs, should be designed and implemented in a conscious way.

Active learning presents a significant opportunity to maximize learning and support students' meaningful learning experiences. Many research studies have generally examined active learning strategies for teacher training, but those focusing on an analysis of active learning strategies implemented in classrooms specifically designed for active learning are limited. Active learning environments are physical places designed for active learning, open to rethinking students and educators' classroom experiences. Moreover, determining learners' and instructors' views on student-centred and constructivist learning environments and investigating these environments' impact on students, particularly educational quality and the teaching profession, are important. This study examines pre-service teachers' first-time experiences and views on active learning environments and courses taken therein.

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Study background

Active learning model

Compared to traditional teaching, learners take responsibility for the learning process in active learning rather than being passive information receivers (Prince 2004). Active learners not only listen to the lesson but also read, write, discuss, and actively use higher order thinking skills, (e.g. analysis, synthesis and evaluation) in various learning activities (Bonwell and Eison 1991).

Many research studies examine active learning's positive effects in higher education (Barr and Tagg 1995; Braxton et al. 2000; Hake 1998; Kalem and Fer 2003; Sokoloff and Thornton 1997; Taçman 2007). Active learning's main objective is for students to learn by doing and thinking about their actions (Bonwell and Eison 1991). Teachers plan learning environments to include cooperative learning, project-based learning, problem-based learning, (Prince 2004) and teaching strategies, i.e., discussion, role-play, self-assessment, peer assessment, brainstorming, and experiential learning (Bonwell and Eison 1991). Students are guided by applying these techniques and strategies in select parts of the learning process (Faust and Paulson 1998).

Active learning implies students' activeness during the learning process, reflecting on learning and gaining experience, thereby also learning how to learn (Ambrose et al. 2010; Zull 2011). Therefore, students discover knowledge in different sources, organise and share this knowledge with classmates, prepare projects individually or collaboratively, and participate in activities like cooperative work in knowledge production (Ward and Tiessen 1997). Kane (2004) stated that active learning tasks have four common features: (1) fostering critical thinking, (2) granting student's responsibility for learning, (3) teachers' organization of learning activities and (4) participation in open-ended learning activities.

Furthermore, active learning tasks should be presented so that students associate learning content with real-life contexts and utilise them in daily life (Faust and Paulson 1998). There is no single way to solve problems. Therefore, active learning environments encourage students to analyse and examine given problems/situations from various perspectives and experience different solutions while creating knowledge structures. Thus, students gain knowledge about solving a problem and understand the solution's mechanism (Gijbels et al. 2006).

Additionally, social interaction is important in the experience and contribution of individual knowledge acquisition. Lev Vygotsky underlines social interaction's impact on acquiring new ideas and on intellectual development, which represent learning's social side (Arends 2012). For students to experience greater interaction with their environments and opportunities for rich learning, enabling them to create student–student and teacher–student collaborations and learn collaboratively in small groups and as individuals is necessary (Prince 2004). Active learning environments require multiple resources to present content through various communication tools. For example, instead of limiting tasks to oral and written communication, students should have opportunities to complete tasks that use multimedia. Thus, students can make the learning process more effective and efficient (Harwood and McMahon 1997) along with improving their intellectual competencies, cognitive learning, and expression skills (Lancy 1990; Jonassen 1994).

For evaluating an active learning environment from pre-service teachers' perspective, this study established two different course structures based on an active learning model designed according to Kane's (2004) active learning strategies and their applicability, such as flipped learning, project-based learning, inquiry-based learning, and micro-teaching strategy. Real life problems based on these courses' learning outcomes were defined. Tasks encouraged critical thinking with students responsible for demonstrating their skills through active participation. The instructor facilitated students' active learning processes.

Active learning environments

To promote learning's nature and quality, enhancing student-centred learning with technology is important because it offers flexible tools that facilitate cognitive processes supporting thinking and learning (Hannafin and Land 2000). For example, computer tools help students access, collect, and use information sources; online scaffolding helps them plan and apply their learning; and generative tools enable students to produce materials reflecting their learning (Hannafin and Land 2000). Technological tools are appropriate for constructivist approaches and quite convenient for implementing active learning and supporting student-centred learning (Jonassen and Jonassen 2000; Kim and Reeves 2007; Gebre et al. 2014; Walker and Baepler 2014).

Instructors generally present courses in classrooms or computer labs with seats arranged in traditional rows. Here, instructors present content and students resemble a passive audience, only listening or taking notes. Because traditional classrooms do not have provide equality in seating arrangement, image, sound and interaction facilities, student motivation, activeness and participation may differ. Park and Choi (2014) defined traditional classrooms as having 'gold' and 'shadow' areas. Students willing or able to sit in the gold area have better participation in lessons, more motivation, and easy communication with the teacher leading to better concentration and learning. Further,

although nearly 80% of students prefer to sit in the gold area, only 10% have the chance, emphasising that classroom setting is important for all students' learning conditions. Thus, traditional classroom environments insufficiently ensure effective, long-lasting learning, and participation, instead resulting in negative influences on learning, participation, and motivation. Finally, although traditional classroom environments use student-centred approaches, optimum effectiveness is impossible due to improper structures for various pedagogic approaches (Cullen et al. 2012; Finkelstein et al. 2013).

