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## **The Analysis of the Relationship between Humor Styles of Counselor Candidates and Their Skills of Coping Through Humor and Problem-Solving**

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Fatih Sultan Mehmet Vakıf University

### **Abstract**

The aim of this research is to analyze the relationship between the humor styles of counselor candidates and their skills of coping through humor and problem-solving. Relational screening model, which is one of the quantitative research methods, was used in the research. The sample of the research consists of 232 students studying in the Guidance and Counseling program at foundation universities in Istanbul. The sample of the study was obtained by convenience sampling, one of the methods of non-random sampling methods. The data of the research was collected with the Personal Information Form, Humor Styles Questionnaire, Coping Humor Scale and Problem-Solving Inventory. The obtained data were analyzed through SPSS 21.0 program using t-test, ANOVA and Pearson product-moment correlation analysis techniques. It is seen that counselor candidates show coping behavior through humor in case of any problem. Counselor candidates mostly use affiliative humor style, followed by self-enhancing, self-defeating and aggressive humor styles, respectively. According to the data of the research, there is a low level, negative and insignificant relationship between humor styles and problem-solving; a moderate, positive and significant relationship between humor styles and coping through humor; and a low, negative and significant relationship between coping through humor and problem-solving.

**Keywords:** Coping Through Humor, Humor, Humor Styles, Problem-Solving, Psychological Counselor

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## INTRODUCTION

The profession of psychological counseling has an important place among the types of professions that provide assistance services. Psychological counselors are recognized by society as professionals who help individuals to achieve effective adaptation. Psychological counseling, on the other hand, is a planned assistance process offered to individuals to help them find solutions to the problems they experience in cognitive, affective and behavioral areas or to support them in the skills they want to develop, taking into account their developmental processes.

According to the definition of American Counseling Association, counseling is a professional relationship that empowers diverse individuals, families, and groups to accomplish mental health, wellness, education, and career goals (ACA, 2022). The profession of counseling is a service offered so that “others” can live more productively and efficiently, exhibit more sufficient problem-solving skills at decision moments, and cope more easily with difficulties and distortions in their lives. Counselors are the ones who meet these countless expectations of people (Warnath, 1979).

It is an inevitable result that counselors experience emotional burnout while showing interest and compassion to others. When there are too many cases, trying to show the same attention and care to all of them can cause counselors to have emotional exhaustion, develop the desire to keep themselves away from others, and to feel that they cannot cope with the problems of others (Burnard, 1999). Swezey (2013) stated that those who work in the helping profession often work with individuals who are in despair, have traumatic stories, and experience situations of crisis, and that in this process they have to establish relationships that require empathy, attachment and separation. For this reason, they are faced with the risk of professional burnout and weakening in the quality of their lives. It is also emphasized that professionals who work face-to-face with people face symptoms of burnout and stress (Schutte et al., 2000).

The relationships that counselors form with people for a long time significantly affect their personal, social and professional lives due to the emotional load of their work (Maslach & Jackson, 1981; Swezey, 2013). Individuals use humor so that they can get away from stressful or problematic situations (Lefcourt, 2001; Martin et al., 1993), and in this way, they can contribute to their own physical and psychological well-being (Martin, 2001). The use of humor as a coping mechanism has been found to be effective in reducing the impact of stressful situations (Bennett & Lengacher, 2006). Galloway and Cropley (1999) said that people with a high level of humor exhibit stronger resistance to psychological disorders in stressful situations. In another study, it is emphasized that one of the most important roles of humor in coping with stress is to prevent the person from feeling that he has lost control of events (Morreall, 1997).

There are some findings supporting that humor is beneficial for mental health (Bennett & Lengacher, 2006). Humor and laughter can improve health and well-being, strengthen social bonds and relationships, increase communication, and develop resilience and power to cope (Chauvet & Hofmeyer, 2007). In addition to livening up business life, humor reduces stress and anxiety, gives the person hope, and in this way, it becomes beneficial to the human body and health (Hurren, 2006). Humor contributes to the development of interpersonal relationships. Considering this aspect, it is possible to use humor with a view to changing the stressful situation itself. Effective use of humor in order to facilitate communication in interpersonal relationships, to reduce conflicts and tensions, and to enrich the positive emotions that other people experience can act as both reactive and proactive coping strategies when faced with stress (Yerlikaya, 2007).

According to the humor styles people prefer, there are four different humor styles under two main headings, namely, those that are compatible (self-enhancing and affiliative humor) and those that are incompatible (aggressive and self-defeating humor). Self-enhancing humor includes elements related to the tendency to maintain a humorous perspective on life, the regulation of emotions, and the use of humor in coping with a variety of issues and situations. In this humor style, the individual can be busy with humor even if there are no other people around him. It is a humor style that is considered



compatible just like affiliative humor style. They do not aim to harm themselves or other people emotionally (Martin et al., 2003). Self-enhancing humor is a method that covers the inner world of the individual and is used by the individual when coping with stress and in order to overcome negative emotions. These individuals do not have to share laughter with those around them; it is enough for them to perceive humor individually (Yerlikaya, 2009). Self-enhancing humor is a positive humor style that includes looking at the world and events from a humorous perspective. While reducing unpleasant feelings, it ensures that a positive and realistic view is maintained in the face of difficulties (Mendiburo-Seguel et al., 2015).

Affiliative social humor is to make jokes to other people, say humorous things, tell funny stories, laugh with other people in a non-aggressive way and entertain them (Martin et al., 2003). In affiliative humor type, relationships are formed in a way that will neither harm others nor the individual himself, and the focus is on the relationships between others and the individual (Yerlikaya, 2009). Individuals close to this humor style are people who are socially extroverted and cheerful, who have high emotional determination and who care about others' feelings (Martin et al., 2003).

Aggressive humor includes elements like sarcasm, making fun of, criticizing, and manipulating people, and ignoring the effects these will have on other people. In this humor style, harmony and the feelings and thoughts of others are not cared about, and the individual uses it in order to show his superiority. Emotional imbalances are often seen in individuals who use aggressive humor. It is also common for the individual to humorously use sexual and racist approaches that contain high masculinity elements. As might be expected, this humor style is much more common among men (Martin et al., 2003).

Self-defeating humor is related to the tendency to use humor in order to humiliate and belittle oneself, to expose oneself to the jokes of others, and as a means of defense and denial to hide underlying negative emotions (Martin et al., 2003). Although people who use this humor style are perceived as quite enjoyable and humorous, the underlying reason is low self-esteem and running away from something. It can be said that self-defeating humor style will be negatively related to psychological well-being and self-esteem, and positively related to anxiety and sadness (Yerlikaya, 2009).

In order for the counselor to be an effective and therapeutic individual, he should know himself well, respect himself, be open to change, be sincere, honest and authentic, be aware of the effects that culture creates on them, have a mentality that accepts the mistakes they have made, be willing to struggle and have a fine sense of humor (Corey, 2008). In Koçak's (2018) research, the most important feature counselors should have was found as "empathy". The traits after empathy were defined as professional knowledge, openness to innovations and change, respect, being encouraging, self-confidence, honesty, self-awareness, cooperation and having a non-cynical sense of humor.

Lawson and Myers (2011) found in their study that the more engaged the counselors are in career-supportive behaviors, the more their professional life quality improves. One of the most effective career-supportive behaviors was stated as having a sense of humor. It is stated that children and adolescents who are psychologically strong have a high level of humor and wit (Masten, 1986). It is stated that one of the common characteristics of individuals with high levels of psychological strength is to have a developed sense of humor (Şahin, 2014). One of the internal protective factors for individuals to have psychological resilience is the sense of humor (Öz & Hiçdurmaz, 2010).

The obstacle that confronts the existing forces that an individual has collected in reaching a goal is called a problem (Bingham, 2004). Problem solving, on the other hand, has been defined as the cognitive and behavioral process that includes forming effective response options and choosing the most appropriate one of these in order to cope with a problematic situation (D'Zurilla & Goldfried, 1971). Problem-solving skill can be explained as the process of reaching a solution by using knowledge and adding originality, creativity or imagination to it (Kılıç Basmacı, 1998).

The problem-solving process is quite complicated since it requires the use of cognitive, emotional and behavioral dimensions together (Heppner & Baker, 1997). Different skills are required to be able to solve problems. Some problems can be solved with cognitive skills, some with socio-emotional development, and some with a creative approach. The main aim is to solve the phenomenon that seems to be an obstacle (Uyar Kurt, 2016). Problem orientation is described as a process that includes all the attitudes, beliefs, emotional reactions and relatively permanent cognitive-emotional schemas that a person developed for the problems he or she had experienced before (D'Zurilla et al., 2004).

As a result of the individual's having problem-solving skills, a positive psychological environment can be provided. Problem-solving competence plays a decisive role in an individual's struggle with life and self-disclosure. People with high problem-solving skills can also encourage people with whom they are in constant contact to have problem-solving success, and can set an example for them in this regard (Güçlü, 2003).

For many people, life is full of daily arguments and stressful events. All of these stressful events are closely related to the events that are important and unimportant. Stress-creating events, both important and seemingly unimportant, can affect whether individuals will be physically and psychologically well (Selye, 1983). Individuals need to have problem solving skills in order to lead a healthy life and maintain their mental health. Problem-solving skills play an important role in an individual's process of being an individual and coping with his environment. Counselors constantly encounter problems during their work. For this reason, it is very important for counselors to have problem-solving skills. Although there are studies addressing counselor candidates' problem-solving skills, humor styles and coping skills through humor separately, there is no study addressing these three variables together. In this regard, it is thought that it will be important to analyze how counselors' humor styles affect their skills of coping through humor and problem-solving.

### **The Aim of the Research**

The aim of this research is to analyze the relationship between the humor styles of counselor candidates and their skills of coping through humor and problem-solving. Within the scope of this aim, answers to the following questions were sought:

1. What are the humor styles students use? What are the students' coping styles through humor? What are the students' problem-solving skills?
2. Is there a relationship between students' humor styles and their skills of coping through humor and problem-solving?
3. Does the relationship between students' humor styles and their skills of coping through humor and problem-solving differ according to demographic variables?

## **METHOD**

### **The Model of the Research**

A correlational survey model, one of the quantitative research methods, was used in the study. Correlational models are often used to determine whether two or more concepts vary consistently and the consequent degree of relationship between these concepts (Creswell, 2012). Fraenkel and Wallen (2009) define correlational research as a type of research that reveals the degree of relationship between two or more variables. Creswell (2012) refers to two types of correlational research: predictive and exploratory. In exploratory design, the relationship between two or more variables and the level of this relationship is determined, while in predictive design research, which variable predicts the other is determined.

## The Universe and The Sample

The universe of the research consists of second-year students studying in the Guidance and Counseling program at foundation universities in Istanbul. The sample of the study was obtained by convenience sampling, one of the methods of non-random sampling methods. Non-random sampling is a sampling method created by starting from the most accessible until the researcher reaches the group size he needs (Büyüköztürk et al., 2010). The sample of the research includes 232 university students. Demographic information of the participants in the research is given in Table 1.

**Table 1: The demographic characteristics of the participants**

		f	%
Gender	Male	68	29,3
	Female	164	70,7
Age	18-20	137	59,1
	21 and above	95	40,9
The order of siblings	1	93	40,1
	2	64	27,6
	3 and later	75	32,3
The number of siblings	Single	11	4,7
	Two	66	28,4
	Three	74	31,9
	Four and more	81	34,9
Income status	Low	7	3,0
	Average	120	51,7
	Good	92	39,7
	High	13	5,6
Education Level of the Mother	Primary School	103	44,4
	Secondary School	45	19,4
	High School	59	25,4
	University	25	10,8
Education Level of the Father	Primary School	57	24,6
	Secondary School	42	18,1
	High School	71	30,6
	University	62	26,7
Total		232	100

164 women (70.7%) and 68 men (29.3%) participated in the research. The average age of the participants is 20.50. 40.1% of the participants are the first child of the family. 51.7% of the participants stated that they had an average income level. The education level of the mothers of 44.4% of the participants is primary school.

## Data Collection Tools

### Personal Information Form

In order to collect data from the participants, this form consists of questions about demographic characteristics such as gender, age, order of siblings, number of siblings, income status, and education level of parents.

### Humor Styles Questionnaire (HSQ)

This scale was developed by Martin, Puhlik-Doris, Larsen, Gray and Weir (2003), and adapted into Turkish by Yerlikaya (2003). There are four sub-dimensions in the scale which are designed to measure two compatible (affiliative and self-enhancing) and two incompatible (aggressive and self-defeating) uses of humor. Each dimension consists of 8 items. There are 32 items in the entire scale. Likert type 7-point rating scale was used in the scale. High scores obtained from the subscales indicate that the relevant humor style is used more. The factor load values of the items in the Turkish version range from .32 to .75. The reliability (Cronbach's Alpha) coefficients of the dimensions are ,78 for

self-enhancing humor; .74 for affiliative humor; .69 for aggressive humor; .67 for self-defeating humor (Martin et al., 2003, pp. 57-59; Yerlikaya, 2009, p. 77).

### **Coping Humor Scale (CHS)**

This scale is a self-expression scale consisting of 7 items and developed (Martin & Lefcourt, 1983) to measure the use of humor as a coping strategy in stressful situations. It uses a four-point Likert-type rating. The total scores that can be obtained from the scale range from 7 to 28, and the high total score indicates the extent to which the person resorts to humor as a coping strategy in stressful situations. The Cronbach's alpha coefficients obtained in different studies related to the scale range from .60 to .70 (Martin, 1996). The Turkish adaptation of the scale was done by Yerlikaya (2009).

### **Problem-Solving Inventory**

This scale was used to assess students' problem-solving skills. The Likert-type scale, developed by Heppner and Petersen (1982), has 35 items. The answers are given points ranging from 1 to 6. The score range is 32-192. The high total score obtained from the scale indicates that the individual perceives himself as inadequate in terms of problem-solving skills. The validity and reliability of the Turkish form of the scale was made by Taylan (1990), and the Cronbach's alpha coefficient of the scale is .86.

Coping humor scale, (CHS), humor styles questionnaire (HSQ) and problem-solving inventory (PSI) were used in the research. Reliability analyses of the scales are shown in Table 2.

