



Effects of Cognitive Stimulation, Physical Arrangement of The Learning Environment, and Instructional Tendency on Student Engagement

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Abstract

This study examines the factors that strengthen student engagement in the teaching process. In this study, the activities carried out by candidate teachers participating in teacher education to increase student engagement in the teaching process have been examined in the context of cognitive stimulation, physical arrangement of the learning environment and instructional tendencies. Candidate teachers enrolled in the Science (3), classroom teaching (4) and social sciences (3) programs of the Faculty of Education, and candidate teachers who enrolled in the pedagogical formation certificate program in the fields of Sociology (3) and Religion (2) participated in the study. The study was designed with a qualitative research approach and data was collected through in-class observations and interviews with teacher candidates. Descriptive analysis was conducted on interview and observation data. Findings were cumulated into three categories: sources of cognitive stimulation, sorts of the physical arrangement of the learning environment, instructional tendencies and teaching roles. Activities used as cognitive stimuli were clustered in enhancing attention, enhancing perception and improving comprehension categories. The findings show that science, social sciences, classroom, sociology and religion teaching candidates can have different approaches to increase student engagement in the teaching process. Regarding the arrangement of the learning environment, teacher candidates mostly used “providing flexibility”, “adjusting the setting” and “rearranging the setting” techniques. To increase student engagement, teacher candidates in different branches performed different instructional tendencies. “Explaining in detail and connecting previous learnings”, “giving clear explanations”, “using expertise”, creating a responsive learning environment” and “being assertive” stood out as the most preferred teaching behaviours. Teacher candidates thought that having the following roles respectively in the teaching process increases student engagement more: Leading the learning process > being a didactic teaching expert > being a motivator > being a facilitator > being a role model > being a reflective professional.

Keywords: student engagement, cognitive stimulation, arrangement of physical learning environment, teaching behaviour, instructional tendency

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1. Introduction

1.1. Problem

Student engagement is among the primary goals of the teaching process and this study focuses on the factors that affect student engagement in the teaching process. Active student engagement is a desired condition for the success of the teaching process and ensuring permanent learning. Student engagement, as a concept, mostly refers to attracting students' attention during the teaching process, motivating them, establishing a connection with the environment and process, and making them the subject of learning (Schnitzler et al, 2020; Berry, 2019; Morris et al, 2019). Although student engagement has physical, cognitive and affective aspects (Schmidt et al, 2018, Watt et al, 2017; Fredricks et al, 2004), this study was examined in the context of academic active engagement (Coates, 2007) in the teaching process. Although many factors increase student engagement, the researcher's teaching experiences in this regard highlight the organisation of cognitive stimuli, arranging the learning environment, and teacher tendencies in the teaching process.

Cognitive stimulations are among the important factors affecting the teaching process. Cognitive stimulation in the learning process refers to activities and strategies designed to improve and enhance cognitive functions such as memory, attention, perception, reasoning, and language. It's based on the concept of neuroplasticity, which is the brain's ability to form and reorganise synaptic connections, especially in response to learning or experience. To incorporate cognitive stimulation into the learning process, exploring various brain exercises, learning new skills, and diversifying stimuli to enhance potential cognitive functions will increase the success of the process. During the teaching process, especially in individuals in the developmental age, cognitive stimulation is provided by adjusting the level of smell, sound and light in the environment (Herz, 2006, 2004), emphasizing sample thoughts (Smith, et al., 1993), ensuring thought sharing (Dugosh et al., 2005), carrying out activities that will strengthen attention, perception and comprehension (Jacobsen et all, 2016; Alloway et all, 2010; Meltzer and Basho, 2010; Meltzer, 2010), providing emotional stimulation to the learners and it is known that it occurs in various ways such as giving emotional support (Pureza, 2024) and so on. Due to the nature of this study, the cognitive stimulations used in the teaching process are clustered in behaviours that increase attention, perception and comprehension.

The physical arrangement of the learning environment is among the effective factors that contribute to the teaching process reaching the desired goals. The physical arrangement of the learning environment indicates that the space, materials and equipment used are arranged to support learning and that the resources used are designed to ensure student engagement at the highest level. In this context, the arrangement of light, temperature, seating comfort, background noise, visually

disturbing objects and other objects in the learning environment to support teaching is considered within the scope of physical arrangement (Hutchinson, 2003). Stewart and Evans (1997) associate the improvement of indoor conditions with the elimination of toxic conditions in the learning environment and recommend that to increase the expected performance, the physical appearance that will inhibit learning should be addressed first. This study in the context of organizing the learning environment, was based on the idea that improving the indoor conditions and making the school climate positive (Quinn et al., 2000) is a factor that will increase student engagement in the teaching process.

The fact that instructional tendencies are among the important factors that increase student engagement in the teaching process has contributed to this concept being within the scope of this study. Instructional tendencies refer to the presuppositions (Wilcox-Herzog and Ward, 2004), beliefs (Mansour, 2009; Yang et al., 2008; Jones and Carter, 2007; Ajzen, 2002), mechanisms (Maxwell et al., 2006), and behaviours (Ajzen, 2002, 2001; Pajares, 1992) that teachers use in directing and guiding the teaching process.

As can be seen, the relevant literature details various aspects of instructional tendencies. In this study, instructional tendencies were limited to "behaviours aimed at increasing student engagement in the teaching process" taking into account other variables in the study and the target audience. In this context, instructional tendencies have been accepted as teacher behaviours during the study such as "using areas of expertise in the process", "giving detailed explanations", "creating a reflective learning environment" and "adopting an assertive atmosphere during the process", etc.

1.2. Purpose and Research Objectives

The researcher conducted various courses in the field of educational sciences during the training of teacher candidates. He thought that the Teaching Principles and Methods course and Material Development courses would contribute to achieving the goals of this study. In this context, the researcher conducted his research design by centring these two courses.