Studies shaping teaching programs and activities in student-centred contexts show that physical classroom environments should also be redesigned based on student-centred approaches (Baepler and Walker 2014; Burke 2015; Fahlberg et al. 2014). Recently, particularly at the university level, active learning environments (developed to apply student-centred learning approaches) emerged, leading to many universities implementing them. Some of the most well-known are the Student-Centred Active Learning Environment for Undergraduate Programs (SCALE-UP) project initiated by Robert J. Beichner, Physics Professor, at North Carolina State University (NCSU); the Technology Enabled Active Learning (TEAL) project initiated and expressed as a re-class design by Massachusetts Institute of Technology (MIT); and the Active Learning Classrooms (ALC) project at Minnesota University. These environments provide possibilities for student participation, mostly in round-table arrangements with technological tools facilitating the content and information transfer between students and teachers.

The SCALE-UP project is cooperative, hands-on, computer-enriched, interactive, and convenient for crowded classes (Beichner et al. 2007). Many schools participated under NCSU's leadership, implementing effective student-centred approaches in crowded classes by prioritizing interaction (Gaffney et al. 2008). The class environment has been constructed as a multimedia studio/workshop; students work in pairs or groups of three or four, with internet access, course activity materials, class discussions, and sharing their work with classmates.

Student-centred learning environments are organised based on the constructivist learning theory wherein individuals take more responsibility for the learning process (Driscoll 2005). Students should create cognitive structures by interacting with the environment, so SCALE-UP classes facilitate group work with a seating arrangement wherein everyone can see everyone else. Each U-shaped or round table has computer and internet access. Learning is facilitated through information sharing; students can build individual knowledge structures through collaborative work. Pedagogically, SCALE-UP classes use group activities, minimizing teacher-centred instruction, with active, cooperating students and teachers guiding students. Therefore, they are effective environments for lessons organised according to the constructivist learning theory. Studies reveal that such lessons increased students' problem-solving skills, understanding, development of positive attitudes, significantly reduced error rates, and enabled unsuccessful students to perform better (Beichner et al. 2007; Brooks 2010, 2012; Dori and Belcher 2005; Walker et al. 2011).

Implementing constructivist learning strategies can be facilitated through physical and technological features. More importantly, lessons can be arranged according to the constructivist learning theory's principles and methods. Based on classroom observations in technology-enhanced active learning environments, Shieh et al. (2010) and Thornton and Kuhl (1999) assert that technology-only environments did not ensure emergence of effective educational performance in the short term.

Furthermore, college instructors must be willing to implement and be experienced in student-centred approaches that might encourage pre-service teachers to adopt a similar approach (Gibbs and Coffey 2004; Ho et al. 2001; Trigwell et al. 1999) in active learning environments. Additionally, Shieh et al. (2010) reveal the importance of instructors improving their competence in student-centred approaches and learning/teaching methods in active classrooms as well as increasing their knowledge of techniques that keep students away from passive learning habits.

While determining the classroom environment's effect on pre-service teachers, Köse and Küçükoğlu (2009) found that they are aware that learning environment affects student achievement. Further, physical and technological classroom conditions, teacher–student and student–student interaction opportunities, as well as teacher characteristics are important to student achievement. Moreover, various studies on learning environment reveal that students' feelings (e.g. course enjoyment, positive attitude), active participation, classroom interaction (teacher–student, student–student), joint student work, and attitudes towards the teacher positively affect learning (Kısakürek 1985; Küçükoğlu and Köse 2008; Wong 1993). Despite many factors affecting learning, the main elements are students, teachers, and educational content; good course design in a suitable environment may provide effective learning.

Finally, active learning classes can facilitate student-centred methods and create effective learning. Not only active classroom characteristics but also instructors with the knowledge and skills to use them effectively and implement lessons appropriately to active learning objectives contribute to effective education. Therefore, studies on active learning

environments for training pre-service teachers and examining active learning strategies for various subjects would both benefit teacher education and improve overall educational quality.

Some studies on development and application of active learning imply that cultural differences would impede such innovative pedagogical approaches (Foote 2014). Moreover, limited Turkish studies examine the contribution or effect of classroom environments on learning (Köse and Küçükoğlu 2009) and active learning environments. Furthermore, sharing evaluations of active environments' impact on learning in different countries would benefit their effective and efficient implementation. Therefore, this study may guide researchers to conduct further research on active learning environments and their effective implementation.

Research aim

This study investigates pre-service teachers' views and experiences of a course and classroom environment designed according to a SCALE-UP principles-based active learning model. It examines pre-service teachers' perceptions regarding cognitive awareness, respectability, individual responsibility, cooperation, and active participation in active learning within courses taking place in active learning environments. Further, courses selected from different programs were designed on the active learning model and conducted by an instructor in an active learning environment. The following are research questions:

1. What are pre-service teachers' perceptions on cognitive awareness, respectability, personal responsibility, cooperation, and active participation in the active learning model in an active learning environment?
2. What are pre-service teachers' views and experiences of courses designed according to the active learning model in an active learning environment?
3. What are pre-service teachers' views and experiences on an active learning environment?