**Table 2: The results of the reliability analyses related to the scales used in the research**

Scale	Scale Dimensions	Number of Items	Cronbach's Alpha
CHS		7	,730
HSQ	Affiliative humor	8	,751
	Self-enhancing humor	8	,802
	Aggressive humor	8	,512
	Self-defeating humor	8	,728
PSI	Avoidant style	4	,689
	Problem-solving confidence style	7	,770
	Monitoring style	3	,724
	Planfulness style	4	,643
	Impulsive style	9	,738
	Reflective style	5	,843

The coping humor scale is a one-dimensional scale consisting of 7 items. Cronbach's Alpha value was calculated as ,730. Humor styles questionnaire consists of 32 items and 4 dimensions. There are 8 items in each dimension. The reliability coefficients of the sub-dimensions of humor styles questionnaire were calculated as follows: affiliative humor as ,751, self-enhancing humor as ,802, aggressive humor as ,512 and self-defeating humor as ,728. The overall reliability coefficient of the humor styles questionnaire was calculated as ,809. Problem-solving inventory consists of 35 items and 6 dimensions. 3 items were not included in the scoring, and the scoring was made over 32 items. The reliability coefficients of the sub-dimensions of problem-solving inventory were calculated as follows: avoidant style as ,689, problem-solving confidence style as ,770, monitoring style as ,724, planfulness style as ,643, impulsive style as ,738 and reflective style as ,843. The overall reliability coefficient of the problem-solving inventory was calculated as ,901. A Cronbach's Alpha value of .70 or more is considered sufficient for the reliability of the scale (Büyüköztürk, 2020, p. 183). All three scales are considered reliable.

### The Analysis of the Data

For the analyses related to the scales used in the research, firstly, it is necessary to examine whether the data are normally distributed. In order to determine if the data were normally distributed, the kurtosis and skewness values were checked, and these data can be found in Table 3.

**Table 3: The results of the kurtosis and skewness related to the scales**

Scale	N	$\bar{X}$	Ss.	Kurtosis	Skewness
CHS	232	2,7562	,51	,276	-,263
HSQ	232	4,1761	,63177	-,023	,154
PSI	232	2,7487	,66052	,084	,496

According to Table 3, the kurtosis and skewness coefficients of all three scales range from -1 to +1. If the kurtosis and skewness coefficients are between -1 and +1, it is accepted that the data have a normal distribution (Büyüköztürk, 2020, p. 40). Since the data show normal distribution, parametric tests will be used in the analysis process.

The obtained data were analyzed through SPSS 21.0 program using t-test, ANOVA and Pearson product-moment correlation analysis techniques.

## FINDINGS

In this section, the findings related to the aims of the research are given.

### 1.Findings about the Descriptive Statistics of the Scales

Descriptive statistics of the scales used in the study are found in Table 4.

**Table 4: Descriptive statistical data of the scales**

Scale	Scale Dimensions	Number of Items	N	$\bar{X}$	Ss.	Min.	Max.
CHS		7	232	19,29	3,57	8	28
HSQ	Affiliative humor	8	232	44,19	7,06	23	56
	Self-enhancing humor	8		37,72	8,67	17	56
	Aggressive humor	8		24,99	6,49	12	43
	Self-defeating humor	8		26,73	8,39	9	51
PSI	Avoidant style	4	232	10,38	3,98	4	23
	Problem-solving confidence style	7		19,12	5,88	9	36
	Monitoring style	3		7,54	3,14	3	17
	Planfulness style	4		10,44	3,62	4	22
	Impulsive style	9		27,32	6,80	13	49
	Reflective style	5		12,19	4,89	5	30

The scores that can be obtained in coping humor scale range from 7 to 28, with an average value of 10.5. A high score indicates the extent to which a person uses humor as a coping strategy in case of a problem (Yerlikaya, 2009, p. 77). The average score obtained from 232 participants in the study was calculated as 19.29. According to the average value obtained, it can be interpreted that the participants resort to humor in case of any problem ( $19,29 > 10,5$ ).

The scores that can be obtained from each dimension of the humor styles questionnaire range from 8 to 56. The high scores obtained from the sub-dimensions of the scale give an idea about how often that humor style is used. In the study, the average score for affiliative humor was calculated as 44.19 for affiliative humor, 37.72 for self-enhancing humor. 24.99 for aggressive humor, and 26.73 for self-defeating humor. It appears that the participants use the affiliative humor style more frequently than the other humor styles. The least used humor style is aggressive humor style.

The scores that can be obtained from the avoidant style dimension, which is one of the sub-dimensions of the problem-solving inventory, are between 4 and 24, with an average value of 10. The scores that can be obtained from the problem-solving confidence style dimension range from 7 to 42, with an average value of 17.5. The scores that can be obtained from the monitoring style dimension range from 3 to 18, with an average value of 7.5. The scores that can be obtained from the planfulness style dimension range from 4 to 24, with an average value of 10. The scores that can be obtained from the impulsive style dimension range from 9 to 54, with an average value of 22.5. The scores that can be obtained from the reflective style dimension are between 5 and 30, with an average value of 12.5. A high score in the problem-solving inventory means that the individual sees himself as inadequate in terms of problem-solving skills. In addition, values above the average mean that the individual is insufficient in problem-solving, and those below the average mean that the individual is sufficient in problem-solving (Şahin et al., 1993). According to the data obtained in the study, the participants appear to be insufficient in problem-solving in the dimensions of avoidant style ( $10.38 > 10$ ), problem-solving confidence style ( $19.12 > 17.5$ ), monitoring style ( $7.54 > 7.5$ ), planfulness style ( $10.44 > 10$ ) and impulsive style ( $27.32 > 22.5$ ). It is seen that the participants are sufficient in problem-solving only in the reflective style ( $12.19 < 12.5$ ) dimension.

## 2. Findings about the Relationship among the Scales

The results of the correlation analysis made to examine the relationship among the scales used in the study are shown in Table 5.

**Table 5: The results of the relationship among the scales**

		CHS	HSQ	PSI
CHS	Pearson Correlation	1	,588	-,229
	Sig. (2-tailed)		,000	,000
	N	232	232	232
HSQ	Pearson Correlation	,588	1	-,075
	Sig. (2-tailed)	,000		,257
	N	232	232	232
PSI	Pearson Correlation	-,229	-,075	1
	Sig. (2-tailed)	,000	,257	
	N	232	232	232

According to Table 5, there is a moderate, positive and significant relationship ( $r = 0.588$  and  $p < .05$ ) between coping humor scale and humor styles questionnaire, and a low, negative and significant relationship ( $r = -0.229$  ve  $p < .05$ ) between coping humor scale and the problem-solving inventory. There is a low, negative and insignificant relationship ( $r = -0.075$  and  $p > .05$ ) between the humor styles questionnaire and the problem-solving inventory.

## 3. Findings about the Level of Significance between the Average Scores of the Scales and Demographic Variables

### The level of significance of the scores according to the gender variable

Independent samples t-test was conducted to measure whether the scores obtained from the scales used in the study differ according to the gender variable. The results of the analysis are given in Table 6.

**Table 6: T-test results of the scores according to gender**

Scale	Gender	N	$\bar{X}$	Ss.	sd	t	p
CHS	Male	68	2,8739	,53368	230	2,286	,023
	Female	164	2,7073	,49330			
HSQ	Male	68	4,2266	,61286		,784	,434
	Female	164	4,1551	,64012			
PSI	Male	68	2,7045	,74488		-,655	,513
	Female	164	2,7670	,62376			

The scores obtained from humor styles questionnaire ( $t_{230}=.784$  and  $p>.05$ ) and problem-solving inventory ( $t_{230}=-.655$  and  $p>.05$ ) used in the research do not show a significant difference according to gender. The scores obtained from coping humor scale, however, show a statistically significant difference according to gender ( $t_{230}= 2.286$  and  $p<.05$ ). It can be interpreted that male participants ( $\bar{X}= 2.8739$ ) resort to humor more than female participants ( $\bar{X}= 2.7073$ ) in case of any problem.

**b) The level of significance of the scores according to the number of siblings variable**

One-way analysis of variance (ANOVA) test was done to analyze whether the scores obtained from the scales differ significantly according to the number of siblings variable. The data obtained from the ANOVA test are given in Table 7.

**Table 7: ANOVA test results of the scores according to the number of siblings**

Scale	Source of variance	Sum of squares	Sd	Average of squares	F	p
CHS	Intergroup	,976	3	,325	1,255	,291
	Within groups	59,107	228	,259		
	Total	60,083	231			
HSQ	Intergroup	2,407	3	,802	2,038	,109
	Within groups	89,792	228	,394		
	Total	92,199	231			
PSI	Intergroup	,876	3	,292	,666	,574
	Within groups	99,905	228	,438		
	Total	100,781	231			

When the one-way analysis of variance (ANOVA) results given in Table 7 are examined, the scores obtained from coping humor scale ( $F_{3,228}= 1,255$  and  $p>.05$ ), from humor styles questionnaire ( $F_{3,228}= 2,038$  and  $p>.05$ ) and from problem-solving inventory ( $F_{3,228}= ,666$  and  $p>.05$ ) do not show a statistically significant difference according to the number of siblings of the participants.

**c) The level of significance of the scores according to the income variable**

One-way analysis of variance (ANOVA) test was conducted to analyze whether the scores obtained from the scales differ significantly according to the income variable. The data obtained from the ANOVA test are given in Table 8.

**Table 8: ANOVA test results of the scores according to income**

Scale	Source of variance	Sum of squares	Sd	Average of squares	F	p
CHS	Intergroup	,499	3	,166	,637	,592
	Within groups	59,584	228	,261		
	Total	60,083	231			
HSQ	Intergroup	,269	3	,090	,222	,881
	Within groups	91,930	228	,403		
	Total	92,199	231			
PSI	Intergroup	2,812	3	,937	2,182	,091
	Within groups	97,968	228	,430		
	Total	100,781	231			

When the one-way analysis of variance (ANOVA) results given in Table 8 are examined, the scores obtained from coping humor scale ( $F_{3,228} = ,637$  and  $p > .05$ ), from humor styles questionnaire ( $F_{3,228} = ,222$  and  $p > .05$ ) and from problem-solving inventory ( $F_{3,228} = 2,182$  and  $p > .05$ ) do not show a statistically significant difference according to the income levels of the participants.

#### **d) The level of significance of the scores according to the education level of the mother**

One-way analysis of variance (ANOVA) test was performed to analyze whether the scores obtained from the scales differ significantly according to the education level of the mother variable. The data obtained from the ANOVA test are given in Table 9.

**Table 9: ANOVA test results of the scores according to the education level of the mother**

Scale	Source of variance	Sum of squares	Sd	Average of squares	F	p
CHS	Intergroup	,833	3	,278	1,068	,363
	Within groups	59,250	228	,260		
	Total	60,083	231			
HSQ	Intergroup	1,233	3	,411	1,030	,380
	Within groups	90,966	228	,399		
	Total	92,199	231			
PSI	Intergroup	3,137	3	1,046	2,442	,065
	Within groups	97,643	228	,428		
	Total	100,781	231			

When the one-way analysis of variance (ANOVA) results given in Table 9 are examined, the scores obtained from coping humor scale ( $F_{3,228} = 1,068$  and  $p > .05$ ), from humor styles questionnaire ( $F_{3,228} = 1,030$  and  $p > .05$ ), and from problem-solving inventory ( $F_{3,228} = 2,442$  and  $p > .05$ ) do not show a statistically significant difference according to the education level of the mothers of the participants.

#### **e) The level of significance of the scores according to the education level of the father**

One-way analysis of variance (ANOVA) test was performed to analyze whether the scores obtained from the scales differ significantly according to the education level of the father variable. The data obtained from the ANOVA test are given in Table 10.



**Table 10: ANOVA test results of the scores according to the education level of the father**

Scale	Source of variance	Sum of squares	Sd	Average of squares	F	p	Significant difference
CHS	Intergroup	2,223	3	,741	2,920	,035	1-2 2-3
	Within groups	57,860	228	,254			
	Total	60,083	231				
HSQ	Intergroup	1,555	3	,518	1,304	,274	
	Within groups	90,644	228	,398			
	Total	92,199	231				
PSI	Intergroup	2,855	3	,952	2,216	,087	
	Within groups	97,925	228	,429			
	Total	100,781	231				

1: Primary School    2: Secondary School    3: High School    4: University

When the one-way analysis of variance (ANOVA) results given in Table 10 are examined, the scores obtained from humor styles questionnaire ( $F_{3,228} = 1.304$  and  $p > .05$ ) and from problem-solving inventory ( $F_{3,228} = 2.216$  and  $p > .05$ ) do not show a statistically significant difference according to the education level of the fathers of the participants. It was concluded that the scores obtained from coping humor scale ( $F_{3,228} = 2.920$  and  $p < .05$ ) differed significantly according to the education level of the fathers of the participants. According to the LSD Multiple Comparison Test, which was conducted to determine between which education levels the difference was, it was concluded that there was a significant difference between primary school level and secondary school level, and between secondary school level and high school level.

#### **f) Findings about the analysis of whether the relationship among the scales changes according to demographic variables**

The results of the partial correlation analysis performed to examine whether the relationship among the scales used in the study change according to demographic variables are found in Table 11.

**Table 11: The analysis of the relationship among the scales according to demographic variables**

Control Variable			CHS	HSQ	PSI
Gender	CHS	Correlation	1,000	,588	-,225
		Significance (2-tailed)	.	,000	,001
		df	0	229	229
	HSQ	Correlation	,588	1,000	-,073
		Significance (2-tailed)	,000	.	,272
		df	229	0	229
	PSI	Correlation	-,225	-,073	1,000
		Significance (2-tailed)	,001	,272	.
		df	229	229	0
The number of siblings	CHS	Correlation	1,000	,586	-,230
		Significance (2-tailed)	.	,000	,000
		df	0	229	229
	HSQ	Correlation	,586	1,000	-,077
		Significance (2-tailed)	,000	.	,246
		df	229	0	229
	PSI	Correlation	-,230	-,077	1,000
		Significance (2-tailed)	,000	,246	.
		df	229	229	0
Income status	CHS	Correlation	1,000	,588	-,229
		Significance (2-tailed)	.	,000	,000
		df	0	229	229
	HSQ	Correlation	,588	1,000	-,069
		Significance (2-tailed)	,000	.	,296
		df	229	0	229
	PSI	Correlation	-,229	-,069	1,000
		Significance (2-tailed)	,000	,296	.
		df	229	229	0

Education Level of the Mother	CHS	Correlation	1,000	,588	-,226
		Significance (2-tailed)	.	,000	,001
		df	0	229	229
	HSQ	Correlation	,588	1,000	-,072
		Significance (2-tailed)	,000	.	,276
		df	229	0	229
	PSI	Correlation	-,226	-,072	1,000
		Significance (2-tailed)	,001	,276	.
		df	229	229	0
Education Level of the Father	CHS	Correlation	1,000	,586	-,220
		Significance (2-tailed)	.	,000	,001
		df	0	229	229
	HSQ	Correlation	,586	1,000	-,065
		Significance (2-tailed)	,000	.	,324
		df	229	0	229
	PSI	Correlation	-,220	-,065	1,000
		Significance (2-tailed)	,001	,324	.
		df	229	229	0

In Table 11, it was analyzed whether the relationship among the scales, the level of the relationship and the significance of the relationship change according to demographic variables. For this procedure, partial correlation analyses were made among the scales by keeping the demographic variables constant. As a result, it was observed that the relationship, the level of the relationship and the significance of the relationship do not change according to demographic variables.