In the preparation process, to determine the purpose of the study, the factors that most affect student engagement in the teaching process were discussed with teacher candidates during the courses. Discussions revealed that cognitive stimulation, physical arrangement of the learning environment, and teachers' instructional tendencies may be the factors that most influence learner engagement. Awareness of the subject contributed to shaping the purpose of this study.

In this context, the study aims to examine how cognitive stimulation, the physical arrangement of the learning environment and instructional tendency affect student engagement in the teaching process. Based on the purpose of the research, the following objectives have been achieved:

Through in-class observations and interviews;

1. To determine the cognitive stimuli that pre-service teachers use in the teaching process.
2. To determine the cognitive stimuli used by teacher candidates enrolled in pedagogical formation teacher training programs, in the teaching process.
3. To determine the physical design approaches of the learning environment that pre-service teachers use in the teaching process.
4. To determine the physical design approaches of the learning environment used by teacher candidates enrolled in pedagogical formation teacher training programs, in the teaching process.
5. To determine the instructional tendencies that pre-service teachers follow in the teaching process.
6. To determine the instructional tendencies followed by teacher candidates enrolled in pedagogical formation teacher training programs, in the teaching process.

2. Method

In this section, information about the design of this study, data collection and analysis procedures of the collected data are included.

2.1. Design and Participants

The qualitative research method was used in this study because it is an effective research method (Patton, 2014) to see a phenomenon from the perspective of individuals and to reveal the process and environment that caused them to acquire these perspectives. This study was designed to reveal how teacher candidates try to increase student engagement. To collect data, interviews were conducted with 15 teacher candidates in five branches and their practical presentations in the courses were observed. The design of the study was planned as shown in Table 1:

Table 1: Study Design

Sampling (1)				
Group One	Group Two	Group Three	Group Four	Group Five
Science	Classroom	Social Sciences	Sociology	Religion
Data Collection and Analysis (2)				
In-class Discussions (2a)		Observations (2b)	Interviews (2c)	
Content Analysis <i>frequencies</i>		Content Analysis <i>frequencies</i>	Thematic analysis <i>Major and sub-themes</i>	
Findings (3)				
Groups (1, 2, 3, 4, 5)				

Merging Results and Discussion (4)

Revealing similar and different aspects of the results (4a)

Making comparisons (4b)

Conclusion (5)

The participants of the study were determined by random selection from pre-service teachers and teacher candidates enrolled in pedagogic formation certificate programs (PFCP), who attended the Teaching Principles and Methods and Material Development courses conducted by the researcher. The study has five groups and study groups and their members were determined voluntarily. In the study, five groups were formed from five teaching programs. The imprint information of the groups is as follows:

- Group one: Includes *three* pre-service teachers enrolled in the *third grade* of the Science Teaching program of the faculty of education.
- Group two: Includes *four* pre-service teachers enrolled in the *third grade* of the classroom teaching program of the faculty of education.
- Group three: Includes *three* pre-service teachers enrolled in the *second grade* of the social sciences teaching program of the faculty.
- Group four: Includes *three* teacher candidates enrolled in the Sociology PFCP.
- Group five: Includes *two* teacher candidates enrolled in the Religion Studies PFCP.

2.2. Data Collection and Analysis

The data of this study were collected in the pre-COVID-19 period at the Suleyman Demirel University, Education Faculty. Before collecting the main data of the study, discussion sessions were held with the candidate teachers. In the discussions, the opinions and suggestions of the candidate teachers regarding the concepts included in the study were discussed. The main data were obtained from group interviews and observations. Observation data was gathered from the iterative presentations made by the participants in the study groups in the Teaching Principle and Methods and Material Development courses.

In-class discussions

At the beginning of the data collection process, and before observations and interviews, in-class discussions were held with the teacher candidates who attended the Teaching Principles and Methods, and Material Development courses. In the discussions, it was discussed what behaviours will be accepted in the context of student engagement and which factors could be more functional to increase student engagement in the teaching process. Engagement behaviours in the context of learner engagement in the discussions are determined as follows: *taking responsibility to speak, answering questions,*

demonstrating a willingness to participate in activities, passive participation by performing tasks, making suggestions for the learning process. Details of what behaviours the learners engaged in the learning setting were not included in the study. It was observed and evaluated whether they engaged or not and whether their level of engagement increased.

The topics and concepts that came to the fore in the discussions were listed in general and were not associated with the programmes that they were enrolled in. Teacher candidates' views regarding the activities to be carried out to increase student engagement in the Teaching Principles and Methods course are clustered on the following structure:

Cognitive stimulation: Adjusting the sources of stimulation: arranging the amount of light in the learning environment, arranging noise level, putting in order the stimulants, using auditory materials, using visual materials, providing emotional support, and paying attention to emotional expectations; *Enhancing attention:* playing word recalling a game, asking questions from the text, repetition of the sequence, creating word lists, and copying; *Enhancing perception:* talking about the sample image, giving verbal stimuli, photo and symbol matching, using graphic organisers, and identifying related sounds; *Improving comprehension:* asking short questions from a short reading text, sorting the concept list, matching appropriate words, solving short puzzles, and demonstrating model behaviour;

Sorts of the physical arrangement: Enriching and enlarging the learning environment, planning ahead, simplifying the learning setting, systematising the learning setting, providing flexibility, adjusting the setting, and rearranging the setting.

Types of Instructional Tendencies: Providing a connection between practice and theory, giving immediate feedback, sharing personal information, being an assertive teacher, being compassionate, friendly and sensitive nature, creating a responsive learning environment, demonstrating field expertise, connecting course topics with students' goals, giving clear explanations, using expertise, caring for learners' needs, explain in detail and connect learnings, being honest and following ethical and universal behavioural standards, showing concern for students' needs, showing assertive behaviours, creating a trustworthy climate, being a mentor, acting as a motivator, acting as a facilitator, leading the process as an autoreactive teacher, being a role model, being a reflective teacher, and being a didactic teaching expert.