Method

Research design

This descriptive study combines qualitative and quantitative data collected simultaneously but analysed separately. Descriptive studies' non-experimental methods present features of a condition or case accurately and completely (Johnson and Christensen 2008).

Participants

Study participants were 80 pre-service teachers in different programs at a Turkish state university. Participants enrolled in either Computer Aided Mathematics Instruction or Multimedia Design and Production, these courses were selected because they are appropriate for active learning approaches and offered by the same instructor. Table 1 presents participants' demographics.

Table 1. Pre-service teacher-participants' demographics in a study of active learning environments

Course	Group	Gender		Class	
		Female	Male	3rd Year	4th Year
Computer Aided Mathematics Instruction	Group 1	22	5	-	27
	Group 2	21	5	-	26
	Total	**43**	**10**	**-**	**53**
Multimedia Design and Production	Group 3	17	10	27	-
	Total	**17**	**10**	**-**	**-**
Total		**60**	**20**	**27**	**53**

As Table 1 shows, 53 pre-service teachers (43 female; 10 male) took Computer Aided Mathematics Instruction in two groups (Group 1 and 2) on different days; 27 (17 females, 10 males) took Multimedia Design and Production in one group (Group 3).

Implementation processes and learning environment

Active learning environment

Following the SCALE-UP project, the active learning environment, a classroom accommodating 63 students, was structurally and technologically designed appropriate to student-centred learning methods and techniques to facilitate active learning, collaborative learning, flipped learning, and situated learning.

With U-shaped tables allowing group work, the centred teacher's desk kept the teacher equidistant from students and allowed easy communication with groups (see Figure 1). Classroom facilities included air-conditioning, computers, an interactive whiteboard, a projector, sound system, web camera, document camera, and multi-purpose printer. A document camera also facilitated sharing students' non-digital work within the classroom. A wireless network infrastructure, custom-created, provided internet access for devices and data sharing. Technological equipment was controlled from the teacher's desk designed as a studio control board. Laptops were also provided for in-classroom group work (see Figure 2). Each U-shaped table had ports to stream video and audio from computers to an interactive whiteboard to facilitate sharing group work with the entire class. Boards were placed across each U-shaped table so that students could use them during group work (see Figure 3).