## RESULT AND DISCUSSION

In this research, it was aimed to analyze the relationship between the humor styles of counselor candidates and their skills of coping through humor and problem-solving. It is seen that the participants are insufficient in problem-solving in the dimensions of avoidant style, problem-solving style, monitoring style, planfulness style and impulsive style, whereas they are sufficient only in the dimension of reflective style.

It is seen that counselor candidates show coping behavior through humor in case of any problem. Counselor candidates mostly use affiliative humor style, followed by self-enhancing, self-defeating and aggressive humor styles, respectively. According to the data of the research, there is a low level, negative and insignificant relationship between humor styles and problem-solving; a moderate, positive and significant relationship between humor styles and coping through humor; and a low, negative and significant relationship between coping through humor and problem-solving.

In the study conducted by Traş et al. (2011), it was found that as teacher candidates' positive problem-solving approach increases, their use of affiliative humor and self-enhancing humor styles also increases, whereas the use of aggressive and self-defeating humor style increases when they have a negative problem-solving approach. A positive problem-solving approach includes believing that the individual can solve the problems he encounters, developing and applying appropriate solutions. Therefore, it can be expected that individuals with a positive problem-solving approach will use self-enhancing and affiliative humor more, whereas they will use aggressive and self-defeating humor styles less.

Durmuş (2000) analyzed the sense of humor and coping styles in a group of university students and concluded that those with a high sense of humor use self-confidence more as a coping style. Durmuş and Tezer (2001) also found that students with a high sense of humor prefer optimistic and self-confident coping styles more. Sarı and Aslan (2005) state that students with a self-confident coping style use affiliative and self-enhancing humor styles more. Similarly, Yerlikaya (2007) found that affiliative humor style is positively related to seeking social support, but negatively related to

helpless approach; self-enhancing humor style is positively related to self-confident and optimistic approach, but negatively related to helpless and submissive approach. In Sümer's (2008) study, it is seen that those who cope with stress more effectively prefer affiliative and self-enhancing humor more. These results indicate that coping with stress is related to humor.

In another study analyzing the relationships between humor styles and interpersonal problem-solving skills of adolescents, it was found that there is a positive correlation between affiliative humor and persistent-perseverant problem-solving; and there is a significant positive correlation between self-enhancing humor and constructive problem-solving and persistent-perseverant problem-solving (Didin, 2016). Again, in a study analyzing the relationship between humor, stress and coping strategies, it was found that the group with a high sense of humor report less stress and anxiety than the group with a low sense of humor, and use coping strategies more in positive reassessment and problem-solving (Abel, 2002).

In a study analyzing the relationship between primary school teachers' styles of coping with stress and the humor styles they use, it was shown that all humor styles are significant predictors of self-confident approach in coping with stress. Self-confident approach was found to be positively related to self-enhancing and affiliative humor styles, while it was found to be negatively related to aggressive and self-defeating humor styles. Optimistic approach in coping with stress was positively predicted by self-enhancing humor, while it was negatively predicted by aggressive humor. The findings showed that teachers with healthy humor styles (affiliative and self-enhancing) also use healthy coping styles more. Teachers who have more aggressive and self-defeating humor styles, on the other hand, resort to unhealthy and ineffective coping styles more (Özdemir et al., 2011). Studies comparing the positive and negative aspects of humor show that people with negative humor styles have a higher anxiety rate (Bilge & Saltuk, 2007).

In a study conducted to determine the relationship between humor use and psychological adjustment and social interactions, Nezlek and Derks (2001) found that students who use humor as a coping mechanism have better psychological adjustment than those who do not use humor as a coping mechanism. In a study conducted to determine the relationship between university students' humor styles and perceived stress, anxiety and depression levels, Yerlikaya (2009) found that there is negative correlation between 'affiliative humor, self-enhancing humor and coping through humor' and 'perceived stress, anxiety and depression'. It was also found in the same study that there is no correlation between aggressive humor and perceived stress, anxiety and depression, but that there is a low, significant correlation between self-defeating humor and perceived stress, anxiety and depression.

When analyzed in terms of gender, there is no significant difference between genders in humor styles and problem-solving skills, but it can be said that men use humor more than women in coping through humor. In other words, men resort to humor more than women in case of any problem.

In a study in which the effect of humor in coping styles was analyzed and in which female administrators participated, it was found that women with a developed sense of humor are more successful in cognitive restructuring of the events they encounter, and that they reinterpret various stressful life experiences in a more positive way (Fry, 1995). In a study conducted with university students, it is seen that healthy humor styles are at a higher level in female students, whereas unhealthy humor types have a higher average in male students, and especially the level of aggressive humor is significant in males (Avcı, 2012). When the humor styles of teacher candidates were analyzed according to gender, it was found that male teacher candidates' average scores of aggressive humor and self-defeating humor styles are higher than female teacher candidates' average scores of aggressive humor and self-defeating humor styles (Traş et al., 2011).

In the comparison made between genders regarding humor styles, it is seen that male students have more self-enhancing humor styles than female students, while female students have more affiliative humor styles than male students (Erözkan, 2009). In a study conducted by Führ (2002) to determine whether humor is used as a coping strategy in early adolescence, it was found that boys are

more prone to aggressive and sexual humor than girls, whereas girls use humor more to amuse themselves. In their study analyzing the relationship between university students' humor styles and their coping strategies, Sarı and Aslan (2005), found that male students use aggressive humor and self-defeating humor styles, which belong to negative humor styles, more than female students. In a study conducted by Soyaldın (2007) to analyze the relationship between the anger expression styles of secondary school students and their humor styles, it was determined that while girls have a higher average score in the affiliative humor and self-enhancing humor subscales, the average score of the boys is higher than the girls in the aggressive and self-defeating humor subscales.

In his study, Tümkaya (2006) found no difference in humor styles according to gender. In the study by Aslan (2006), in which the humor styles of teachers working in secondary education institutions were analyzed, it was found that gender does not make a significant difference.

There was no significant difference between the groups in terms of number of siblings and income. No difference was determined between the groups in terms of the education level of the mother, either. In terms of the education level of the father, though, it was concluded that there is significant difference in the skill of coping through humor between primary and secondary school levels, and also between secondary and high school levels.

In Açıkgöz's (2016) research, it is seen that there is no significant difference between the education level of the mothers of the students and students' humor styles. It was determined that students whose fathers are uneducated use aggressive humor at a significantly higher level, and as the education level of their fathers increases, the level of their children's use of aggressive humor decreases. In the Didin's research (2016), it was found that the education level of the parents does not have an effect on the humor styles of the adolescents.

In Didin's study (2016), it was observed that the number of siblings and birth order have no effect on the humor styles of adolescents. In Sayar's (2012) research, it was found that birth order has no effect in terms of humor scores. In Açıkgöz's (2016) research, it is seen that there is no significant difference between the socio-economic level of the family, the number of siblings, sibling order and humor styles. In Sümer's (2008) study, it was observed that the average scores obtained by university students in affiliative humor and self-enhancing humor sub-dimensions increase as their income levels go up.

Humor is regarded as one of the ways to cope with the obstacles encountered in life. It both protects the person from the cruel realities of life and enables the person to socialize by adapting to the society. An individual who uses humor in his life can look at life from a more flexible perspective. The sense of humor is an element of mental balance that serves as a guard against the obligations of life, and it relieves the tense mood (Thorson et al., 1997). In their study to determine the role of humor in reducing the relationship between stressful life events and psychological stress reactions, Nezu et al. (1988) determined that humor has a regulating role in the relationship between stressful life events and depressive symptoms. Kuiper et al. (1993) concluded that university students with a high sense of humor have high self-esteem. At the same time, students with a high sense of humor have more control over their lives.

In a study analyzing the relationship between 'humor styles and positive personality traits' and 'perceived stress', it was found that positive and negative self-directed humor styles have negative correlations with perceived stress. However, it was concluded in the study that positive humor style supports physical and psychological well-being and maintaining a positive personality style (Cann et al., 2010). In Talbot's (2000) study, it was observed that individuals with high use of humor also have a high level of feeling of individual success. For this reason, it can be said that humor is an effective method in coping with stress in business life (Öz & Hıçdurmaz, 2010).

Studies have found that the appropriate use of humor improves social relations (Graham, 1995), and is effective in reducing the client's stress in counselor-client relationships (Lowis, 1997).

Also, there is a negative relationship between the sense of humor and a stressful job performance (Bizi et al., 1988). At the same time, it was emphasized in another study that excessive use of humor can turn into a style of denial and reduce coping power (Overholser, 1992).

As a result, it can be said that counselor candidates' forming positive humor styles and developing their skills to cope through humor will contribute to them in their professional life.

### **Suggestions**

Based on the research findings, the following recommendations can be made:

1. In this study, data were collected only from second-year students at foundation universities. Therefore, larger sample groups can be analyzed and the results can be compared with counselors working in the field.

2. Undergraduate programs can include content aimed at supporting counselor candidates to use positive humor styles more and to develop coping skills through humor.

3. Studies can focus on the analysis of the relationship among different variables that will affect the humor styles of the counselor candidates, such as self-esteem, anxiety level, emotional intelligence, subjective well-being, shyness, etc.

4. Counselor candidates who use incompatible humor styles can be helped to gain insight into how this might negatively affect both their clients during the counseling process and themselves in daily life.

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## Latent Transition Modeling for Categorical Latent Variables: An Application Using Longitudinal Resilience Data \*

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### Abstract

This study aims to illustrate how the latent transition modeling might be applied to identify qualitative change patterns in longitudinal assessment settings. Using the data collected on three measurement occasions, we examine whether and to what extent resilience latent class memberships of pre-service teachers changed over time. First, latent class models are tested for all time points separately, revealing that a 4-class model is the best fitting model (Resilience, Competence, Maladaptation, and Vulnerability). Next, latent transition model alternatives are tested, leading to the conclusion that the transition model with stationary probabilities provides the best fit. The results show that individuals with the statuses of Vulnerability and Competence have the highest probabilities of maintaining the same status compared to others and that the highest transition probabilities occur from the status of Resilience to Competence and from Maladaptation to Vulnerability. These findings suggest that individuals with sufficient coping skills might have the status of Resilience and move toward Competence, while those lacking coping skills might have the status of Maladaptation and move toward Vulnerability with the absence or decrease of adversity. A discussion is provided highlighting the usefulness of the latent transition modeling when it is suspected that latent class memberships of subjects could be sensitive to change over time.

**Keywords:** Assessment, Categorical Latent Variable, Latent Transition Analysis, Longitudinal

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## INTRODUCTION

Psychological constructs that cannot be directly observed are often referred to as latent variables and are labeled as static or dynamic, depending on how prone they are to change over time (Collins & Flaherty, 2002). In the study of dynamic variables, it is of critical importance that longitudinal assessment designs are utilized to help support the validity of the inferences to be made (Baltes & Nesselroade, 1979; Collins, 1991; Maxwell & Cole, 2007; Schoenberg, 2008). The repeated data in a longitudinal design allow for the simultaneous evaluation of intra-individual change and inter-individual differences (Wu et al., 2013). With longitudinal research, it is possible to study whether changes occur in the construct over time, what patterns of change are observed, and whether other variables affect those patterns (e.g., Lanza et al., 2003). The design of longitudinal studies is critical for the meaning of inferences related to the construct of interest. The researchers (Collins, 2006; Ployhart & Vandenberg, 2010; Wang et al., 2017) highlight the necessity of examination of the theoretical background of the construct, design of an application procedure reflecting the nature of change in the construct (e.g., the number of measurement occasions and measures), selection of an appropriate statistical model, and integration of all these components.

Statistical models, which are expected to be compatible with the research design, can be classified according to whether the latent variable is continuous or categorical (Muthén, 2007). Continuous variables reflect quantitative differences between individuals along one or more continua, while categorical variables reflect qualitative differences between groups (Ruscio & Ruscio, 2008). In longitudinal models, this distinction is combined with the notion of change, and quantitative change can be modeled when latent variables are taken as continuous. In contrast, qualitative change can be modeled when latent variables are taken as categorical. The former reflects a change occurring in some degree/amount (e.g., decrease or increase in scores of a listening test), and the latter reflects a change occurring in a form/type (e.g., change in reading strategies) (Shaffer & Kipp, 2013). For continuous latent variables, we might use conventional psychometric models such as structural equation models (SEMs) in cross-sectional study settings or growth analysis where the continuous latent variables reflect individual differences in development over time (Muthén, 2007). For categorical latent variables, we might use latent class analysis (LCA) (Lazarsfeld & Henry, 1968) in cross-sectional study settings or latent transition analysis (LTA) (Collins & Wugalter, 1992; Langeheine, 1988) in longitudinal settings. The LTA, a generalization of LCA, allows to model the change patterns in individuals' subgroups (classes) defining dynamic categorical latent variables (Wang & Chan, 2011).

While the methodologies and applications for modeling change are relatively familiar to researchers when variables of interest are presumed to be measured on a continuous scale (e.g. latent growth curve model), a need still remains for studies providing methodologies and applications suited for research involving variables measured on a categorical scale (e.g., Sorgente et al., 2019; Wang & Chan, 2011). Considering the discrete latent constructs in social sciences (e.g., attachment styles, problem-solving strategies), studies modeling categorical variables will have great potential in forming and testing various theories or hypotheses (Yu, 2013). The present study addresses that methodological gap by focusing on the application of LTA and illustrating a multi-step modeling strategy formulated for researchers interested in modeling qualitative changes that can only be quantified using categorical variables. Presented together with a brief overview, the approach illustrated here is capable of resolving potential issues that may arise while using LTA. Integrating LTA into the analysis of repeated assessment data, we provided an example applying this approach to 3-wave data collected during a longitudinal study investigating patterns of changes in pre-service teachers' resilience and experienced adversity levels over time.