The concepts and teacher behaviours that came to the fore in the discussions were studied in detail by the researcher, and it was decided to eliminate some of them and include the remaining ones in the observation forms.

Observations

The observations were carried out to examine the teaching practices and group activities of the teacher candidates. Observations were made about “how the pre-service teachers gave cognitive stimuli in the teaching process”, “how they made the physical design of the teaching environment” and “how they reflected their instructional tendencies to the teaching process”. A form was developed for structured observations and notes were engraved on the form as frequencies.

Interviews

Interviews were conducted with semi-structured interview forms, as secondary sources to fulfil the research objectives. Questions have been chosen to allow the interviewer to ask participants to expand on comments or offer clarification where participants have queries. The interview questions are as follows:

1. How do you regulate cognitive stimuli to ensure learners’ engagement in the teaching process?

Prompt: How do you make the classroom ready to interact?

2. What do you pay attention to in the physical design of the learning environment to increase student engagement?

Prompt: Do you have an approach to the physical design of the learning environment?

3. How do you manage your instructional tendency to ensure learners’ engagement in the teaching process?

Prompt: In your opinion, what tendencies should teachers have to increase student engagement in the teaching process?

Prompt: Which teaching roles can be more effective in the teaching process to increase student engagement?

3. Findings

The data collected in the study were primarily analysed according to the fields of the teacher candidates. The findings of the interviews made in each group and the findings obtained from the interviews were compared and discussed. Findings of the groups are presented in separate tables and the first number in parentheses indicates observation, and the second number indicates interview findings. Numbers in the parentheses in the texts indicate the frequency of the relevant behaviour.

Group One: Science Teaching Candidates

To collect data from the first group of the study, firstly, presentations made by *three* candidates enrolled in the third-grade Science teacher training program in the *Teaching Principles and Methods* course were observed. Secondly, interviews were conducted with

the same group of students on separate dates. Findings of the observation and interview data are shown in Table 2:

Table 2: Behaviours of Science Teaching Candidates Based on Observation and Interview Data

Sub-themes	Behaviours			
Sources of cognitive stimulation	<i>Adjusting the sources of stimulation</i>	<i>Improving comprehension</i>	<i>Enhancing attention</i>	<i>Enhancing perception</i>
	<ul style="list-style-type: none"> • Using auditory materials (1, 2) • Using visual materials (3, 3) 	<ul style="list-style-type: none"> • Sorting the concept list (1,2) • Asking short questions from a short reading text (2, 2) • Matching appropriate words (0, 2) 	<ul style="list-style-type: none"> • Asking questions from the text (2, 3) • Playing word recalling game (1, 2) • Creating a word list (2, 2) • Copying (1, 3) 	<ul style="list-style-type: none"> • Talking about sample image (3, 2) • Giving verbal stimuli (2, 3) • Identifying related sounds (1, 2) • Photo and symbol matching (2, 2)
Sorts of the physical arrangement	<ul style="list-style-type: none"> • Planning ahead (1, 1) • Systematising the learning setting (1, 1) • Rearranging the setting (1, 2) • Adjusting the setting (1, 1) 			
Instructional tendencies	<ul style="list-style-type: none"> • Providing a connection between practice and theory (2, 3) • Creating a responsive learning environment (3, 3) • Giving clear explanations (2, 3) • Explain in detail and connect previous learnings (2, 2) • Being assertive (1, 2) • Using expertise (1, 3) 			
Teaching roles	<ul style="list-style-type: none"> • Leading the process (2, 3) • Being a role model (1, 1) • Being a didactic teaching expert (3, 2) 			

As seen in Table 2, interview and observation findings regarding the behaviours exhibited by candidate teachers enrolled in the Science teacher training program to increase student engagement are similar. Observation findings show that Science teaching candidates exhibit fewer behaviours in classroom activities than they expressed in interviews. The lectures of candidates were observed and it was seen that they tended to use mostly visual (3) and audial (1) materials to increase student engagement, and that they used photographs (3) and videos (3) as cognitive stimuli while delivering Teaching Principles and Methods courses. In the interviews, teacher candidates stated that they asked questions from a short reading text to enhance attention (2), used word list-creating activities to improve comprehension (1) and talked about sample photographs for enhancing perception (3). It was observed that the cognitive stimuli used increased learner engagement in lectures at a satisfactory level. It was also observed that in some courses, participating students became voluntarily active in teaching the subjects, and taking responsibility for the learning process became automatic. Science1: *“I think the best way to increase student engagement is to strengthen their perceptions, for*

this, I show the students a photo I have chosen regarding the subject and let them comment on it.” Science 3: *“To maximize comprehension in the Teaching Principles and Methods course, I present a list of words related to the subject from my field, science, and increase student engagement by playing short games and puzzles with the words in this list.”*

The observations revealed that science teacher candidates were simplifying the learning setting (3) and rearranging the setting (1) in the learning environment. While all of the teacher candidates stated that they tried to free the learning environment from distracting factors as much as possible to maximize student engagement in the interviews, one of them stated that he grouped student tables while teaching theoretical and practical subjects in the classroom. Candidate coded Science2 gave the following example on the subject: *“Our field does not actually allow changing the classroom order much, but to increase the permanence of newly learned subjects and support student engagement, I sometimes make groups and include our students who I observe to be less active in the process.”*

Observation findings on instructional tendencies show that Science teacher candidates act teacher-oriented and use previous learning to strengthen learning. Teacher candidates demonstrated the behaviours of "providing a connection between practice and theory" (2) and "creating a responsive learning environment" (3) in the lessons. In the interviews, Science teacher candidates stated that they used their "field expertise" (3) as much as possible and "made understandable explanations" for the learners (3). It has been observed that the teaching behaviours demonstrated by Science candidate teachers meet the participating students' expectations regarding the combination of theory and practice and contribute to increasing learner engagement. Science 1: *“Our field requires that the subjects be taught in a way that is as comprehensible as possible.”* Science 3 *“A science teacher's use of his/her field expertise in the teaching process will both increase students' motivation for the course and increase student engagement to the highest level.”*

It has been observed that Science teacher candidates act like "didactic teaching experts" (3) in lessons and have a tendency to direct the teaching process like a role model (1) and leader (2). Interview findings support observation findings. Interestingly, in the observations, it was seen that all three teacher candidates acted as "didactic teaching experts", but only two of them emphasized it in the interviews. Observation and interview findings have shown that Science teacher candidates tend to behave mostly teacher-centred management to increase student engagement in the teaching process, diversify cognitive stimuli as much as possible and emphasize their field expertise in the teaching process.