Figure 1. **Views of the classroom**

Figure 2. **Equipment of the classroom**

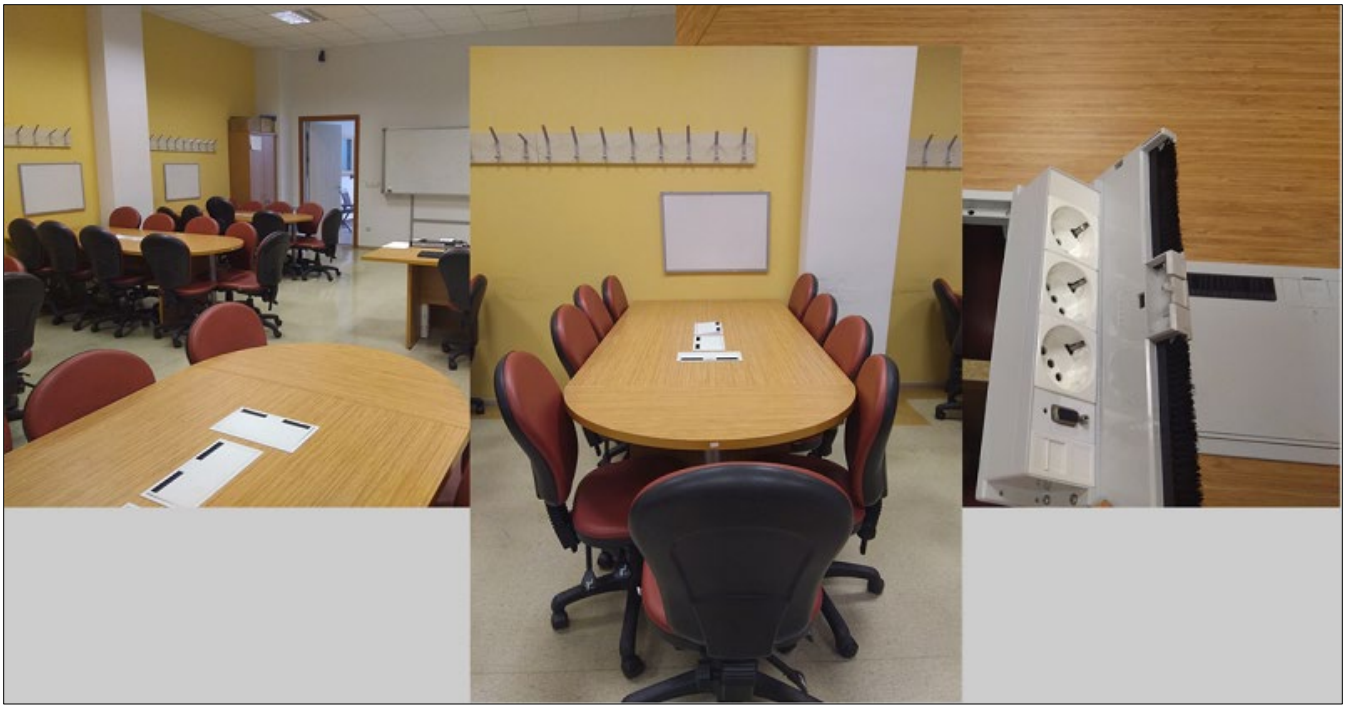

Figure 3. **U-shaped tables of the classroom**

Courses' design and implementation

Multimedia Design and Production (MDP) aimed for students to develop skills and gain knowledge of educational multimedia application, promote multimedia learning principles, and teach animation software as a multimedia authoring tool. Computer Aided Mathematics Instruction (CAMI) aimed to provide pre-service teachers with information and experience integrating technology into mathematics instruction by using algebra and dynamic geometry software. To improve the validity of this study's findings, the same instructor taught both courses. The instructor, also this study's researcher, has nearly 20 years of experience. She has previously led courses in a traditional classroom and computer lab. The instructor has been teaching in this active classroom for one year. This course was the students' first experience in the active learning classroom.

For both courses' implementation of active learning strategies, versions of open-ended learning activities recommended by Kane (2004) were designed to encourage critical thinking, provide students with the opportunity for demonstrating skills and evaluating results, and support students' active participation. The instructor conducted educational activities as a guide rather than as a transferor of information. A fundamental real-life problem lying within course objectives was defined while designing each course's learning activities.

The following points were considered for each course's problem:

- Students undertaking a realistic role for their profession.
- Students creating their own sub-problems and finding solutions.
- Instructor supporting learning with activities that students enjoy and that require thinking skills.
- Students learning from one another and cooperating in group work.
- Students reflecting on learning experiences from previous courses.
- Instructor and students using alternative evaluation methods (e.g., peer evaluation, performance assessment).

Aligned with the active learning model, a course syllabus describing learning activities, activities' content, control, and evaluation checkpoints created. Then field experts examined activities' suitability to content, objectives and student-centred-ness. Based on this information, some learning activities' features can be explained as follows.

To develop students' multimedia skills, the Watch-Think-Apply activity based on flipped learning was implemented. Students watched video-based courses presented through a Learning Management System (LMS), and during the course hour, students developed multimedia materials by interpreting the information they had learnt in LMS lessons. Another activity based on project-based, collaborative

learning was Read-Think-Design for developing students' multimedia application design skills according to multimedia design principles and features. In this activity, students prepared by reading the LMS content and considering educational multimedia design. During class, students prepared a teaching scenario, created story sheets, and planned the interface.CAMI implemented a Let's Discover-Let's Learn activity based on inquiry-based learning and a Let's Teach activity based on a micro-teaching strategy. In Let's Discover-Let's Learn, prior to class students examined LMS learning content and discovered ways of using this technology in mathematics on a weekly basis. During class, in groups, students discussed critical thinking questions presented by instructors or solved a problem using algebra software in groups. In the Let's Teach activity, micro-teaching helped pre-service teachers experience mathematics instruction using algebra and dynamic geometry software.

The instructor led debates on activities and guided students during application, after all these activities, pre-service teachers shared and discussed approaches and solutions.

Data collection tools

This study collected qualitative and quantitative data with two forms: quantitative data with a form titled *How was the class for you?* developed by Kalem and Fer (2003), adapted from Saban's (2000) active learning form. The form used here contains 20 items in five categories, including cognitive awareness, respectability, individual responsibility, cooperation, and active participation. Using four options for each category, pre-service teachers marked the form appropriately for each active learning implementation.

For collecting qualitative data, this study's researchers developed a form consisting of five structured, open-ended questions to address the study's second and third research questions as follows:

Please fill in the blanks in the following five (5) sentences by expressing your opinions about the course in this classroom.

- From the course we had in this classroom, I……. because……
- Did this classroom differ from others? When I compare this classroom with others, ……
- What other courses would you like to take in this classroom? Please include reasons.
- How could taking a course in the active learning environment affect a pre-service teacher? For a student in the Faculty of Education, taking courses in this classroom can……
- What qualifications should instructors who conduct courses in this classroom have? Please explain.

Data collection and analysis

Qualitative and quantitative data were collected simultaneously from all students at the end of each 14-week course. Quantitative data collected with the questionnaire How was the class for you? is presented with frequency and percentage values.

For qualitative data, content analysis determined pre-service teachers' views and experiences of the learning environment's features in each course. In content analysis, with some necessary changes were made to codes (Weber 1990), the active learning model and features of the active learning environment were coded.

To ensure the qualitative data's validity, researchers concentrated on a clear, consistent research process; other researchers verified their findings. Research questions, participant characteristics, characteristics of data collection tools, the lesson planning, and implementation process were explained in a clear, detailed way. Two researchers analysed qualitative data to ensure reliability. Inter-coder agreement was calculated with the formula by Miles and Huberman (1994) (agreement/ (agreement + disagreement = reliability coefficient), and the correspondence percentage was .89. With a calculated reliability score above 70%, codes and views assigned to codes were considered reliable (Miles and Huberman 1994).