Resilience shows the what extent individuals cope with and adapt to adversity or stressful situations (Vella & Pai, 2019). The present study considers this construct as a dynamic (Tusaie & Dyer, 2004) and categorical latent variable. Categories of the variable were evaluated in the light of groups (Resilient, Competent, Maladaptive, and Vulnerable) suggested by Masten and her colleagues (Masten, 2015; Masten & Tellegen, 2012; Masten et al., 1999; Masten et al., 2004). When making

inferences about the resilience of individuals, two components need to be taken into account: adversity (difficulty/risk/stress) and adaptation (Jntema et al., 2019; Vella & Pai, 2019). Although resilience measures should consider these two components, they generally do not involve the assessment of specific person-situation interactions and allow only one-time measurement. Jntema et al. (2019) emphasize current measures' limitations in reflecting the dynamic nature of resilience. Therefore, we designed a longitudinal measurement model allowing us to monitor individuals' experienced adversity and resilience in their current situation.

In this study, using data collected within a longitudinal measurement design, we identified the potential resilience classes of pre-service teachers. Then, we examined the probabilities of transitioning between those classes over a period of time. The research questions are as follows: (1) Are there classes with specific response patterns of resilience for each time point? (2) Do individuals' resilience classes vary between time points? (3) What transition patterns can be identified between resilience classes?

## METHOD

### Research Design

In this study, a longitudinal panel design was used. This design uses a study group with the same individuals at each measurement point (Menard, 2008).

### Participants and Data Collection

The data were collected from a group of pre-service teachers in Türkiye ( $n = 360$ ) who volunteered to complete a measure at three different time points at 4-week intervals over the course of an academic semester. The mean age of participants was 21.38 ( $SD_{age} = 2.64$ ); 74.2% were female, while 12.5% were male. The measurement tool was designed considering the results of a previous study (Akbas & Kahraman, 2019). The measure was composed of self-report items related to adversity exposure and perceived resilience. Items related to adversity exposure were as follows: "Facing problems/adversity" ( $A1$ ) and "Facing severe adversity" ( $A2$ ). Items related to perceived resilience were as follows: "Coping with problems/adversity" ( $R1$ ), "Feeling challenged" ( $R2$ ), and "Feeling resilient" ( $R3$ ). The items were coded dichotomously (0 = Low, 1 = High). The measure was administered via an online platform using only participant numbers to protect the privacy of the respondents. All respondents signed a consent form at the beginning of data collection.

### Data Analysis

#### Latent Transition Analysis

In LTA, measurement models are defined for each measurement occasion by using LCA models, and changes in class memberships over time are modeled based on the relationships between latent variables (structural models) (Wang & Wang, 2012). For instance, in an LTA model with 3-time points, LCA models ( $C_1, C_2, C_3$ ) can be constructed for each time point, and then autoregressive relationships ( $C_1 \rightarrow C_2, C_2 \rightarrow C_3$ ) between the latent variables can be defined (Nylund, 2007).

The mathematical model of LTA is presented below in terms of three measurement occasions and three indicators (items) of the latent class variable on each occasion. For simplicity, the example and representation here were adapted from Collins et al. (2002) by excluding the exogenous static variable. Let us assume response categories for the items are as follows:  $i, i', i'' = 1, \dots, I$  for the first item  $j, j', j'' = 1, \dots, J$  for the second item, and  $k, k', k'' = 1, \dots, K$  for the third item. Here,  $i, j$ , and  $k$  represent responses at the first time point;  $i', j'$ , and  $k'$  at the second time; and  $i'', j'',$  and  $k''$  at the third time. Let us define  $p, q, r = 1, \dots, S$  latent statuses (denoting dynamic latent classes), where  $p$  refers to status in the first time point,  $q$  refers to status in the second time point, and  $r$  refers to status in the third time point. If  $y = \{i, j, k, i', j', k', i'', j'', k''\}$  denotes a particular response pattern for the

current example, then the proportion of individuals with this pattern can be shown as following (adapted from Collins et al., 2002):

$$P(Y = y) = \sum_{p=1}^S \sum_{q=1}^S \sum_{r=1}^S \delta_p \rho_{i|p} \rho_{j|p} \rho_{k|p} \tau_{q|p} \rho_{i'|q} \rho_{j'|q} \rho_{k'|q} \tau_{r|q} \rho_{i''|r} \rho_{j''|r} \rho_{k''|r}$$

Here,  $\delta_p$  stands for the proportion in status 'p' at the first time point;

$\rho_{i|p}$  stands for the probability of response 'i' to the first item in the first time point conditioned on membership in status 'p' at the first time point; and

$\tau_{q|p}$  stands for the probability of being in status 'q' at the second time point conditioned on membership in status 'p' at the first time point.

As shown in the formula above, three sets of parameters are estimated in LTA: (1) latent status prevalences, (2) item-response probabilities, and (3) transition probabilities (Collins & Lanza, 2010). Latent status prevalences ( $\delta$ ) denote the proportion of the population in latent statuses, while item-response probabilities ( $\rho$ ) denote the probability of a specific response for an indicator conditional on status membership (Lanza et al., 2003). These two parameters are direct counterparts in LCA and are estimated separately for each time point if there is no constraint, but transition probabilities ( $\tau$ ) are a type of parameter specific to LTA and indicate how change happens between latent statuses (Collins & Lanza, 2010).

### Data Analysis Steps

The multi-step modeling strategy was conducted in five consecutively executed steps (Nylund, 2007; Ryoo et al., 2018):

*Step 0: Studying descriptive statistics.* The proportions of individuals for the observed variables were calculated for each time point and then compared across time points.

*Step 1: Testing LCA models for each time point.* LCA models starting from the model with one class up to the model with five classes were separately evaluated for all time points to determine the latent class structure underlying the data, even though it was assumed that the latent variable had four categories. The fit indices of all models for each time point were examined, and the model with the best fit was chosen. The following indices and criteria were used to evaluate model fit: AIC (the Akaike Information Criterion) (Akaike, 1987) and BIC (the Bayesian Information Criterion) (Schwarz, 1978), with lower values signifying better fit (Masyn, 2013; Nylund et al., 2007); VLMR-LRT (the Vuong-Lo-Mendell-Rubin Likelihood Ratio Test) (Lo, Mendell & Rubin, 2001; Vuong, 1989), and BLRT (Bootstrap Likelihood Ratio Test) (McLachlan & Peel, 2000), with significant  $p$  values implying that the  $K$  class model had better fit than the  $K-1$  class model (Nylund-Gibson & Choi, 2018); and the Likelihood Ratio Chi-square ( $\chi^2$ ) Test, with non-significant  $p$  values indicating model-data fit. After model selection, the assumption of local independence, which implies that observed variables conditional on the latent classes are independent (Magidson & Vermunt, 2004), was tested using standardized bivariate residuals (<1.96).

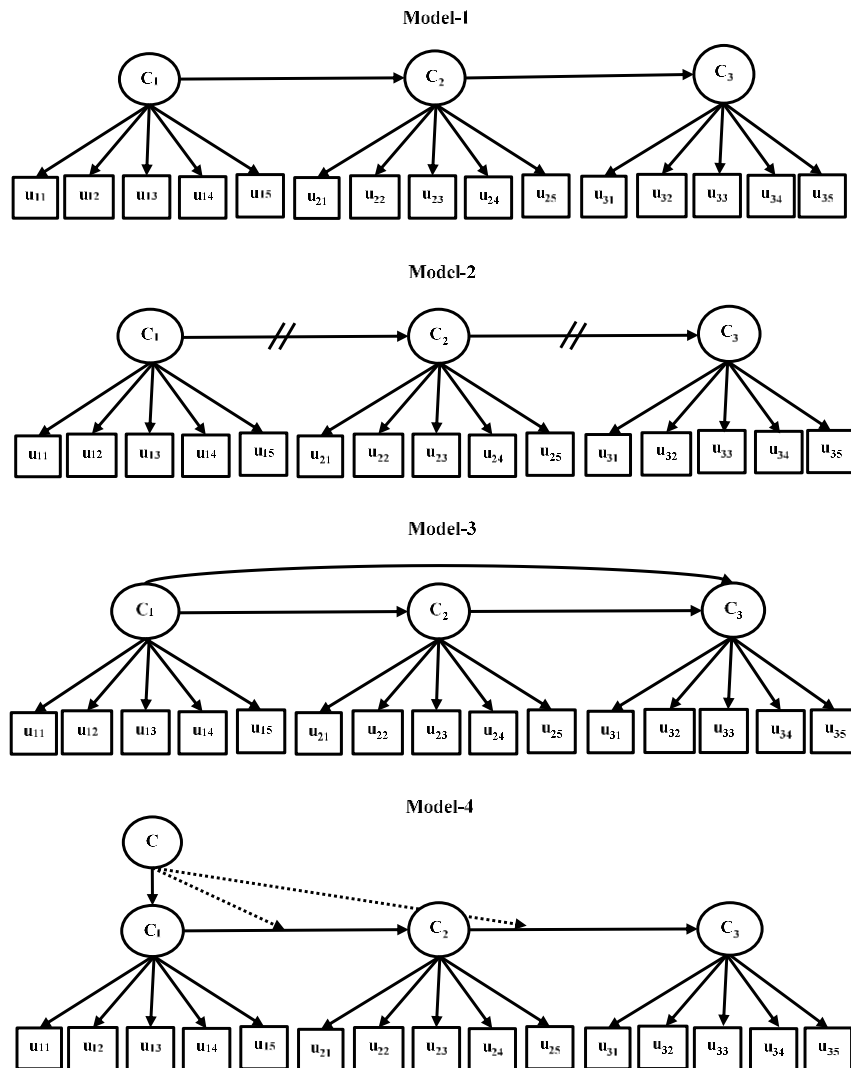
*Step 2: Exploring transitions based on cross-sectional results.* Based on the class membership probabilities estimated in Step 1, individuals were assigned to the identified classes based on their highest latent class probabilities at each time point. Cross-tables were then constructed to examine the observed transitions between these measurement points.

*Step 3: Examining measurement invariance assumption.* Two models (non-invariance and full-invariance) were tested to ensure that the measurement invariance assumption was met. In the non-invariance model, item-response probabilities were estimated freely for all time points, while in

the full-invariance model, they were constrained to be equal. If the assumption holds, it can be said that latent classes have the same meaning for all time points, and direct inferences can be made regarding the change (Collins & Lanza, 2010; Nylund, 2007).

*Step 4: Testing LTA models and exploring transitions.* The four LTA model alternatives given in Figure 1 were evaluated: (1) a model involving only first-order (lag-1) effects, (2) a model involving first-order (lag-1) effects where the transition probabilities were restricted to be equal between time points, (3) a model involving both first-order (lag-1) and second-order (lag-2) effects, (4) a model involving a second-order latent variable with two latent classes (mover-stayer), in which the transition probability parameters for the “mover” class are freely estimated while the probabilities for the “stayer” class are constrained to being a unit matrix. The model-data fit was evaluated using the AIC, BIC (Collins & Lanza, 2010), and Likelihood Ratio Test (Nylund, 2007), which are suggested for model evaluation in LTA. Finally, the parameters estimated by the model providing the best fit were summarized and interpreted in the context of the theoretical framework.

For LCA and LTA, Mplus 7.0 was used (Muthén & Muthén, 1998-2012). This program can deal with missing data among the observed variables using FIML (Full Information Maximum Likelihood) (Nylund, 2007). And, it is sufficient for analysis to have data even at a single measurement point (Wang & Wang, 2012).



**Figure 1. LTA models**

*Note.* C represents categorical latent variables and u represents categorical observed variables.

## RESULTS

**Step 0: Descriptive statistics.** The proportions of individuals in the “High” category for item *A1* were .17, .30, and .21 for the 3-time points, respectively, while they were .07, .11, and .10 for item *A2*. These proportions were .35, .31, and .23 for item *R1*; .66, .68, and .60 for item *R2*; and .76, .74, and .66 for item *R3*. Accordingly, it can be said that the distribution of individuals into categories was similar across the time points. The proportions of missing data were .18, .14, and .20 for item *A1*; .18, .14, and .20 for item *A2*; and .16, .13, and .19 for item *R1* for the time points, respectively. There were no missing data for items *R2* and *R3*.

**Step 1: LCA models for each time point.** The model fit indices (Table 1) indicated that the 4-class model was most plausible for the first time point ( $T_1$ ). Specifically, it was seen that the models with 3, 4, and 5 classes fit the data well (LR  $\chi^2$   $p > .01$ ), and the 3-class model had the smallest BIC while the 4-class model had the smallest BIC. The VLMR-LRT and BLRT values showed that the 4-class model improved the model fit compared to the 3-class but the 5-class model did not improve the fit compared to the 4-class. In the other time points,  $T_2$  and  $T_3$ , the 4-class model was also chosen, considering not only the model fit indices but also the parsimony and interpretability of the model. For the selected models, the standardized bivariate residuals for each time point were less than 1.96, showing that the local independence assumption was met.

After model selection, estimations for the conditional item-response probabilities were examined and it was observed that the latent classes had different response probability patterns in each data wave in terms of the items related to adversity (*A*) and resilience (*R*) (Appendix A). In alignment with the hypothesis derived from the theoretical framework, the four latent classes were labeled as *Resilience*, *Competence*, *Maladaptation*, and *Vulnerability* after an in-depth analysis of the individuals’ item-response patterns as estimated by the LCA models.