Group Two: Classroom Teaching Candidates

To collect data from the second group of the study, firstly, presentations made by four candidates enrolled in the third-grade Classroom teacher training program in the

Teaching Principles and Methods course were observed. Secondly, interviews were conducted with the same group of students on separate dates. Findings of the observation and interview data are shown in Table 3:

Table 3: Behaviours of Classroom Teaching Candidates Based on Observation and Interview Data

Sub-themes	Behaviours			
Sources of cognitive stimulation	<i>Adjusting the sources of stimulation</i>	<i>Improving comprehension</i>	<i>Enhancing attention</i>	<i>Enhancing perception</i>
	<ul style="list-style-type: none"> • Arranging light conditions (1, 2) • Using auditory materials (2, 3) • Using visual materials (4, 4) • Providing emotional support (2, 2) 	<ul style="list-style-type: none"> • Asking short questions from a short reading text (2, 3) • Matching appropriate words (1, 3) • Demonstrating model behaviour (3, 3) 	<ul style="list-style-type: none"> • Repetition of the sequence (2, 3) • Copying (3, 3) • Creating a word list (2, 3) 	<ul style="list-style-type: none"> • Giving verbal stimuli (4, 4) • Photo and symbol matching (3, 3) • Using graphic organisers (2, 2) • Talking about sample image (3, 4)
Sorts of the physical arrangement	<ul style="list-style-type: none"> • Enlarging the learning environment (1, 2) • Enriching the learning environment (0, 2) • Providing flexibility (4, 4) • Rearranging the setting (1, 3) 			
Instructional tendencies	<ul style="list-style-type: none"> • Creating a responsive learning environment (3, 4) • Creating a trustworthy learning atmosphere (climate) (2, 3) • Explain in detail and connect previous learnings (4, 4) • Giving clear explanations (3, 4) • Caring for learners' needs (3, 3) 			
Teaching roles	<ul style="list-style-type: none"> • Being facilitator (1, 2) • Leading the process (4, 4) • Being a role model (2, 3) • Being a motivator (2, 2) 			

Observation findings in Table 3 show that teacher candidates registered in the Classroom teacher training program provide high levels of cognitive stimulation during the teaching process. Interview transcripts of teachers in this group support the observation findings. It has been observed that candidate classroom teachers frequently use visual materials as a source of cognitive stimulation during their lessons (4). In addition to visual and audio materials, candidate classroom teachers also exhibited "providing emotional support" as a cognitive stimulus. Both observation and interview findings indicate that candidate classroom teachers engage in "copying" (3) to enhance attention; They stated that they used "giving verbal stimuli" (4) and "photo and symbol matching" (3) to enhance perception; It has been shown that they also exhibit "demonstrating model behaviour" (3) for improving comprehension. It has been observed that the cognitive stimuli used by candidate classroom teachers in the teaching process increase the active participation of learners. Regarding the subject, the candidate teacher with the code Classroom2 said, "Our field requires involving students in the learning process as much as possible. That's why I find it important to provide emotional support

to students.”. While the candidate teacher coded Classroom1 said, *“As a classroom teacher, I think that the more verbal stimuli we give students, the more we can involve them in the process.”*. Based on these findings, it can be said that the views of the candidate classroom teachers regarding the activities they carry out to increase student engagement in the teaching process are consistent with the observations. This finding suggests that classroom teacher candidates are willing and able to provide cognitive stimulation during the teaching process.

Observations show that candidate classroom teachers exhibit "providing flexibility" (4) in the learning environment as much as possible to increase student engagement. This finding is consistent with the interview data. In the interviews, candidate classroom teachers stated that in addition to making the learning environment flexible, they also "rearranged the setting" (3) and "enlarged the learning environment" (2). The candidate teacher coded Classroom3 said, *“I think we need to provide flexibility in the classroom if we want students to be more active. For this, we must take student needs into consideration,”* he said, emphasizing the importance of "providing flexibility". According to Classroom2, *“enriching the learning environment is an important requirement for motivating students”*.

In the context of instructional tendencies, it can be said that the observation and interview findings of candidate classroom teachers support each other. Candidate classroom teachers who exhibit the behaviours of "giving clear explanations" (3-4), "explaining in detail and connecting previous learnings" (4), and "creating a responsive learning environment" (3-4) to increase student engagement may perhaps be more interested in the field. They exhibited the behaviour of "caring for learners' needs" (3) with a sensitivity that can be considered unique. It has been observed that the instructional tendencies of candidate classroom teachers have an impact on learners in lessons and increase engagement. Another striking finding in this regard is that the behaviours of candidate classroom teachers are compatible with the learning environment and the expectations of the learners. It was observed that this situation had an impact on the increase in the engagement level of the participating students. The candidate teachers coded Classroom4 said: *“First of all, I try to understand what my students feel in the process. If I can make the learning process meaningful for my students, I can make them more active,”*. Classroom3 said: *“I think creating a climate of trust in the classroom comes first. In this way, we can ensure an all-round positive interaction. This will support greater student engagement.”*

Observations show that candidate classroom teachers mostly embrace leading the learning process (4), while on the other hand, they also attach importance to being role models (2) and acting as motivators. Interview findings support this situation. The candidate classroom teacher coded Classroom2 emphasized that *“the teacher should be active in the learning process, as well as acting as a facilitator and supporting students in*

shaping their own learning.". Classroom4 also said: "Classroom teachers are models more than anything else. Therefore, we must act as role models in the teaching process so that students can actively participate and exhibit the desired behaviours without wasting time."