Because pre-service teachers took courses designed according to two different active learning models in an active learning environment in three separate groups, quantitative and qualitative data were analysed and findings presented according to group. Thus, study results' consistency and accuracy were evaluated.

Findings

Pre-service teachers' perceptions of the active learning model in courses conducted in an active learning environment

Findings reflecting the active learning questionnaire's five categories regarding the first sub-problem—What are pre-service teachers' perceptions on cognitive awareness, respectability, personal responsibility, cooperation and active participation in the active learning model in an active learning environment, based on the SCALE-UP program—are presented according to groups with frequency and percentage values in Table 2.

As Table 2 shows pre-service teachers had a complete awareness of courses, more than half the pre-service teachers (55%) marked I was fully aware of what was going on around me in lessons. They felt respected in the learning environment, more than half the pre-service teachers (51%) marked I felt completely positive and relaxed during lesson'.

They could perform work in cooperation and took individual responsibility, 60% of all pre-service teachers marked I felt like I was part of a group and was accepted by the group and, more than half the pre-service teachers marked I had the opportunity to make choices during lessons. Additionally, they were active during lessons, 69% of all pre-service teachers marked "I was an active participant during lessons."

Table 2. **Pre-service teachers' perceptions of cognitive awareness, respectability, individual responsibility, cooperation and active participation in an active learning environment**

Categories	Phrases/Statements	Group 1 n (%)	Group 2 n (%)	Group 3 n (%)	Total
Cognitive Awareness	I was fully aware of what was going on around me in lessons.	18 (67%)	13 (50%)	13 (48%)	44 (55%)
	I was generally aware of what was going on around me in lessons.	7 (26%)	13 (50%)	11 (41%)	31 (39%)
	I was little aware of what was going on around me in lessons.	2 (7%)	0 (0%)	3 (11%)	5 (6%)
	I felt bored in lessons.	0 (0%)	0 (0%)	0 (0%)	0
Respectability	I felt completely positive and relaxed during lessons.	14 (52%)	14 (54%)	13 (48%)	41 (51%)
	I generally felt positive and relaxed during lessons.	10 (37%)	8 (31%)	9 (33%)	27 (34%)
	I didn't feel good during lessons.	3 (11%)	2 (7.5%)	3 (11%)	8 (10%)
	I felt bad about myself during lessons.	0 (0%)	2 (7.5%)	2 (8%)	4 (5%)
Individual Responsibility	I had opportunities to make choices during lessons.	16 (59%)	16 (62%)	16 (59%)	48 (60%)
	I felt responsible during lessons.	10 (37%)	10 (38%)	9 (33%)	29 (36%)
	I was dragged without using my willpower.	0 (0%)	0 (0%)	2 (8%)	2 (3%)
	I didn't take any responsibilities. I was just directed.	1 (4%)	0 (0%)	0 (0%)	1 (1%)
Cooperation	I felt like I was part of a group and was accepted by them.	14 (52%)	15 (58%)	19 (70%)	48 (60%)
	I generally had positive feelings about class members.	12 (44%)	9 (35%)	18 (30%)	29 (36%)
	I did not feel accepted by my own group.	1 (4%)	2 (7%)	0 (0%)	3 (4%)
	I felt selfish and ignored by others.	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Active Participation	I was an active participant during lessons.	17 (63%)	15 (58%)	23 (85%)	55 (69%)
	I felt lively and energetic.	10 (37%)	11 (42%)	3 (11%)	24 (30%)
	I didn't spend much energy on my work.	0 (0%)	0 (0%)	1 (4%)	1 (1%)
	I felt passive.	0 (0%)	0 (0%)	0 (0%)	0 (0%)

What are pre-service teachers' views and experiences of courses designed according to the active learning model in an active learning environment based on SCALE-UP principles?

Table 3 displays both pre-service teachers' positive and negative views of courses designed on the active learning model in an active learning environment. However, they mostly provided positive comments, stating that they enjoyed the courses, and found them beneficial and contributed to their learning ($f_{Group1} = 24$; $f_{Group2} = 24$; $f_{Group3} = 24$). Conversely, only two expressed negative opinions ($f_{Group1} = 0$; $f_{Group2} = 1$; $f_{Group3} = 1$). One teacher from Group 2 (k37) expressed a negative opinion about not taking the course until their last educational year—not about course objectives or their implementation.

In depth examination of pre-service teachers' positive views showed that their experiences were influenced by both the class and course features (see Table 4). Course features were quite important for positive thinking ($f_{Group1} = 9$; $f_{Group2} = 9$; $f_{Group3} = 9$). Additionally, not only experiences

related to class features (f_{Group1} = 9; f_{Group2} = 7; f_{Group3} = 4) but also course features (f_{Group1} = 5; f_{Group2} = 6; f_{Group3} = 11) played an important role in shaping students' views.