**Table 1. Fit indices for LCA models**

	Models				
	1-class	2-class	3-class	4-class	5-class
$T_1$					
AIC/BIC	1757.91/ 1777.34	1665.34/ 1708.08	1604.44/ 1670.51	1602.39/ 1691.77	1610.63/ 1723.33
LR $\chi^2$ (df), $p$	198.29 (25), .00	93.18 (20), .00	20.28 (14), .12	6.26 (7), .51	3.05 (1), .08
VLMR-LRT, $p$	-	104.58, .00/	72.89, .00/ 72.89,	14.05, .01/	3.76, .33/
BLRT, $p$	-	104.58, .00	.00	14.05, .00	3.76, .67
$T_2$					
AIC/BIC	1920.83/ 1940.26	1833.60/ 1876.35	1759.94/ 1826.00	1756.93/ 1846.31	1767.37/ 1880.07
LR $\chi^2$ (df), $p$	202.13 (26), .00	102.90 (20), .00	17.24 (14), .24	2.23 (8), .97	.68 (2), .71
VLMR-LRT, $p$	-	99.23, .00/ 99.23,	85.66, .00/ 85.66,	15.01, .11/	1.56, .53/
BLRT, $p$	-	.00	.00	15.01, .00	1.56, .67
$T_3$					
AIC/BIC	1848.03/ 1867.46	1731.33/ 1774.08	1660.05/ 1726.12	1641.94/ 1731.32	1637.72/ 1750.42
LR $\chi^2$ (df), $p$	261.16 (26), .00	132.46 (20), .00	49.18 (14), .00	19.07 (8), .01	2.85 (2), .24
VLMR-LRT, $p$	-	128.70, .00/	83.28, .00/ 83.28,	30.11, .01/	16.22, .00/
BLRT, $p$	-	128.70, .00	.00	30.11, .00	16.22, .00

Note. df = degrees of freedom

**Step 2: Transitions based on cross-sectional results.** Based on the cross-tables of class membership assignments (Appendix B), it was observed that the proportions of individuals staying in specific classes (e.g., *Competence*) were higher compared to others. The proportions of individuals moving between specific classes (e.g., from *Maladaptation* to *Vulnerability*) were higher than others, indicating various transition patterns in the data.

**Step 3: Measurement invariance assumption.** The fit indices of the non-invariance and full-invariance models showed that the assumption of measurement invariance was met for the current data (non-invariance model AIC = 5001.85, BIC = 5269.99; full-invariance model AIC = 4959.14, BIC = 5071.84;  $\Delta\chi^2(40) = 36.52, p > .05$ ). Hence, it was concluded that characteristics or meaning of the latent classes were equivalent for all time points.

**Step 4: LTA models and transition probabilities.** Based on the fit indices of the LTA model alternatives (Table 2), it was observed that the model with the smallest BIC was Model-2, while that with the smallest AIC was Model-3. However, in the estimation of Model-3, a warning message was received, stating that the parameter estimations might not be trustworthy for some reason. When nested Model-1 and Model-2 were compared, a significant difference was found, but Model-2 was chosen as the final model because it was more parsimonious and did not reveal any estimation problems.

**Table 2. Fit indices for LTA models**

	Model-1	Model-2	Model-3	Model-4
AIC	4816.40	4819.94	4808.17	4812.57
BIC	4999.05	4955.95	5025.79	5010.76
Log-likelihood	-2361.20	-2374.97	-2348.08	-2355.28
#p	47	35	56	51
c	.98	1.10	.89	1.03
cd	.63		--	--
TRd, <i>p</i>	43.67, .00		--	--

*Note.* #p = Number of parameters, c = Scaling correction factor, cd = Difference test scaling correction, TRd = Chi-square difference test

The parameter estimations of Model-2 are presented in Table 3. Statuses were labeled based on a joint evaluation of the theoretical model and the conditional item-response probabilities estimated equally for all times. The first status, with high probabilities for both the adversity (*A*) and resilience (*R*) items, was labeled as *Resilience*, while the second status, which had low probabilities for adversity items and high probabilities for resilience items, was labeled as *Competence*. The third status, with high probabilities for adversity items and low probabilities for resilience items, was labeled as *Maladaptation*, while the fourth status, with low probabilities for both groups of items, was labeled as *Vulnerability*.

**Table 3. Item-response probabilities and latent status prevalences estimated for Model-2**

Items	Statuses			
	Resilience	Competence	Maladaptation	Vulnerability
Item-response probabilities				
A1	1.00	.00	1.00	.09
A2	.42	.00	.54	.00
R1	.52	.44	.09	.12
R2	.83	.85	.18	.21
R3	.90	.94	.00	.33
Latent status prevalences				
T <sub>1</sub>	.14	.61	.05	.20
T <sub>2</sub>	.20	.48	.08	.25
T <sub>3</sub>	.19	.43	.09	.28

*Note.* Item-response probabilities are presented for the response category “High.”

The latent status prevalences (Table 3) indicated that the proportions for the *Resilience*, *Maladaptation*, and *Vulnerability* statuses were similar for all time points and the proportions for the *Maladaptation* status were low. For *Competence*, it was observed that the proportion of individuals



with this status at time  $T_1$  was higher than at other time points and higher than the proportions of the other statuses.

**Table 4. Transition probabilities estimated for Model-2**

	T+1			
	Resilience	Competence	Maladaptation	Vulnerability
Resilience	.41	.46	.00	.13
Competence	.22	.64	.03	.11
Maladaptation	.04	.17	.34	.45
Vulnerability	.01	.10	.20	.69

*Note.* One set of transition probabilities was estimated because of equality constraints.

The transition probabilities (Table 4) showed that individuals with statuses reflecting low levels of adversity (statuses of *Vulnerability* and *Competence*) tended to stay in the same status over time. In contrast, individuals with statuses reflecting high levels of adversity (statuses of *Maladaptation* and *Resilience*) tended to move toward other statuses. The probabilities of transitioning from *Resilience* (with high adversity and resilience) to *Competence* (with low adversity and high resilience) and from *Maladaptation* (with high adversity and low resilience) to *Vulnerability* (with low adversity and resilience) were higher compared to other transition probabilities.

## DISCUSSION

The purpose of the current study was to illustrate an application of LTA using 3-wave resilience data where latent class memberships were estimated for a group of pre-service teachers. The results showed that the model with four classes had the best fit. These latent classes were interpreted in line with a theoretical model proposing that individuals can be divided into groups characterized by their experienced adversity and adaptability levels (Masten, 2015; Masten & Tellegen, 2012; Masten et al., 1999; Masten et al., 2004). LTA model alternatives were tested to model the transitions among these classes and it was observed that the best fitting model was the one with equal transition probabilities between time points. As a result, it was concluded that individuals were more likely to maintain the statuses of *Competence* and *Vulnerability* (low adversity). In contrast, individuals with the status of *Resilience* (high adversity, high resilience) and *Maladaptation* (high adversity, low resilience) had a tendency to move toward statuses with the same level of resilience but lower adversity. Presenting detailed information at the individual level, these findings provide insights into practical and theoretical terms by raising additional questions, such as what are the factors affecting the transition patterns and how these patterns affect other characteristics of individuals.

While this paper's primary focus has been to provide a brief overview and an application of LTA, the results were also helpful in compiling a meaningful narrative that was later shared with a group of participants ( $n=12$ ) who agreed to participate in a follow-up study. The majority of these participants confirmed that the findings presented to them about their predicted class memberships and transition patterns were reasonably accurate. The results showing that intra- and inter-individual differences existed in terms of resilience offer a reflection of how to model repeated data obtained with a longitudinal design and interpret the findings when the construct of interest is prone to change and can be considered categorical.

It should be noted here that the inferences made in this study are subject to a number of limitations due to the use of a relatively small sample, few items, and a temporal design with a limited number of measurement occasions. A temporal design with 3-time points at 4-week intervals was used in this study. Although the ideal approach is to plan a temporal design as suggested by the theoretical model (Collins, 2006), this may not always be possible due to the lack of logistical resources. Among resilience studies, there are examples of research in which data were collected over 3 months to 2-6 years (Cosco et al., 2017). However, it has been stated that collecting data at closer and more frequent time points might be a more effective way to capture change (Collins & Lanza, 2010; Timmons & Preacher, 2015). In addition, in the present study, five indicator variables were used, which were

related to experienced adversity and perceived resilience. One reason for this was that there might be model definition problems if the number of items is high in LTA. The other reason was the limitations of the current resilience measures while collecting repeated data. Hence, it is of utmost importance that the inferences presented here about these pre-service teachers' resilience transition patterns not be taken as inferences to be generalized to pre-service teachers at large.

We only tested four versions of LTA models here, but various extensions of these models can be formulated. For example, higher-order effects might be added using data from more time points, specific transition probabilities might be constrained (e.g., setting some to 0) to test hypotheses about change, various groups (e.g., gender) might be compared concerning transition patterns, and other measurement models might be used (e.g., DINA model (Li et al., 2016)). By incorporating auxiliary variables into the models, the features of the individuals forming the classes and the results of class membership could be examined in more detail (Nylund-Gibson et al., 2014).

This study has presented an illustrative example of LTA modeling that can be used to obtain in-depth information for studies in which qualitative individual differences and changes related to such constructs are of interest. The information provided by the models proposed here is of a quality that can potentially meet the needs of researchers studying individual differences by placing individuals at the center of their research studies (Molenaar, 2004; Raufelder et al., 2013). The information gained at the individual level might be helpful for monitoring individuals, designing tailored prevention and intervention programs (Beck et al., 2010), or evaluating such existing programs' short- and long-term effectiveness for specific subgroups (Lanza et al., 2003). Researchers in psychology and education interested in evaluating individuals' developmental processes may take advantage of the LTA by utilizing person-centered approaches and longitudinal assessment designs that can be used to discover time-sensitive qualitative individual differences.

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## APPENDIX A

### Item-response probability estimations for each time point

Items	Classes			
	Class-1	Class-2	Class-3	Class-4
T <sub>1</sub>				
A1	1.00	.00	1.00	.25
A2	.52	.00	1.00	.00
R1	.53	.51	.14	.09
R2	.94	.80	.01	.10
R3	.80	.92	.00	.27
T <sub>2</sub>				
A1	1.00	.15	1.00	.00
A2	.50	.00	.37	.00
R1	.49	.50	.05	.12
R2	.81	.94	.19	.29
R3	.86	.98	.07	.46
T <sub>3</sub>				
A1	1.00	.00	1.00	.22
A2	.34	.00	1.00	.00
R1	.52	.29	.09	.15
R2	.75	.80	.27	.07
R3	1.00	.89	.00	.02

*Note.* Item-response probabilities are presented for the response category “High.”

## APPENDIX B

### Cross tabulation of class membership assignments based on results of Step-1

		T <sub>2</sub>			
		Resilience	Competence	Maladaptation	Vulnerability
T <sub>1</sub>	Resilience	.43	.43	.03	.13
	Competence	.24	.47	.05	.24
	Maladaptation	.00	.00	.33	.67
	Vulnerability	.07	.32	.19	.42
		T <sub>3</sub>			
		Resilience	Competence	Maladaptation	Vulnerability
T <sub>2</sub>	Resilience	.27	.59	.02	.12
	Competence	.11	.76	.03	.11
	Maladaptation	.04	.35	.19	.42
	Vulnerability	.02	.45	.11	.42

## **How does Students with and without Disabilities Perceive Student–Teacher Relationship in Inclusive Elementary Classrooms?**

**Aysegul Sukran Oz<sup>i</sup>**

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### **Abstract**

This investigation aims to examine the differences in perceived Student–Teacher Relationship (STR) among students with mild intellectual disabilities (SMID), low academic achievement (SLAA) and high academic (SHAA) achievement in Turkish inclusive elementary classrooms. Student participants were interviewed to complete a scale. Teacher participants completed teacher demographic information, student and classroom information forms. The findings indicate that except students' gender, teachers and students demographic characteristics do not affect the students' perceptions of the STR. Girls appear to be more satisfied in STRs than boys. SMID and SLAA are less satisfied in STRs than high achieving group. The satisfaction levels of the child participants in the emotional, informational and closeness dimensions of the STR were significantly different for SMID. The results demonstrate that the participants' ratings of closeness significantly differ from the emotional and informational support dimensions.

**Keywords:** Student–teacher Relationship, Inclusive Classroom, Intellectual Disability, Academic Achievement, Student Perception.

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## INTRODUCTION

In the last two decades, there has been a philosophical shift with regards to the educational placements of children with disabilities in Türkiye. This change highlights that children with special needs to be included in regular classrooms. Inclusive school models were developed, and the standards and principles of inclusive education were determined (Ministry of National Education [MNE], General Directorate of Special Education and Guidance Services, 2013). Consequently, parallel with the international developments in the field of special education, more students with mild intellectual disabilities (SMID) found their places in general education classrooms next to their typically developing peers (Hallahan & Kauffman, 2003; Klang et al., 2020). Regardless of the large number of SMIDs in the school system (Bowe, 2005; Salend, 2005), and scientific evidence demonstrating the invaluable benefits of inclusive education for all parties involved, the desired levels of full participation of individuals with disabilities in schools and social life have not yet been achieved (Smith, 1998), only a small percentage of them were able to take their rightful place in the classroom (United States [US] Department of Education, 1994).

Teachers are among the most important elements of the successful inclusive education (De Boer et al., 2011; Stronge et al., 2011). The positive attitudes of classroom teachers play a significant role in the social acceptance of SMID in inclusive classrooms. In inclusive classrooms, the teacher-perceived student-teacher relationship (STR) is positively correlated with the involvement in peer relationships and the level of the social inclusion of children with disabilities (Robertson et al., 2003). Previous studies demonstrate that the sense of belongingness, perceived pedagogical caring and strong STR are critical elements of the school success of children (Pianta, 1999; Wentzel, 1998). A positive STR and a caring atmosphere result in higher levels of engagement in school activities and higher grades (Christiansen, 1982; Fraire et al., 2013; Pianta et al., 1997).

### **Student-Teacher Relationship (STR)**

The STR is a multidimensional and dyadic construct; so, it is affected by the demographic features and characteristics of the teachers and students with and without disabilities (Murray et al., 2008; Prino et al., 2016). The resources, organizational structure and culture of the school (Baker, 2006; İpek, 1999; Murray & Malmgren, 2005; Pigott & Cowen, 2000), classroom structure and instructional practices (Hamre & Pianta, 2005; Jordan & Stanovich, 2001; Pieratt, 2011), and, beliefs and behaviors of teachers (Sutton & Wheatley, 2003) affect the STRs. The effects of the STR quality are greater on children at risk for academic failures, such as students with special needs and low socioeconomic and ethnic minority status (Hamre & Pianta, 2001).

Although it is an important construct for all students, the impact of STR on children with special needs is even more palpable. To illustrate; an analysis of 99 previous studies, conducted between 1990 and 2011, reveals that negative STRs diminish the school engagement and achievement of students with learning difficulties (Roorda et al., 2011). Although a strong STR is notably important for students with Learning Disabilities (LDs), Emotional Behavioral Disorders (EBDs) and MIDs academically, mentally, socially and emotionally (Murray & Pianta, 2007), some features of their disabilities, such as difficulties with self-regulation and organization (Salend, 2005), language and communication issues, internalizing and externalizing problems (Bowe, 2005) may be preventing them from establishing and benefiting from the social relationships with others (Tekinarslan & Kucuker, 2015).