Both observation and interview findings indicate that candidate classroom teachers act both teacher- and student-oriented. Candidate classroom teachers find it important to provide emotional support, provide flexibility in the classroom environment, give examples in detail, relate learning topics to previous learning, and care about students' needs to increase student engagement in the teaching process.

Group Three: Social Sciences Teaching Candidates

To collect data from the third group of the study, firstly, presentations made by three candidates enrolled in the second-grade Social Sciences teacher training program in the Teaching Principles and Methods course were observed. Secondly, interviews were conducted with the same group of students on separate dates. Findings of the observation and interview data are shown in Table 4:

Table 4: Behaviours of Social Sciences Teaching Candidates Based on Observation and Interview Data

Sub-themes	Behaviours			
Sources of cognitive stimulation	<i>Adjusting the sources of stimulation</i>	<i>Improving comprehension</i>	<i>Enhancing attention</i>	<i>Enhancing perception</i>
	<ul style="list-style-type: none"> • Using auditory materials (1, 1) • Using visual materials (2, 3) 	<ul style="list-style-type: none"> • Sorting the concept list (1, 2) • Solving short puzzles (1, 2) • Demonstrating model behaviour (0, 2) 	<ul style="list-style-type: none"> • Playing word recalling game (1, 2) • Asking questions from the text (2, 2) • Copying (0, 1) 	<ul style="list-style-type: none"> • Photo and symbol matching (1, 1) • Using graphic organisers (1, 2) • Giving verbal stimuli (1, 3)
Sorts of the physical arrangement	<ul style="list-style-type: none"> • Simplifying the learning setting (1, 3) • Providing flexibility (1, 2) • Adjusting the setting (0, 1) 			
Instructional tendencies	<ul style="list-style-type: none"> • Creating a responsive learning environment (1, 2) • Using expertise (2, 3) • Explain in detail and connect previous learnings (1, 1) • Being assertive (1, 2) 			
Teaching roles	<ul style="list-style-type: none"> • Being a reflective professional (0, 1) • Being a role model (0, 1) • Being a motivator (2, 1) 			

The findings in Table 4 show that the observation and interview findings regarding teacher candidates enrolled in the Social Sciences teacher training program differ slightly. Observations show that candidate social studies teachers prefer auditory (1) and visual (2) materials as a source of cognitive stimulation. In the interviews conducted on the subject, social studies candidate teachers asked questions from a short reading text to

enhance attention (2); they showed model behaviour for improving comprehension (2) and solved short puzzles (2); they also stated that they gave verbal stimuli to enhance perception (3). It has been observed that the behaviours exhibited by Social Sciences candidate teachers as cognitive stimulation are sufficient for learner engagement and contribute to the learners' being active in the lessons. The candidate teacher coded SS3 said: *"I try to keep the students' interest alive and activate them in the learning process by using visual materials as much as possible."* The candidate teacher coded SS2 expressed a different opinion on this issue: *"Social sciences are related to narrative art in a way, and I think verbal stimuli are necessary for active engagement."* Observations showed that Social Science candidate teachers preferred "simplifying the learning setting" (1) and providing flexibility (1) in organizing the learning environment. In the interviews, candidate teachers stated that the social studies course would need a simplified learning environment. It has been observed that this idea has a response in learners. It was observed that the students attending the classes responded positively to the arrangement of the learning environment in this way and their participation in the classes increased. The candidate teacher coded SS1 said, *"I do not impose any strict rules on the learning environment in my lessons. I try to shape the learning environment according to the subject I teach and the expectations of the students."* SS3 said, *"If we want to achieve the desired level of success, it would be good to first try to adjust the learning environment according to the objectives of the course. I try to adapt it as much as possible in my own lessons. This way, students become more active."*

Observation findings on instructional tendencies have shown that Social Science teacher training program students tend to demonstrate their field expertise (2) and tend to be assertive (1). Contrary to the researcher's expectations, Social Sciences candidate teachers' behaviour in this way did not hinder the learning process and increased student engagement. It was evaluated that this situation may be a field-specific reaction. Interview findings support this. Candidate teacher coded SS2 said, *"I try to create a learning environment that is as responsive as possible in the lessons. In this way, I can increase the engagement of my students"*. The candidate teacher coded SS3 said, *"Our field requires expertise. We need to keep both our curriculum and our field knowledge up to date. The more I show my expertise, the more motivated my students become"*. Observations show that Social Sciences teacher candidates act as motivation enhancers (2). In the interviews, candidate teachers stated that they acted as role models (1) and reflective professionals (1) in the lessons. The candidate teacher coded SS2 said, *"I set an example for my students with the behaviours I display in my classes and in this way, I encourage them to be inclined towards social science subjects."*

Both observation and interview findings indicate that candidate Social Science teachers act teacher-centred and provide flexibility in the learning environment, use their expertise, relate learning topics to previous learning, and be a motivator to increase student engagement in the teaching process.