***Table 3*. Pre-service teachers' views on courses in the active learning model in an active learning environment**

Group	Codes	f	Sample (Example)
Group 1	Positive	24	It was productive (k5). I was pleased. All our courses [were] hands-on (k66). We got a lot of pleasure (k69).
	Negative	0	-
	No comment	3	(k58), (k65), (k70)
Group 2	Positive	24	I learnt a lot (k33). I enjoyed it a lot (k44). I benefitted a lot (k48).
	Negative	1	It wasn't productive because this course shouldn't be given in the final year (k37).
	No comment	1	(k53)
Group 3	Positive	24	It was fun (k13). I am pleased (k20). It was productive (k27).
	Negative	1	I didn't learn anything. I didn't like the class. The space between the rows was narrow. I wish there had been more computers and I didn't have to bring my own computer (k5).
	No comment	2	(k8), (k9)

Pre-service teachers' views about an active learning environment designed on SCALE-UP principles

Pre-service teachers' views about differences between the active learning environment and other classrooms are in Table 5. Particularly, they emphasized technological equipment (f_{Total} = 21). For instance, a pre-service teacher from Group 3 (k17) said, *the technological facilities are a lot, it supports active learning*. Another from Group 1 (k58) expressed the opinion *It is a higher-level class as it is highly technological and makes many abstract concepts concrete more easily with the help of interactive whiteboard*. And another from Group 2 (k35) noted, *It is technologically better equipped*.

Table 5 shows that pre-service teachers emphasized the classroom's different physical features (f_{Total} = 13). For example, one from Group 3 (k15) commented, *there was an opportunity for us to see the board from anywhere in the classroom and it was different with its seating arrangement that was suitable for group work*. Another from Group 2 (k49) stated *It was more fun, seating arrangement was better and it was suitable for group work with its physical structure*. They found that the active learning environment differed in student-centred learning implementation. They also found the classroom more suitable for active, effective learning (f_{Total} = 13). For instance, a pre-service teacher from Group 3 (k23) noted, *I was more active in the class and this provided me with advantages*.

Another from Group 1 (k75) said, *It is a classroom which is suitable for active and effective learning*. Additionally, pre-service teachers found that this classroom differed because it was interactive and facilitated group work as well as cooperation. For example, a pre-service teacher from Group 3 (k19) noted, *It is a more interactive and relaxing environment and it is suitable for group work*. k53 from Group 1 said, *It is more practical since the teacher and students are in constant communication*; another from Group 2 (k51) called it *a more relaxing class environment; students interact with each other and it is easy to return to the board*.

Furthermore, Table 6 presents courses that pre-service teachers wanted to take in an active learning environment. Some in Groups 1 and 2 wanted to take, for instance, Analytic Geometry and Analysis in Mathematics Education Program; some in Group 3 wanted such courses as Graphics in Education, Animation and Programming (f_{Total} = 49). All groups wanted teaching professional courses, e.g. special education methods, in the active learning environment (f_{Total} = 25).

Reasons for choosing these, primarily the physical and technological features of the classroom, are presented in Table 7 (f_{Total} = 79).

For example, (k65) from Group 1 wanted to take all courses in this classroom because *the class doesn't seem crowded and the seating arrangement is quite suitable for learning environment. There are more opportunities for interaction with the instructor*. From Group 2, (k42) wanted to take all applied courses in this classroom: *There is a seating arrangement which enables more active participation and I believe this brings more success*. Similarly, Group 3 stressed class features. For example, (k13), who had taken a special teaching methods course and the programming course, a field course, in this classroom, said, *It was very suitable for group work and the interaction was more with the instructor*. Another, (k18), who wanted to take programming courses in this classroom, expressed the opinion *It is a classroom where groups are in an interactive communication with each other*.

Table 4. **Experiences shaping pre-service teachers' views on courses designed according to the active learning model in an active learning environment**

Group	Codes	f	Sample (Example)
Group 1	Class features	9	The class was wonderful and fun (k69). I feel lucky to have had a course in this classroom before graduating (k67). There were enough facilities in the class (k62).
	Course features	9	I think it was both enjoyable and informative (k79). We acquired knowledge and experience about material preparation that we can offer to our students concretely at the stage of becoming a teacher (k76). It was a course that made me understand that I can lecture in different ways (k55).
	Class and course features	5	I learnt how to use interactive whiteboard. I didn't have any idea about dynamic geometry software Geogebra. I believe I will be a better teacher by improving myself in this area (k54). Our courses were hands-on and I started to use technology effectively in this class (k66). I had the opportunity to conduct a real lesson and use technological tools (k71).
Group 2	Class features	7	The class was rich in terms of instructional tools and we benefitted from them (k48). The class was effective for conducting a lesson (k38). I learnt how to use interactive whiteboard and the seating arrangement was also good (k34).
	Course features	9	I learnt how to construct more understandable maths instruction because we turned it into something concrete (k33). I wasn't bored as we were intensive in interactions (k44). It provided me with ways for making my lessons enjoyable for the students (k29). I got some information that I can use in daily life (k45).
	Class and course features	6	We had more interesting lessons and the class being different made me curious about things (k30). The class was very comfortable. For the first time, I had the opportunity to work in cooperation with my friends (k51). Both micro-teaching and computer applications were effective (k40).
Group 3	Class features	4	It was completely a working environment. I had the chance to know better the equipment I will use when I become a teacher (k3). We were in a class where the interaction was comfortable and easy (k6). I was in an environment where we learnt by enjoying and interacting (k19).
	Course features	9	The interaction with friends and the lecturer was strong and the lesson was easy to understand (k13). It was fun to be involved in learning (k20). The lessons were enjoyable as we had active participation (k27).
	Class and course features	11	There was a chance for each student to be active and we had a relaxed atmosphere where we could work in groups (k22). It was fun and easy to cooperate (k15). Both the environment and lesson plans made the class pleasant. We did group work (k1).