The disability type and magnitude play a role in the STR (Baker, 2006; Prino et al., 2016; Thijs & Koomen, 2009). Prino et al. (2016) compared the effect of different disability statuses such as no-disability, Autism Spectrum Disorder (ASD), LD, Attention Deficit and Hyperactivity Disorder (ADHD) and Down Syndrome (DS) on the teachers' and teacher aids' perceptions regarding the STR. The perception of teachers and teacher aids of the quality of the STR with their typically developing students and students with DS were comparable. Students with LDs were reported to be more dependent than their high and low achieving classmates. However, the relationship with the students

with ASD and ADHD were perceived less close and more conflictual, i.e. less warm and affectionate with fewer occasions of sharing emotions and conversations. Another study revealed the relationship between the perceptions of the STR of teachers and the behavioral characteristics of children with ASD in inclusive classrooms, which demonstrated that the inattentiveness, impulsivity and opposition of students were associated with the perception of teachers of conflicted relationships. Likewise, the teachers viewed the children who exhibited hyperactivity/impulsivity and oppositional behaviors in more dependent relationships with their teachers (Robertson et al., 2003).

The teachers feel frustrated particularly when their teaching is interrupted by factors such as behavior problems of the students, not adhering to the classroom rules or out-of-class factors (Amstad, & Müller, 2020; Emmer, 1994; Haydon et al., 2018; Hargreaves, 2000). In sort, the type and severity of students' disabilities may have an impact on teachers' emotions and thus their perception of STR. The next section focuses on the child's, the other part of bilaterally structured STR, understanding of the teacher's emotions.

The positive and negative emotions of individuals are conveyed through psychological vocal (Johnson & Scherer, 2000) and physical changes, such as facial expressions, (Cacioppo et al., 2000; Planalp, 1999). Students at various grades can understand and be affected by negative and positive teacher emotions (Thomas & Montgomery, 1998). They may learn more about these emotions by observing these positive and negative exchanges, while their teachers interact with other students. In fact, Hughes et al., (2001) suggest that when children make a decision about a peer's likeability and characteristics, they consider the quality of teacher support provided to the peer in question along with their direct experiences with the peer and his/her social standing. A positive classroom atmosphere formed by the combination of emotional and instructional support may be even more important for the young children who demonstrate behavioral, attention, social and/or academic problems (Hamre & Pianta, 2005). Thus, the relationship between teachers and students with disabilities (SWD) is notably important in terms of peer acceptance inclusive settings.

The previous studies confirm the positive effects of STR for the students with and without disabilities and provide information on the factors that affect the STR (Hughes et al., 2001). However, there is limited information on designing and examining the intervention programs that target the STR particularly for students at risk (Murray & Malmgren, 2005). A recent study was conducted with 90 students aged between eight and eleven to determine the mediating effect of daily progress reports, coach-student, student-teachers and teacher-student relationships and their interaction on the behavioral outcomes of the students who participated in a one-year behavioral intervention program. Forty participants had a type of disability, such as LDs, ADHD, intellectual disabilities (IDs) and ASD. The findings indicate that regardless of the opinions of teachers, the positive student's perception of the STR moderates the intervention results with a decline in problem behaviors (Stage & Galanti, 2017). Another study investigated the effects of a teacher-student relationship program on the school competence, school adjustment, internalizing and externalizing behaviors, classroom engagement and academic grades of African-American high school students in a high-poverty school setting, where 25% of the students were identified with special needs (Murray & Malmgren, 2005). Although the researchers did not observe a change in social and emotional adjustment, an increase in grade point averages of high school students was noted.

A strong theoretical (Pianta & Steinberg, 1992) and empirical foundation (Murray & Malmgren, 2005; Sakız, 2017) that provides evidence for the importance of the STR was built. Research on typically developing children has demonstrated that a well-established STR increases the self-esteem of students, decreases the levels of depression (Reddy et al., 2003), improves motivation and school engagement (Rosenfeld et al., 2000), increases positive attitudes towards school (Longobardi et al., 2021) and contributes to their academic achievement (Murray & Malmgren, 2005; Sethi, & Scales, 2020). Comparable findings were reported by the researchers for students with disabilities. To illustrate, when students with high incidence disabilities have an accepting, satisfying and constructive relationship with their teacher, they experience less loneliness (Al-Yagon & Mikulincer, 2004) and lower levels of anxiety and conduct problems (Murray & Greenberg, 2001).

Positive relationships with teachers act as a buffering factor for children with disabilities (Baker, 2006). However, compared with their typically developing peers, the children with special needs feel less content in their relationship with teachers (Al-Yagon & Mikulincer, 2004; Murray & Greenberg, 2001). These differences in perceptions were also noted by the teachers. For example, Prino et al. (2016) have demonstrated that the perceptions of STR of Italian teachers change based on the disability status of the student and are affected by the type of disability.

In summary, the STR has been comprehensively examined for typically developing children (Eisenhower et al., 2007), specifically from the teachers' perspective (Fraire et al., 2013; Koomen et al., 2012; Tsigilis & Gregoriadis, 2008), using the STRS developed by Pianta (2001). However, after synthesizing 119 studies, which were conducted in the US, Canada, Philippines, Brazil, Germany and the UK in the years from 1948 to 2004, Cornelius-White (2007) concluded that the views of STR of the students and observers were actually more predictive of the students' success. Despite the importance of understanding the internal judgments of children in terms of relationships (Lynch & Cicchetti, 1997; Olson, 1977; Reid, Landesman, Treder, & Jaccard, 1989), few studies focused on the student perceptions (Mantzicopoulos & Neuharth-Pritchett, 2003; Murray et al., 2008; Oz & Dolapcioglu, 2019; Williams, 2012). Additionally, there is a scarcity of research that focuses on the STR through the entire elementary school period (Baker, 2006). Despite its relevance to the emotional, social and academic well-being (Murray & Pianta, 2007) and the social inclusion of students with special needs in regular classrooms (Robertson et al., 2003), there are even fewer studies on the relationship between teachers and students with developmental vulnerabilities (Eisenhower et al., 2007; Prino et al., 2016; Roorda et al., 2011). Further, previous research rarely incorporates SWD as participants (Losh, et al., 2022).

The present study aims to expand the purview of research on relationships between teachers and students in two ways. First, the STRs in Turkish inclusive elementary education classrooms from the students' standpoint will be examined. Secondly, the differences in perceived STR among the three different group of students with MID (SMID), low academic achievement (SLAA) and high academic achievement (SHAA) will be presented.

## METHODS

### Participants

The sample consisted of 126 students with and without disabilities and 42 teachers. All teacher participants had a bachelorette degree in elementary education. The participating children included 60 girls and 66 boys. These children were in first (23,8%), second (14%), third (26%) and fourth (35,7%) grades between the ages six and 11. All children were enrolled in 30 inclusive classrooms in public schools in different districts of Hatay, Türkiye. Among these 126 children, 42 were SMID; the others were typically developing students with low academic achievement ( $n = 42$ ) and high academic achievement ( $n = 42$ ). The academic achievement statuses of typically developing students were determined by the classroom teachers using a 3-point Likert scale (1 = low academic achievement, 2 = average academic achievement, 3 = high achievement). The student participants with MID in this study were diagnosed and placed in inclusive classrooms by the Guidance and Research Centers in the city. In congruence with the fifth edition of The Diagnostic and Statistical Manual of Mental Illnesses (DSM-V), the Special Education Services Regulation in Türkiye defines IDs as a 'developmental condition that is characterized by significant deficits in both intellectual functioning and adaptive behavior, including conceptual, social and practical skills that are present before the age of 18 (American Psychiatric Association [APA], 2013). According to DSM-IV-TR, individuals with MID have an IQ score ranging between 50, 55 and 70, which are associated with deficits in adaptive functioning (APA, 2000).

### Data Collection Tools

**My teacher and I-Child scale (MTI-C).** The My Family and Friends (MFF) instrument was first developed by Reid et al., (1989). This study demonstrated that using MFF, the perception about social support can be measured reliably and validly from early childhood through adolescence. The original MFF was transformed into the My Family and Friends-Child scale (MFF-C) by Murray et al. (2008) and was used to understand the ability of kindergarteners to provide reliable information on STRs.

MFF was modified by C. Murray, K. Murray, Was (2008) based on the STR. The scale contains a two-stage structure for each item. The first stage of each question requires the student to answer in the form of 'yes' and 'no'. This first section assesses whether the child has received a certain type of support from his teacher. If the child says 'no', the score is given as '0'. If the child gives a 'yes' answer, they move to the second stage. The second stage requires the students to state their ratings for the perceived support level. These support types are listed as four different factors in the scale: informational support, emotional support, closeness and conflict. The children must answer the second part of the question with a feeling barometer that contains four levels: I feel no happiness, I feel very little happiness, I feel a little happy, I feel very happy. The information support factor of the scale contains three items and accounts for 24.9% of the total variance ( $\alpha = .65$ ). The emotional support factor contains four items and accounts for 11.4% of the total variance ( $\alpha = .51$ ). The Closeness Factor contains three items and accounts for 10.9% of the total variance ( $\alpha = .46$ ). The conflict factor contains one item and accounts for 9.6% of the total variance ( $\alpha = 0.67$ ).

The MFF-C scale was adapted to the Turkish culture by Oz and Dolapcioglu (2019). Since the adapted form of the scale only focused on the STR, it was renamed 'My Teacher and I-Child Scale (MTI-C)' to fit the scale's content. The My Teacher and I- Child form was perfectly consistent in terms of the model fit indices (RMSA: .033, RMR: .011, SRMR: .050 and CFI: .91), and it was concluded that the scale had model fit. Although the  $\chi^2 /df$ , RMSEA, RMR, SRMR, GFI and AGFI values are at a perfect level of fit, the fit indices of the model related to the CFI and IFI values are at an acceptable level (Kline, 2005; Ullman, 2001). In the analyses for the reliability study of the scale, the internal consistency Cronbach value was .59. My Teacher- I scale includes ten items and three factors: emotional support, informational support and closeness, which include 3, 3 and four items, respectively.

Although Reid et al., (1989) reported that MFF was appropriate for evaluating young children with IDs, kindergarteners, atypical populations and special adolescents that could not be evaluated with other readily available tools, to use the MTI-C with elementary students with MID, an additional CFA and reliability analysis was conducted. Cronbach alpha value was found to be .61, which indicates acceptable scale reliability (Özdamar, 1999). To conduct the CFA, 80 students (who were not involved in the actual study) diagnosed with MIDs were selected from inclusive classrooms in 206 schools in nine different districts in the city of Hatay. The CFA results revealed that the My Teacher and I- Child form was perfectly consistent in terms of the model fit indices for using with students with MIDs [ $\chi^2 /df = 30.01$ ; RMSA: .000; RMR: .011; SRMR: .065; CFI: 1.00; NNFI: 1.23].

**Information forms.** To collect data, three different information forms were used as follows: teacher demographic information form, student form and classroom information form. The teacher demographic information form includes questions related to the gender, age, years of experience, major, previous experience in inclusive classrooms, level of knowledge on inclusive education, experience of having taken classes related to the characteristics of SWD and inclusive education in college; and participation in in-service trainings on inclusive education of the teachers. The questions in the student information form were about age, gender and students' grade-levels. The last form was used to gather information on the classroom size and number of SWD in the classroom.

## Data Collection Procedures and Analysis

At the beginning of the 2016–2017 school-years, necessary permissions to collect data from public elementary schools in the entire city were secured. After identifying schools with inclusive classrooms in each district, the number of SWD in each classroom and the disability type were determined. A list of elementary schools with at least three included students with MID was created. Although no formal information on socioeconomic profiles for schools or districts was available, the school locations demonstrated a wide variety from rural to urban; and from the low-socioeconomic status to upper middle class. 30 elementary schools were randomly selected from this final list.

Before the data collection began, the school principals and classroom teachers were visited to provide information on the study. The list of included students with MID provided by the Provincial National Education Directorate and school records were compared and confirmed. After randomly selecting classrooms with students with MID, the classroom teachers completed a teacher and classroom information sheet and rated the academic achievement of their students using a 3-point scale (1 = low; 2 = medium; 3 = high academic achievement) on a class roster. For each SMID, two typically developing children (one low achieving and one high achieving) were randomly selected from this list.

To ensure that the children and teachers had time to develop relationships, all data were collected during an eight-week period at the end of the spring semester. MTI-C was individually administered in a quiet room outside of the classroom, designated by the school principles. All participants were informed that their answers were confidential, and they could withdraw from the study at any time. Before beginning the actual assessment, each child was required to demonstrate an understanding of the four levels of the feeling barometer. All child participants had an opportunity to explore the materials and ask questions. When the assessment was completed, each child was escorted to the classroom.

Prior to the actual data analysis, fundamental tests, such as missing values and outlier identification, were conducted. LISSREL 9.1 and the SPSS-20 Statistics programs were used for the data analysis, and the significance threshold was determined as .05 and .01. Mann-Whitney U, Kruskal-Wallis, Chi-square, Independent t-tests and One Way ANOVA were used to detect the differences among the groups.

## RESULTS

### Analysis of the Demographic Variables

Tables 1, 2 and 3 summarize the findings related to the differences in STR ratings based on the demographic characteristics of the participants.

**Table 1. Mann-Whitney U Test Results for Elementary Education Students' STR Ratings**

Variable		n	Mean Rank	Sum of Ranks	U	p
Gender	Female	30	19.98	579.5	144.5	.40
	Male	12	23.46	281.5		
Years of experience	6–15 years	10	24.05	240.5	134.5	.46
	16 years +	32	20.70	662.5		
Had an inclusion student earlier	Yes	32	20.55	657.5	129.5	.37
	No	10	24.55	245.5		
Level of knowledge in inclusion	Yes	22	20.09	442	189	.43
	No	20	23.05	461		
Course taken on SWD during undergraduate education	Yes	16	17.25	276	140	.11
	No	25	23.40	585		
Course taken on inclusion during undergraduate education	Yes	9	16.28	146	101	.18
	No	32	22.33	714		
Attended an in-service training on special education	Yes	18	19.89	358	187	.60
	No	23	21.87	503		

According to the results, the students' perceptions of STR did not differ with respect to the demographic characteristics of teachers, such as gender, age, years of experience, prior experience of having an inclusion student, level of knowledge on inclusion, having taken courses on SWD and inclusion during undergraduate education and attending in-service training on special education ( $p > .05$ ). Thus, the demographic characteristics of the teachers do not meaningfully affect the STR according to the student judgments.