Group Four: Sociology Pedagogical Formation Teaching Candidates

To collect data from the fourth group of the study, firstly, presentations made by three candidates enrolled in the Sociology pedagogical formation certificate program (PFCP) in the educational Material Development course were observed. Secondly, interviews were conducted with the same group of candidates after the presentations. Findings of the observation and interview data are shown in Table 5:

Table 5: Behaviours of Sociology PFCP Candidates Based on Observation and Interview Data

Sub-themes	Behaviours			
Sources of cognitive stimulation	<i>Adjusting the sources of stimulation</i>	<i>Improving comprehension</i>	<i>Enhancing attention</i>	<i>Enhancing perception</i>
	<ul style="list-style-type: none"> • Using visual materials (1, 2) • Using auditory materials (3, 3) 	<ul style="list-style-type: none"> • Asking short questions from a short reading text (1, 1) • Sorting the concept list (1, 1) • Solving short puzzles (0, 1) 	<ul style="list-style-type: none"> • Asking questions from the text (1, 1) • Creating a word list (0, 2) 	<ul style="list-style-type: none"> • Giving verbal stimuli (2, 3) • Talking about the image (2, 2) • Using graphic organisers (1, 2)
Sorts of the physical arrangement	<ul style="list-style-type: none"> • Planning ahead (0, 1) • Systematising the learning setting (0, 1) • Rearranging the setting (1, 1) 			
Instructional tendencies	<ul style="list-style-type: none"> • Explain in detail and connect previous learnings (1, 2) • Giving clear explanations (1, 2) • Using expertise (2, 3) 			
Teaching roles	<ul style="list-style-type: none"> • Leading the process (1, 2) • Being a reflective professional (0, 1) • Being a role model (0, 1) 			

Table 5 shows that there is a difference between the interview findings and observation findings regarding the behaviours exhibited by teacher candidates registered in the Sociology PFCP to increase student engagement and that the candidate teachers exhibited fewer behaviours in classroom activities than they expressed in the interviews. The lessons of Sociology PFCP candidates were observed and it was observed that they tended to use mostly visual (3) and audio (1) materials to increase student engagement, and they used photographs (3) and videos (2) as cognitive stimuli while delivering Material Development courses. It has been observed that candidate teachers' use of photographs and videos as cognitive stimuli helps them get off to a good start in lessons, attracts learners' attention, and helps them take the floor in class.

In the interviews on the subject, candidate teachers stated that they asked questions from a short reading text for attention enhancement (1) and created a word list (2); they did concept development activities to improve comprehension (1); and they stated that they gave verbal stimuli for perception enhancement (3), used graphic organisers (2) and talked about sample photographs (2). Candidate teachers' opinions on the subject are as follows: *"Our field mostly requires giving verbal stimuli to activate students. I try to do*

this in the learning process as well” Sociology1. *“We carry out concept development activities to keep students’ attention. “They both like these activities and attend classes more.”* Sociology3.

Observations revealed that Sociology PFCP teacher candidates were rearranging the setting (1) on the learning environment. In this group, interview findings and observation findings differ. Candidate teachers stated in the interviews that they did both planning ahead (1) and systematizing the learning setting (1). It was observed that the changes made in the teaching environment caused an increase in the engagement level of participating students. Teachers' systematisation of the learning setting motivated students more. Regarding the subject, the teacher candidate coded Sociology 2 stated the following: *“I think that the learning environment should be rearranged to ensure student engagement at the highest level. For this purpose, in addition to using attention-enhancing materials, I have students work collaboratively by grouping their desks.”*

Observation findings on instructional tendencies show that Sociology PFCP candidate teachers demonstrate their field expertise (3) during the teaching process; (2) shows that they establish connections between previous learning and newly learned topics. It is difficult to say that the teaching tendencies of sociology candidate teachers are shaped according to the demands of the learners. Candidate teachers mostly tried to highlight their own expertise, which contributed to the passive participation of the learners. Interview findings support classroom observations: *“Sociology is a field that expresses itself with concepts. Therefore, I try to explain the concepts in detail and with examples as much as possible to increase understanding and student engagement.”* Sociology1; *“My field requires expertise and I have to demonstrate this in my classes. When I do this, I observe that students show more participation.”* Sociology3.

It has been observed that Sociology PFCP candidates teach teacher-oriented lessons and adopt leadership in the teaching process (2). Interview findings revealed that teacher candidates tended to be role models (1) in the teaching process and taught as reflective professionals (1). Selected statements on the subject are as follows: *“For learning to occur, I need to guide and manage the process. Otherwise, it becomes difficult to participate.”* Sociology1. Observation and interview findings show that Sociology PFCP teacher candidates provide concept-oriented teaching, tend to lead the teaching process and try to increase student engagement by diversifying cognitive stimuli. It cannot be said that the behaviours displayed by Sociology candidate teachers during the teaching process are highly successful in increasing student engagement. The efforts made mostly contributed to passive participation in the learners.

Group Five: Religion Pedagogical Formation Teaching Candidates

To collect data from the fifth group of the study, firstly, presentations made by two candidates enrolled in the Religion pedagogical formation certificate program in the educational Material Development course were observed. Secondly, interviews were

conducted with the same group of candidates after the presentations. Findings of the observation and interview data are shown in Table 6:

Table 6: Behaviours of Religion PFCP Candidates Based on Observation and Interview Data

Sub-themes	Behaviours			
Sources of cognitive stimulation	<i>Adjusting the sources of stimulation</i>	<i>Improving comprehension</i>	<i>Enhancing attention</i>	<i>Enhancing perception</i>
	<ul style="list-style-type: none"> • Using auditory materials (2, 2) • Providing emotional support (1, 1) • Using visual materials (2, 2) 	<ul style="list-style-type: none"> • Matching appropriate words (2, 2) • Demonstrating model behaviour (1, 2) 	<ul style="list-style-type: none"> • Playing word recalling game (1, 1) • Repetition of the sequence (2, 2) • Copying (2, 2) • Asking questions from the text (2, 2) 	<ul style="list-style-type: none"> • Talking about the sample image (1, 2) • Giving verbal stimuli (2, 2) • Identifying related sounds (1, 1)
Sorts of the physical arrangement	<ul style="list-style-type: none"> • Simplifying the learning setting (1, 2) • Providing flexibility (1, 2) • Adjusting the setting (0, 1) 			
Instructional tendencies	<ul style="list-style-type: none"> • Giving clear explanations (1, 1) • Being assertive (2, 2) • Explain in detail and connect previous learnings (1, 2) • Using expertise (2, 2) 			
Teaching roles	<ul style="list-style-type: none"> • Being a motivator (1, 1) • Being a didactic teaching expert (2, 2) • Being a reflective professional (1, 2) • Leading the process (2, 2) 			