Table 5. **Pre-service teachers' views about differences between the active learning environment and other classrooms**

Codes	Group 1 (f)	Group 2 (f)	Group 3 (f)	Total (f)
Technological Equipment	10	8	3	21
Enjoyable	2	5	2	9
Practical	3	3	1	7
Comfortable	2	1	4	7
Active and suitable to learning	2	4	7	13
Physical features (spacious, different seating arrangement, etc.)	5	3	3	11
Facilitating interaction, group work and cooperation	3	2	7	12

Table 6. **Courses that pre-service teachers wanted to take in an active learning environment**

Codes	Group 1 (f)	Group 2 (f)	Group 3 (f)	Total (f)
Subject-area courses	19	12	18	49
Teaching-professional courses	6	7	12	25
General culture courses	1	-	1	2
Project-based practical courses	-	2	3	5
Information technology courses	-	3	2	5
All courses	2	2	1	5

Table 7. **Why pre-service teachers want to take courses in the active learning environment**				
Codes	Group 1 (f)	Group 2 (f)	Group 3 (f)	Total (f)
Different physical characteristics (seating arrangement, technological equipment)	27	26	26	79
Environment enabling application	7	11	2	20
Technological equipment	7	9	3	19
Supporting active participation	3	5	7	15
Suitable for cooperation / group work	1	-	13	14
No comment	2	3	6	11

Table 8. **Pre-service teachers' views of possible effects on Faculty of Education students in courses in an active learning environment**				
Codes	Group 1 (f)	Group 2 (f)	Group 3 (f)	Total (f)
Experience in teaching methods and techniques	11	10	4	25
Experience in use of technology	9	5	2	16
Collaboration skills	1	2	9	12
Beneficial effects.	6	6	-	12
Self-confidence	2	2	6	10
Effective communication skills	-	1	3	4
A course experience in a real university classroom	-	1	2	3
No comment	-	-	2	2

Pre-service teachers provided their views (Table 8) on effects of courses conducted in active learning environments, stating that these course environments would contribute to their development in experiencing various teaching methods and techniques (f_{Total} = 25), using information and communication technologies (f_{Total} = 16) and using cooperation skills (f_{Total} = 12). For example, (k28) from Group 2 said, *It enables a teacher to learn different methods other than the traditional teaching methods to present a lesson more effectively*. From Group 3, (k11) declared, *It provides collaborative learning opportunities and more effective interaction with the teacher*. Another from Group 1 (k69) observed, *It gives self-confidence, it develops skills in technology use and you learn actively*.

Presenting frequencies of views on instructor characteristics in an active learning environment, Table 9 shows that pre-service teachers stated that instructors should particularly be information and communication technology literate (f_{Total} = 17). Additionally, they emphasized instructors' pedagogical knowledge (f_{total} = 13) and personality traits (f_{Total} = 13). For example, Group 3's (k17) said, *The instructors should be people who are constructive and open to innovation targeting active learning*. Group 1's (k66) said that the instructor needs to be *an expert in his/her field and skilful in transferring field knowledge properly*.

Table 9. **Pre-service teachers' views on instructors in active learning environment courses**				
Codes	Group 1 (f)	Group 2 (f)	Group 3 (f)	Total (f)
Technological literacy	4	2	11	17
Teaching profession knowledge	7	2	4	13
Personality traits (open to communication, understanding, self-confident)	3	4	6	13
Subject-knowledge information	6	3	-	9
No comment	9	14	8	31

Discussion and Conclusion

This study investigated 80 pre-service teachers' views and experiences of a course and an environment designed for active learning strategies via the questionnaire "How was the class for you?" and via open-ended, researcher-developed questions.

First, findings revealed their generally positive perceptions. Pre-service teachers had a complete awareness of courses, felt respected in the learning environment, could perform work in cooperation, and took individual responsibility. Additionally, they were active during lessons and had positive perceptions about organising their work through their own choices.

Prince (2004) stated that active learning's forms (e.g. problem-based learning, project-based learning, collaborative, and cooperative learning) are not a panacea for educational problems and that core elements of active learning strategies should be examined in depth. Thus,

evaluating how active learning strategies can be used in various teaching areas would be beneficial. Our study examined different active learning strategies in two courses and explained these strategies' contents during implementation, perceived as positive by three groups of pre-service teachers. Although more evidence is required, study results indicate that active learning designed for the CAMI and MDP courses could be useful templates for similar courses in teaching education programs.