**Table 2. Mann-Whitney U Test Results for Elementary Education Students' STR Ratings**

Variable		n	Mean Rank	Sum of Ranks	U	p
Number of inclusion students	1	32	20,17	645,5	117,5	.72
	2-4	8	33,52	174,5		
Classroom size	10-20	9	20,28	182,5	137,5	.74
	20-40	33	21,83	720,5		

The results indicate that the students' ratings related to the STR do not differ based on the classroom size and number of SWD ( $p > .05$ ). Of the 30 classes randomly selected for the study, the largest number of students in one classroom was between 30 and 40. In each classroom, there were two to four SWD. Neither the classroom size nor the number of students with special needs in the classroom had a meaningful effect on students' perceptions of STR.

**Table 3. Independent t-Test and Mann-Whitney U Test Results for the STR Ratings of Elementary Education Students**

Variable		n	$\bar{X}$ /Mean Rank	SS	sd	$t/\chi^2$	p
Gender	Girls	60	34,47	6,04	115	2,29	.02*
	Boys	66	31,61	7,33			
Grades	1	30	70,27	-	3	2,57	.46
	2	18	54,06	-			
	3	33	65,80	-			
	4	45	61,08	-			

The results of this analysis indicate a statistically significant difference in the ratings between boys and girls of STR  $t(115) = 2,29$ , and  $p < .05$ . The student grades are not a differentiating factor. Girls appear to be more satisfied in STRs ( $X = 34,47$ ) than boys ( $X = 31,61$ ). This finding demonstrates the meaningful association between the students' gender and their ratings of the STR. The STR ratings of the male students with their teachers are weaker.

### Analysis of Differences in the STR among Student Participants

The student participants of this study rated their STR based on their satisfaction level with the type of social support that they received from the teachers using the MTI-C scale. This section presents the differences observed in the ratings of the entire MTI-C Scale and MTI-C Subscales in three different student groups: SMID, students with high academic achievement (SHAA) and students with low academic achievement (SLAA).

**Table 4. One Way ANOVA Results for the MTI-C Subscales Ratings of Elementary Education Students**

	Variable	n	$\bar{X}$	SS	sd	F	p
Informational Support	SMID	42	8,65	2,90	123	2,73	.07
	SLAA	42	9,18	2,20			
	SHAA	42	8,95	2,47			
Emotional Support	SMID	42	9,60	2,76	123	.540	.58
	SLAA	42	9,44	2,49			
	SHAA	42	10,00	2,33			
Closeness	SMID	42	11,07	3,17	123	3,00	.05
	SLAA	42	11,25	2,73			
	SHAA	42	12,40	2,07			
Total MTI-C	SMID	42	32,09	8,07	123	3,15	.04*
	SLAA	42	32,37	5,82			
	SHAA	42	35,38	5,83			

According to Table 4, when the student ratings of the STR are investigated, a significant difference among three student groups is observed ( $F(2,123) = 3,15; p < .05$ ). A post hoc Tukey test shows that the SHAA group was significantly different from both SMID and SLAA groups at  $p < .05$ . These findings indicate that the SMID and SLAA groups were less satisfied in STRs than the SHAA group. To investigate this significant difference, chi-square tests for each subscale was conducted based on three different student groups.

**Table 5. Chi-Square Results for the Closeness Factor in STR Based on the Student Groups**

Items	Ratings	Student Groups						Chi-Square		
		SMID		SLAA		SHAA		$\chi^2$	sd	p
		%	f	%	f	%	f			
3a. Does your teacher say things that make you feel good about yourself?	0 (No)	7,3	3	9,3	4	0	0	9,15	.8	.33
	1	2,4	1	0	0	0	0			
	2	7,3	2	2,3	1	2,4	1			
	3	14,6	6	9,3	4	9,5	4			
	4	68,3	29	79,1	33	88,1	37			
	T	100	42	100	42	100	42			
5a Do you get upset or angry with your teacher, even if you don't show it to him/her?	0 (No)	36,6	15	37,2	16	35,7	15	3,57	8	.89
	1	7,3	3	4,7	2	9,5	4			
	2	9,8	4	11,6	5	19	8			
	3	22	9	18,6	8	19	8			
	4	24,4	11	27,9	11	16,7	7			
	T	100	42	100	42	100	42			
6a. When you do something good at school that makes you feel really happy, such as making a beautiful picture, do you tell (teachers' name)?	0 (No)	17,1	7	7	3	0	0	12,53	6	01*
	1	0	0	0	0	0	0			
	2	2,4	1	4,7	2	0	0			
	3	4,9	2	14	6	16,7	7			
	4	75,6	32	74,4	31	83,3	35			
	T	100	42	100	42	100	42			
10a. Do you ever feel like (teachers' name) really understands you or really knows you?	0 (No)	26,8	11	34,9	15	14,3	6	8,88	8	.30
	1	0	0	2,3	1	0	0			
	2	2,4	1	4,7	2	2,4	1			
	3	26,8	11	30,2	13	38,1	16			
	4	43,9	19	27,9	13	45,2	19			
	T	100	42	100	42	100	42			
10b. How much does your teacher really understand or know you?	0 (No)	26,8	11	34,9	15	14,3	6	8,88	8	.30
	1	0	0	2,3	1	0	0			
	2	2,4	1	4,7	2	2,4	1			
	3	26,8	11	30,2	13	38,1	16			
	4	43,9	19	27,9	13	45,2	19			
	T	100	42	100	42	100	42			

According to Table5, the differences in student perceptions of item 6 varied based on the disability and achievement status of the children:  $\chi^2 (sd=6, n=126) = 12,53, p \leq .05$ . It appeared that 17%

of students with MID did not tell their teacher when they did something good at school. Compared to the SLAA (7%) and SHAA (0%) groups, they have a higher inclination of not sharing pleasant occurrences with teachers, although 75,6% felt ‘a lot’ of happiness if they did. No students in the SHAA group responded ‘No’ to item 6a; they felt either ‘pretty happy’ or ‘a lot’ of happiness because of their sharing with their classroom teacher. In other words, SHAA reported higher levels of satisfaction on item 6 than their peers in other groups.

Although no significant differences were detected, the responses to other items may have an importance to practitioners. To illustrate, 7,3% of SMID and 9,3% of SLAA did not hear things from their teachers that make them feel good about themselves. Further, 88,1% SHAA reported that their teachers made them feel notably good about themselves; SMID (24,6%) and SLAA (27,9) reported that they feel notably angry/upset with their teachers even if they did not show it; 34,9% of SLAA, 26,8 % of SMID and 14,3% of SHAA felt that their teachers did not know or understand them.

**Table 6. Chi-Square Results for the Informational Support Factor in STR**

Items	Ratings	Student Groups						Chi-Square		
		SMID		SLAA		SHAA		$\chi^2$	sd	p
		%	f	%	f	%	f			
2a. When you need help with doing your school work, such as learning the alphabet, do you ask (teachers' name) for help?	0 (No)	14,6	6	11,6	5	7,1	3	10,19	8	.25
	1	4,9	2	0	0	2,4	1			
	2	12,2	5	4,7	2	4,8	2			
	3	14,6	6	20,9	9	7,1	3			
2b. If you go to your teacher for help with school work, how helpful is he/she?	4	53,7	23	62,8	26	78,6	33	12,19	8	.14
	T	100	42	100	42	100	42			
4a. When you want someone to help you learn how things work, such as how to build something, do you ask (teacher' name) to tell you?	0 (No)	12,2	5	11,6	5	4,8	2			
	1	4,9	2	0	0	0	0			
	2	9,8	4	7	3	4,8	2	41,13	8	.84
	3	19,5	8	39,5	17	23,8	10			
4b. How much do you learn about how things work from your teacher?	4	53,7	23	41,9	17	66,7	28			
	T	100	42	100	42	100	42			
7a. When you need help putting on your shoes or coat, do you go to your teacher for help?	0 (No)	22	9	16,3	7	16,7	7	41,13	8	.84
	1	2,5	1	0	0	0	0			
	2	0	0	4,7	2	0	0			
	3	19,5	8	30,2	13	31	13			
7b. If you go to your teacher for help putting on your shoes or coat, how helpful is he/she	4	56	24	48,8	20	53,4	22	41,13	8	.84
	T	100	42	100	42	100	42			

The chi-square results indicate that the differences in the students’ ratings regarding the informational support subscale were not statistically meaningful ( $p \geq 05$ ). Table 6 shows that 14,6 %, 12,3 and 22% of SMID did not go to their teachers for help when they needed assistance with school work, understating how things work and putting on their coats or shoes, respectively. In terms of perceived support for school work and learning about how things work, the SHAA had higher satisfaction levels than the other two student groups.



**Table 7. Chi-Square Results for the Emotional Support Factor in STR**

Items	Ratings	Student Groups						Chi-Square		
		SMID		SLAA		SHAA		$\chi^2$	sd	p
		%	f	%	f	%	f			
1a. When you want to share your feelings, for example when you feel happy or sad, do you share them with your [teacher's name] teacher?	0 (No)	7,3	3	14	6	4,8	2	9,53	8	.30
	1	2,4	1	0	0	0	0			
	2	2,4	1	0	0	7,1	3			
	3	14,6	6	25,6	11	21,4	9			
	4	73,2	31	60,5	25	66,7	28			
1b. How much better do you feel when you share your feelings with your teacher?	T	100	42	100	42	100	42			
9a. If you want to be with someone who makes you happy, would you go to your teacher?	0 (No)	19,5	8	16,3	7	16,7	7	8,77	6	.16
	1	0	0	0	0	0	0			
	2	7,3	3	0	0	0	0			
	3	12,2	5	16,7	7	16,7	7			
	4	61	26	66,7	27	66,7	28			
9b. How happy do you feel if you are with your teacher?	T	100	42	100	42	11	42			
11a. Do you want help from your teacher when there is something that you do not know much about?	0 (No)	9,8	4	9,3	4	7,1	3	2,21	8	.97
	1	2,4	1	2,3	1	0	0			
	2	4,9	2	7	3	7,1	3			
	3	22	9	25,6	11	19	8			
	4	61	26	55,8	23	66,7	28			
11b. If you go to your teacher for help, how much do you learn from him/her?	T	100	42	100	42	100	42			

The chi-square results indicate that the differences in the students' ratings regarding the emotional support subscale were not statistically meaningful ( $p \geq .05$ ).

**Table 8. One Way ANOVA Results for the MTI-C Ratings of Different Student Groups**

Student Groups	Variable	n	$\bar{x}$	SS	sd	F	p
SMID	Informational Support	42	8,65	2,90	120	6,96	00*
	Emotional Support	42	9,60	2,76			
	Closeness Support	42	11,07	3,17			
SLAA	Informational Support	42	9,14	2,21	123	8,80	00*
	Emotional Support	42	9,42	2,51			
	Closeness Support	42	11,26	2,76			
SHAA	Informational Support	42	9,95	2,47	123	15,58	00*
	Emotional Support	42	10,00	2,33			
	Closeness Support	42	12,40	2,07			

The satisfaction levels of child participants in the emotional, informational and closeness dimensions of STR significantly vary for SMID ( $F(2,120) = 6,96$ ;  $p < .01$ ), SLAA ( $F(2,123) = 8,80$ ;  $p < .01$ ) and SHAA ( $F(2,123) = 15,58$ ;  $p < .01$ ). A post hoc Tukey test shows that the ratings of closeness of the participants significantly differ from the emotional and informational support dimensions. Regardless of the disability or academic achievement status, the children's views of the STR may be more affected by their perception of closeness that they experience with the teachers.

## DISCUSSION AND CONCLUSIONS

The purpose of this investigation was to examine the differences in perceived STR among SMID, SLAA and SHAA. This investigation focused on students who are attending inclusive classrooms. The findings indicate that except students' gender, the demographic characteristics of teachers and students do not affect the students' perceptions of STR. Confirming Murray et al.'s (2008) findings on kindergarteners; teacher's gender was not found as an influential factor in STR for elementary students in this study. However, the female student participants had more positive perceptions of STR than their male counterparts. This finding may be resulted from the conflicting relationships between boys and their teachers as it was revealed by Mantzicopoulos and Neuharth-Pritchett's (2003) work focusing on STR during the early childhood years. Zee et al., (2020) reported that female elementary education SWD felt more closeness and less conflict with their teachers across

Netherland. Teachers also reported higher levels of dependency and closeness with girls and more conflicts with boys (Fraire et al., 2013).

When teachers gain experience in their work, they adjust to their profession and master the art of teaching; therefore, an association between the years of experience of the teachers and their relationship with students was expected (Rivkin, Hanushek, & Kain, 2005). Although Kesner (2000) suggested a relationship among the personality, experience, personal relationship history and ability to form relationships with children in classrooms of the teachers, the student participants in this study did not report a statistically significant difference in their STR in terms of teachers' experience. Moreover, teacher-related factors, such as a previous experience of having an inclusion student, level of knowledge on inclusion, courses taken on SWD and inclusion during undergraduate education and participation in in-service training on special education do not affect the STRs.

Although a decreasing tendency appeared in previous research in the scores of closeness as students gets older (Baker, 2006) and move towards upper grades (Zee, et al., 2020) during elementary education years, the students' perceptions in this study did not vary based on the grade. International studies that were conducted with typically developing children report differentiating findings on the effect of the grade levels or ages of the students. To illustrate, teachers report more conflict and dependency in their relationships with early childhood education children than primary school age students in Italy. The authors explain this decrease in conflict and dependency using the cognitive, emotional and social developments during the transition from kindergarten to elementary school (Fraire et al., 2013).

The present findings indicate that SMID and SLAA groups were less satisfied in STRs than the SHAA group. The effect of the school performance on the levels of closeness and conflict perceived by the teachers was also reported by Prino et al. (2016). They found that teachers tended to perceive a more affectionate and less hostile relationship with the students who had better school performance. Parallel with our findings, previous studies demonstrated that teachers provided lower levels of emotional support and reinforcements and higher levels of criticism, ignoring and negative behaviors to low achieving students than to their high achieving peers (Montague & Rinaldi, 2001). This type of teacher behavior may result in lower levels of self-concept and motivation and a higher level of alienation feeling for SWD (Murdock, 1999). Differential teacher beliefs towards high and low achieving students with and without LDs' have also been demonstrated since the eighties (Brattesani, et al., 1984). Teachers perceive their relationships with children with autism and attention deficit disorder, where behavioral problems are more prominent; to be more conflicted than with students with learning disabilities (Zee et al., 2020).