Table 6 shows that interview findings and observation findings support each other regarding the behaviours exhibited by Religion PFCP registered teacher candidates to increase student engagement. Religion PFCP candidates' Material Development lessons were observed and it was observed that they tend to use mostly visual (2) and audio (2) materials as well as providing emotional support (1) to increase student engagement. Observations revealed that learners in the Religion course responded more to visual stimuli, and they also paid attention to verbal stimuli in activities that required repetition. In the interviews on the subject, candidate teachers stated that they did verbatim copying (2) and repetition of the sequence (2) activities to enhance attention; showing model behaviour for improving comprehension (1); They stated that they talked about the sample photo (2) and gave verbal stimuli (2) for perception enhancement. Religion1: *“As a teacher of religious culture and ethics, I often do repetition activities that students enjoy.”* Religion2: *“The materials we work on allow us to make exact copies. “Students become more active in classes thanks to this activity.”*

In the observations made, it was seen that Religion teacher candidates were simplifying the learning setting (1) and rearranging the setting (1) in the learning environment. Although the learners generally did not need any changes in the learning environment, it was observed that they preferred flexibility.

Teacher candidates stated that they tried to clear the learning environment from distracting factors as much as possible to maximize student engagement in the interviews (2). Observations on instructional tendencies show that Religion PFCP candidates use their field expertise (2), act assertively (2) to make students active in the process, make difficult-to-understand topics understandable by making detailed explanations (1), and establish a connection between previous learning and new ones (1). It has been observed that the behaviours and instructional tendencies of candidate teachers in lessons are shaped according to the expectations of the learners. In this context, it can be said that candidate Religion teachers adapted their instructional tendencies to increase student engagement. Interview findings are parallel to observation findings. Sample statements on the subject are as follows: *“We have to use our field expertise. Students observe how well we master the subject, and if we are confident, they participate more in the lesson.”* Religion2; *“It requires making detailed explanations on religious issues. Students also ask questions where they do not understand anyway”* Religion1.

In Material Development courses, it was observed that Religion PFCP candidates, in addition to their tendency to direct the teaching process (2) and “being a didactic teaching expert” (2), also acted as “being a motivator” (1) and “being a reflective professional”. Similar findings were obtained in the interviews. Candidate teacher coded Religion1 said: *“Sometimes I turn into a motivation booster and sometimes into a didactic teacher where I*

use my field expertise extensively. In both cases, I see increased participation from my students”; Religion2 said: “I act as a reflective professional. I explain the topics both subjectively and objectively, and I try to contribute to the students' self-identification by adding my feelings and expectations to the narrative. In this way, their engagement increases further.”

Observation and interview findings reveal that Religion PFCP teacher candidates tend to exhibit both student-oriented and teacher-oriented management to increase student engagement in the teaching process, diversify cognitive stimuli as much as possible, and attach importance to simplifying and flexible the learning environment; showed that they emphasized their field expertise in the teaching process. It can be said that these efforts of candidate teachers contribute to increasing the active engagement of learners.

4. Results and Discussion

Observation results revealed that all candidate teachers used audio and visual materials as a source of cognitive stimulation in the teaching process, and additionally, classroom and religious teachers offered emotional support to students. Among the groups, it was observed that only the classroom teacher candidates adjusted the light level in the learning environment. While 9 of the teachers who participated in the interview stated that they used audio materials, 15 stated that they used visual materials and 3 of them stated that they provided emotional support to the learners. Observations have shown that the majority of participants in classrooms respond positively to visual stimuli, become active in the learning process, and are willing to take responsibility for learning.

The cognitive stimuli presented during the teaching process were clustered into three groups: enhancing attention, enhancing perception and improving comprehension. Candidate teachers stated that they mostly did copying (9), asking questions from text (8) and creating word list (7) activities to enhance attention. Giving verbal stimuli (15) and talking about the sample image (10) stood out as the most frequently used stimuli for enhancing perception. For improving comprehension, candidate teachers used matching appropriate words (7), demonstrating model behaviour (7) and asking short questions from a short reading text (6) activity.

Regarding cognitive stimulation, it has been observed that candidates in the Classroom and Science teaching fields diversify cognitive stimulation more than others. Candidates in the field of Sociology are the least stimulating group among the groups. If we accept classroom teaching as a multidimensional field, it can be said that candidates in numerical sciences diversify stimuli more than candidates in verbal sciences.

- If the teacher candidates use a variety of cognitive stimulates, it leads the learners to become more willing and the multifaceted interaction increases.

- Most of the candidates tended to ignore emotional factors during the process.

There were major differences between observation findings and interview findings regarding the physical arrangement of the learning environment. While observations show that teacher candidates mostly simplify the learning setting and provide flexibility, in the interviews, the teacher candidates emphasised these behaviours: rearranging the setting (6), providing flexibility (8), simplifying the learning setting (5), adjusting the setting (3), systematizing the learning setting (2), enriching the environment (2), planning ahead (2) and enlarging (2). The difference between observation and interview findings suggests that it points to the candidate teachers' expectations regarding ideal arrangements. Even though they did not show these behaviours during the observations, it gave the impression that they would make these arrangements in their classes as assigned teachers.

The view put forward by the candidate teachers in the study is that the arrangements to be made in the learning environment are aimed at taking into account the expectations of the students and the characteristics of the learning subject. Lippman (2010) also emphasizes that stakeholders' opinions such as teachers, student parents, administrators and students should be considered holistically in organizing the learning environment. On the other hand, increasing student engagement by eliminating negative features in the environment (Cummings, 2000; Daniels, 1998; Stewart and Evans, 1997) is also among the emphasized opinions. In this context, candidate teachers' emphasis on behaviours such as "adjusting the setting", "rearranging the setting" and "simplifying the setting" to organise the learning environment and their efforts to reduce students' anxiety and increase their engagement (Weinstein and Mignano, 2003; Hutchinson, 2003) show that their awareness on the subject is high. The study revealed that arrangements in the learning environment contribute to changing student behaviour (Matai and Matai, 2007) and ensuring active student engagement, supporting the view that organizing the learning environment and student engagement should be considered together.