Second, findings revealed that pre-service teachers' views on experiencing an active learning environment and active lessons were positive. These findings are consistent with similar studies on positive effects of courses conducted with active learning strategies (Faust & Paulson 1998) in active classes (Burke 2015; Park and Choi 2014). Thus, our study's findings suggest that to ensure a positive effect of active learning environments, such courses should be designed and implemented according to the constructivist learning theory and student-centred approaches.

Conversely, Brooks (2010) identified the relationship between formal (physical) learning spaces and student outcomes, in a study where an instructor presented the same course in two radically different environments (i.e. traditional classroom, active learning environment). That study suggested, independent of other factors, that active learning environment significantly and positively influence student's learning (Brooks 2010).

Third, pre-service teachers in different disciplines, taking two different active learning environment courses that offered a different physical environment from traditional classrooms or computer laboratories, expressed a similar view: the active learning class differed from other classrooms. However, this was not only due to its physical environment. They perceived the classroom and course holistically. The course differed not only in physical characteristics but also in opportunities for active learning and cooperative group work. This finding reflects previous studies (Gebre, Saroyan and Bracewell 2014), revealing the learning environment's role in incorporating affordances of information technologies and learning methods.

Fourth, according to active learning environment courses that pre-service teachers want to take and their reasoning, results indicate that pre-service teachers would like to first take subject area courses and then teach profession courses. In education faculties, subject area courses mostly require analysing various facts, concepts, and experiences as well as integrating concepts, information and opinions. Teaching profession courses also require applying theories to practice. Findings by Park and Choi (2014) are similar to ours because these coursework outcomes match active learning classes' main aim. They indicate that active learning classes are more suitable for application-based coursework than for theory-based coursework. Further, besides its physical characteristics, our participants stressed the classroom's technological facilities and its suitability for cooperative work and active student participation. Therefore, because pre-service teachers from different disciplines had positive perceptions, we suggest that active learning environments in various application-based courses would benefit them.

Fifth, pre-service teachers stated that lessons in an active learning environment, particularly at the Faculty of Education, contributed to their development. They experienced student-centred learning methods, used technology in learning environments, and improved their cooperation skills and self-confidence, particularly Group 3 wherein pre-service teachers mostly developed original educational multimedia products in groups. This situation reflects pre-service teachers' learning (Yıldırım, 2000). Consistent with previous studies (Gebre et al. 2014; Löfström and Nevgi 2007), ours propounds that taking courses with student-centred methods can effectively change pre-service teachers' perceptions of student-centred learning approaches.

Last, detailed examination of pre-service teachers' instructor evaluations in the active learning environment revealed that they emphasized knowledge, communication technology skills, teaching-profession knowledge, and instructors' personality traits. Probably, pre-service teachers emphasize knowledge and communication technology skills because technology enhances active learning. Additionally, they emphasized the importance of professional knowledge more than subject area knowledge and personality traits. Gebre et al. (2014) revealed that whether or not technology improves teaching in higher education, professional development considers changes in professors' conceptions of effective teaching. Andrews, Leonard, Colgrove and Kalinoski (2011) revealed that improving students' effective and active learning in college science courses requires instructors' skills and expertise as well as classroom norms of active learning, which differ fundamentally from those in traditional lectures. Accordingly, instructor skills and experiences are essential for effective use of active learning environments and for applying active learning. Further, it is important that pre-service teachers correctly interpret the instructor's importance in active learning and in active learning environments.

Our results associated with active learning environments and teacher education programs have two main implications. First, active learning environments positively affect students' learning in teacher education courses designed with student-centred approaches like active learning. Second, technology-enhanced learning environments, like active learning environments, clearly change both pre-service teachers and instructors' teaching

and learning approaches. Therefore, creating such environments in Faculties of Education would benefit pre-service teachers' learning and develop their teaching skills through experience of active learning in active learning environments.

Findings related to active classes' positive effects generally come from American research, so research considering possible cultural differences should be conducted in Asia or any other continent (Foote 2014). Additionally, Arı (2010) expressed that pre-service teachers in Turkish programs graduate without the necessary knowledge and skills in student-centred strategies. This research can thus contribute to literature on active learning in active learning environments and student-centred learning approaches in other cultures.

Nonetheless, this study's limitation could be the investigation of perceptions and views only of pre-service teachers' experiences in an active learning environment. Accordingly, in future studies, the following research topics are recommended: (1) effect of pre-service teachers' cognitive abilities and motivation on learning in active learning environments; (2) effects on learning various courses in these learning environments. Furthermore, despite the conclusion provided by Brooks (2010) that active learning environments significantly and positively impact student learning and our findings that partially support this viewpoint, investigations to reveal differences on learning between the same courses conducted in active and traditional environments would add more evidence to the literature. Instructors' experiences in active learning environments and the effect of same or different courses conducted by different instructors with different levels of experience in active learning environments should be examined to reveal instructors' conceptions about active learning and active learning environments; this could result in innovative pedagogical use of technology. Finally, particularly in Turkish and other cultures' teacher education programs, active learning activities and environments in which pre-service teachers learn more effectively and efficiently could be comparatively investigated.

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