- Based on the interviews, it was seen that almost all teacher candidates believe that well-established classroom routines and student expectations were very important.
- According to teacher candidates, designing the learning environment in a flexible and adjustable way during the teaching process will increase student engagement by contributing to social interaction among learners, group work and automation of learning.
- Teacher candidates believe that learning and teaching materials should be easily visible and accessible to learners and access to the resources within their classroom affects the overall management of learners. Besides, teacher candidates

to strengthen learner engagement, offered to assign the students to assist with handing out materials to avoid any congestion during transitions.

It has been observed that candidates in Classroom teaching fields make more arrangements regarding physical arrangement than candidates in other fields. It can be said that the expectations of the target audience of classroom teachers may be effective in this. In addition, it was evaluated that Religion candidate teachers were keen on physical arrangement, and the persuasive nature of their fields had an impact on this.

Similarities were observed between the behaviours of the teacher candidates regarding instructional tendencies in the lessons and their statements in the interviews. In this context, it can be said that the issue in which observation and interview findings support each other the most is instructional tendencies. Observations have shown that candidate teachers attach the most importance to the teaching process by using their field expertise, being assertive, and making connections between subjects. Participants stated that they showed explaining in detail and connecting previous learnings (11) and using expertise (11) behaviours during the interviews. Following these, they stated that they exhibited the behaviours of giving clear explanations (10), creating a responsive (9) learning environment and being assertive (6).

In the study, it was seen that teacher candidates thought that diversifying their behaviours would increase their effectiveness in the teaching process, and as a result, they thought that they would increase student engagement. Reeve and Lee's (2014) and Kini and Podolsky's (2016) findings show that these thoughts of teachers are realistic at the beginning or in the first years of their professional lives. Regardless of the field difference, it has been observed that the in-class behaviours of candidate teachers increase student engagement. It is possible to explain this situation by ensuring harmony between learner expectations and the instructional efforts of candidate teachers. In this study, which is quite broad in scope, it can be said that the tendencies and behaviours of candidate teachers lead to the following effects on learners: causing changes in students' attitudes (Reeve and Tseng, 2011; Teo and Lee, 2010; Faulkner-Schneider, 2005, Schraw and Olafson, 2002), meeting expectations (Koestner and Levine, 2023; Kallery, et al, 2009; Tsai, 2002); contributing to the positive interaction between learner and teacher (Reeve and Tseng, 2011; Hamre and Pianta, 2006) encouraging critical thinking (Wei and Hu, 2018); and increasing autonomy, motivation and self-determination (Reeve, 2022, 2016, 2013; Ryan and Deci, 2020, 2017).

- Observation results revealed that learner-centred teaching increased student engagement and contributed to the increase in awareness levels for the acquisition of achievement.
- Unlike the pre-service Classroom teacher training program candidates, other candidates who enrolled Pedagogic Formation Certificate Program would like to

put themselves at the centre of the teaching process and they wanted to conduct teacher-oriented instruction.

- Almost all candidates preferred to be the centre of the multifaceted interaction process and tended to be an authority.

Differences have been observed between teaching fields regarding instructional tendency. While only Science candidate teachers showed the Providing a connection between practice and theory behaviour, others except classroom teachers showed the using expertise behaviour. On the other hand, it was concluded that only classroom teachers showed the behaviours of creating a trustworthy climate and caring for learners' needs. It was concluded that classroom teachers are more inclined to provide student-oriented teaching than candidates in other fields.

Observations have shown that teacher candidates mostly try to conduct a teacher-centred education. The fact that the candidates stated in the interviews that they took on the roles of leading the teaching process (11), being a role model (6) and being a didactic teaching expert (4), respectively, shows that they placed themselves at the centre of the teaching process, consistent with the observation findings. Similarly, Reeve et al, (2004), Reeve et al., (2019) and Jang et al. (2010) state that teachers creating harmony while determining the focus of the teaching process is a factor that increases student engagement.

It has been concluded that there is no difference between the candidates registered in the pedagogic formation certificate program and those registered in the teaching programs of the faculty of education regarding teaching roles, except for classroom teachers. It has been thought that the differences between classroom teachers in their teaching roles are related to the target audience with whom they will carry out the teaching process.

5. Conclusions

In this study, observing the following behaviours was deemed sufficient for student engagement: taking responsibility to speak, answering questions, demonstrating a willingness to participate in activities, passive participation by performing tasks, and making suggestions for the learning process. Therefore, the study examined which teacher behaviours increased learner engagement rather than the details of how students participated in the teaching process. The results showed that to increase student engagement in the teaching process, candidate teachers attach importance to providing cognitive stimulation, making physical arrangements of the classroom, diversifying instructional behaviours and taking on different teacher roles.

Candidate teachers use visual stimuli more than audial stimuli to increase learner engagement in the teaching process. One of the prominent results is that they present

cognitive stimuli to achieve the three targets such as increasing attention, perception and comprehension. In organising the learning environment, candidate teachers generally followed methods such as facilitating, simplifying, and adjusting the learning setting. Demonstrating expertise, being assertive, giving detailed information and associating with previous knowledge during the teaching process show that candidate teachers carefully comply with the requirements of the teacher training programs

While observation and interview results of Science, Classroom and Religion candidate teachers support each other, differentiation was observed in Social Sciences and Sociology candidate teachers. Further studies are recommended to uncover possible sources of this result.

Declaration of Conflicting Interests and Ethics

The author declares no conflict of interest.

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