The results indicate that the student-perceived closeness has a differentiating effect on the satisfaction levels of students in STRs regardless of the disability or academic achievement status. A positive classroom atmosphere formed by the combination emotional and instructional support may be even more important for the young children who demonstrate behavioral, attention, social and/or academic problems. Research demonstrates that the emotional support provided by teachers who knew and attended to the individual needs of the students more significantly affects the academic achievement of the first graders than the instruction support, which involves specific instructional practices and conversations (Hamre & Pianta, 2005).

The findings and conclusions of this study should be considered with certain limitations. All data came from students in inclusive classrooms. These results reflect the perceptions of students with MID and high and low academic achievement on the STR in inclusive settings. The findings may not represent the perceptions of students with MID who attend self-contained classrooms, private special education and rehabilitation centers. Including in-class observations and teacher ratings would have strengthened the study; these dimensions will be pursued in future research. Similar to its original form (Murray et al., 2008; Reid et al., 1989), the items in the MTI-C scale do not represent a comprehensive assessment of the social needs of children and only focus on the support received from

teachers. Moreover, only a few items evaluate the negative events that occur between the student and the teacher.

The results of this study have practical and policy implications for teachers, researchers, teacher educators. Although the skill deficits of students with conduct problems may be considered an important source of peer rejection, the perceived teacher support appears to be a better predictor of the peer liking of students who are behaviorally at risk than the peer- and teacher-rated aggression (Hughes et al., 2001). Therefore, it is imperative to develop efficient intervention programs to improve the effective qualities of STR to support inclusive education. Considering previous studies, when one designs intervention programs that will increase the peer acceptance of students (who are at risk in inclusive classrooms) instead of focusing on only social-skill training for the children at risk, the incorporation of affective features of teacher-student interactions may be more meaningful.

Moreover, when one designs the pre-service and in-service teacher training programs, building strong relationships with students can be included as an important component. The growing national and international research background on the positive effect of the STR on the academic, social, behavioral and mental well-being of the students with and without disabilities should be considered. In addition, methods and strategies to increase the quality of STR at schools in Türkiye, such as decreasing school sizes and creating instructional settings where students and teachers can have one-on-one interaction, should be discussed.

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## Effects of 5E Integrated STEM Based Activities on Middle School Students' Attitudes Towards Science, Science Anxiety and Perceptions of STEM Fields

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### Abstract

The purpose of this study was to investigate the effects of using 5E integrated Science Technology Engineering Mathematics (STEM) based activities on 6th grades students' attitudes towards science, their science anxiety and their perceptions of STEM fields. Mixed research method was used for this purpose. The study was conducted with 28 6<sup>th</sup> grade students who live in Gaziantep city of Turkey. "Matter and Heat" science topic was taught using the 5E integrated STEM based activities. Questionnaires to test students' attitudes towards science, their science anxiety, and their perceptions of STEM fields were used as pre and post-tests before and after the implementation of the activities. While effect size difference (*r* score) and non-parametric Wilcoxon signed rank test were used for the quantitative data analyses, the qualitative data from the semi-constructed interviews were analyzed using thematic analysis. Before the implementation of the activities, female students' attitude levels were higher and their anxiety levels were lower than males. The results showed that the 5E integrated STEM-based activities had a positive effect on increasing students' attitudes towards science while decreasing their science anxiety. Although the effect on students' perceptions of individual STEM fields was relatively small, these activities positively increased their perceptions of each STEM field. The participants also found the activities very enjoyable, fun and like doing.

**Key Words:** STEM Based Activities, Attitude Towards Science, Science Anxiety

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## INTRODUCTION

The global world has been facing serious issues related to public, environmental, economic and natural resources recently. In order to tackle with these issues, the advancement in science and technology play important roles. The curiosity and the unlimited needs of the humanity have filled their history with scientific and technological innovations. Today, the fast changing and increasing knowledge and technological innovations give directions to the needs of the 21<sup>st</sup> century. These needs become very important to have and to raise qualified individuals who answer and keep up with the changes of today's needs (Vennix et al., 2018). It is expected from this century's individuals to have critical and analytical thinking, investigation and questioning, creative thinking as well as decision making skills. The fields of science and mathematics, and educational activities in these fields play important roles in the gain of these expected skills (Yamak et al., 2018). This has led to many countries to priorities science and math education for improving the development and production of new knowledge and technologies, and to equip their citizens with these important skills that play important roles in the development of their economies. However, many studies highlight that students' motivation and involvement in the fields of Science, Technology, Engineering, and Mathematics (STEM) have been decreasing recently especially in developed nations (Thomas and Watters, 2015). Many developed and developing countries give high importance of students' interests and motivations in STEM fields, which it is expected to be shortages with these subjects related workforces in near future and this may influence global world issues negatively (Kelley and Knowles, 2016). Therefore, many countries are taking the necessary steps through improving and making changes by including STEM education in their existed educational systems and policies (Bybee, 2010).

Researchers propose various definitions and perspectives for STEM education (Lin et al., 2020). STEM education bases on the integration of science, technology, engineering and math knowledge and skills with engineering-based design teaching. It is an education approach that aims to improve research, creativity, effective communication, collaboration with other fields, analytic thinking, and problem-solving skills (Bybee, 2010).

STEM education has turned to be important matter in educational research recently. It is reported that it can provide many benefits to students all age. One of the most important purposes of STEM education is to improve students' motivation and interest in STEM fields, leading to increased career preferences in these areas (Hackman et al., 2021; Lin et al., 2020). It is suggested that STEM education increases children's attitudes and the selection of STEM related careers. The integration of STEM education and its applications to the real-world problem-solving situations can increase both students' attitudes and their career towards STEM fields (Toma and Greca, 2018). STEM education is an important approach that increases the interest, achievement and motivation of students through making them to involve in daily life problems (Honey et al., 2014). The process of solving daily life problems make students to engage with and use alternative solutions, enhancing their inquiry-based skills, expanding their higher order thinking and promoting cooperative learning skills (Buyruk and Korkmaz, 2014). While STEM education also helps students to develop their problem-solving and critical thinking skills, it prepares them to their future careers and jobs (Öztürk, 2017). It is reported that the STEM education approach has positively affected students' interests and learning in STEM fields (Becker and Park, 2011). STEM education approaches equip students with 21<sup>st</sup> century skills and positively increase their motivation and interest in STEM fields, and related job and career preferences in these fields (Fernandez-Cezar et al., 2020).

Problem solving skills, critical thinking, confidence, and creativity in using engineering knowledge and skills, and ability to understand and to explain the nature of technology are some of the benefits of STEM education for students (Morrison, 2006). It contributes to students to get interdisciplinary perspective, to improve their creativities with critical thinking, and to develop their engineering design skills. In addition, it is reported that students increase their knowledge and understanding by connecting them with their prior knowledge and experiences, learn their lesson without boring, and increase their higher order thinking (Yıldırım and Altun, 2015). Moreover, it

reported that math and science integration have effects on attitudes and interest towards school, learning motivation and achievement among students (Stohlmann et al., 2012).

STEM education has been prioritized due to positive effect on students' attitudes towards science and STEM related career preferences (Sanders, 2009). It is reported that students' attitudes, interest and motivations towards science are declining through their educational progresses. Although students have positive attitudes, interest and motivations towards science during their elementary education, those turn to decrease through middle and high school education due to their perceptions of science is irrelevant, boring and too hard to learn (Toma and Greca, 2018). These perceptions can be change using STEM based activities that involve students in active participation in their educational process (Savelsbergh et al., 2016).

Integration of 5E instructional model with STEM education can help student in more active participation in their educational process by applying STEM related daily life problems. 5E Instructional model that uses constructivist learning theory is generally used in science education practice. This model involves five cognitive stages which are engagement, exploration, explanation, extension and evaluation. It explained by Bybee (1997) "using this approach, students redefine, reorganize, elaborate, and change their initial concepts through self-reflection and interaction with their peers and their environment. Learners interpret objects and phenomena, and internalize those interpretations in terms of their current conceptual understanding" (p. 176) (cited by Duran and Duran, 2004). Science lessons and teaching plans can be developed according to the five stages of this model. Five stages of this model are described as the following:

**Engagement:** It is a motivational phase for students to capture their attentions, helps teachers to examine students' existed knowledge and any possible misconceptions about the given topic.

**Exploration:** Students explore the information through cooperative working, process skills, problem solving and inquiry-based learning. Teachers navigate students to explore the information.

**Explanation:** Students explain and discuss their understanding from the previous stage and ask questions to get better explanations. Teacher provides explanations and corrections about the information students explore.

**Elaboration:** Students apply the skills and the information they learn and expand their understanding with designing models or experiments. This stage helps students to expand their learning.

**Evaluation:** Students evaluate and test their understanding. Teacher evaluates students' works and gets their ideas about their learning (Duran and Duran, 2004).

Science and math should be integrated with engineering and technology for teacher to be able to use STEM based activities. This integration can be made with preparing teaching programs that include more than one individual STEM fields and use one of the teaching strategies (Ramaley, 2007). For this reason, the five steps of 5E Instructional model were adopted and used to design the 5E integrated STEM based activities used in this study. The purpose of this study was to investigate the effects of using 5E integrated Science Technology Engineering Mathematics (STEM) based activities on 6<sup>th</sup> grades students' attitudes towards science, their science anxiety and their perceptions of STEM fields. "Matter and Heat" science topic was selected and taught with these activities. The following research questions were answered:

#### Research Questions:

1. To what extent do the 5E integrated STEM based activities affect students' attitudes towards science, and what is the effect regarding gender?

2. What is the effect of the 5E integrated STEM based activities on students' science anxiety, and what is the effect regarding gender?
3. What are the effects of the 5E integrated STEM based activities on students' perceptions of STEM fields?

## METHODS

The effects of using 5E integrated Science Technology Engineering Mathematics (STEM) based activities that include teaching activities of "Matter and Heat" science topic, on 6th grades students' attitudes towards science, their science anxiety and their perceptions of STEM fields were investigated. For this purpose, mixed research method was selected to be the most suitable research method for answering the research questions. Johnson and Onwuegbuzie (2004) defined mixed research method "as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (p.17). Combining quantitative and qualitative research approaches provided best explanations for the research questions and eliminated any weaknesses of the used methods. One group pre and post-test experimental design was the most suited experimental research methods because of the researcher availability and easy access to the students. Qualitative research used to eliminate some of the limits of this experimental method and to provide more details about the effects of 5E integrated STEM based activities.

The lesson plans of this study prepared by integrating 5E educational model with STEM based activities. Questionnaires to test students' attitudes towards science, their science anxiety and their perceptions of STEM fields were used as pre and post-tests before and after the implementation of activities (Table 1).

**Table 1. The experimental design of the study**

Before the implementation (as pre-tests)	The implementation	After the implementation (as post-tests)
The attitudes towards science questionnaire	5E integrated STEM based activities	The attitudes towards science questionnaire
The science anxiety questionnaire		The science anxiety questionnaire
The perceptions of STEM fields questionnaire		The perceptions of STEM fields questionnaire
		Semi-constructed interviews

The 5E integrated STEM based activities were the independent variables while students' attitudes towards science, science anxiety and perceptions of STEM fields were the dependent variables of this study. The effects of the independent variables on the dependent variables were tested.

### Participants

The study was conducted with 28 6<sup>th</sup> grade students who live in Gaziantep city of Turkey. 18 of these students were boys and 10 of them were girls. One of the researchers was the teacher of these students and the study mainly conducted by this teacher. The study was limited to this group because of the limited time and easy access to the participants.

### Data collection tools

The attitudes towards science questionnaire used in this study developed by Oğuz (2002) and it was adopted to be used for measuring students' attitudes towards science. The questionnaire was 5 Likert type and containing 20 items. The reliability of this test was measured 0.85 through Cronbach alpha measurement. Science Anxiety questionnaire was used to measure students' science anxiety levels. This questionnaire developed by Uluçınar and Sağır (2014) was adopted and used in this study.

The questionnaire was also 5 Likert type containing 25 items and 5 factors. The reliability of this questionnaire was measured using Cronbach alpha analysis and the general Cronbach alpha value was 0.880. The perceptions of STEM fields questionnaire developed by Knezek and Christensen (2008), and translated to Turkish by Kızılay (2017) was adopted for measuring students' perceptions of STEM fields in this study. The questionnaire was also 5 Likert type containing 25 items and 5 sub-factors. The Cronbach alpha of this questionnaire was measured 0.820. The 5 sub-factors were the perceptions of Science, Maths, Engineering, Technology and Careers in STEM fields. The qualitative data of the study was collected using semi-structured interviews. The researcher developed 8 interview questions, but these questions reduced to 6 questions after some recommendations and the experts' reviews.

### **Lesson plans and development of the 5E integrated STEM based activities**

The lesson plans used in this study were developed by the researchers according to the learning objectives from the 2018 National Science Education Program, 5E instructional model and the STEM education activities suggested in the literature. The "Heat and matter" science topic and its four learning objectives were selected from the 6<sup>th</sup> grade science lesson curriculum. Four hours lesson plans and the 5E integrated STEM based activities were designed according to each of the learning objectives. Additional handouts were prepared for each 5E integrated STEM based activities. Designing process of these activities and the lesson plans were as the following:

1. Researching the studies that used STEM education approach.
2. Selection of the student grade and the topic of science lesson.
3. Determining the learning objectives that suitable for STEM education.
4. Deciding to the 5E integrated STEM based activities to prepare suitable lesson plans.
5. Revising the activities and lesson plans according to the expert views.
6. Preparing the 5E integrated STEM based activities.
7. Giving the last format of the 5E integrated STEM based activities according the science education experts.

The 5E integrated STEM based activities and the selected learning objectives were shown in Table 2.

**Table 2. The 5E integrated STEM based activities and the learning objectives**

Learning Objectives	5E integrated STEM Based Activities
Students can classify matters according their heat conduction features	Which spoon heated?
Students can decide to the selection criteria of heat insulation materials that used in buildings.	My favourite house
Students can develop alternative heat insulation materials.	Which box becomes hotter?
Students can discuss the importance of using heat insulations in buildings regarding advantages for family and countries' economies, and effective uses of resources.	Which one more economic?

### **Implementation of the study and data collection process**

The study was conducted with 6<sup>th</sup> grade 28 students who were attending to a private school in Gaziantep city of Turkey. The study took 4 weeks (16 lesson hours) time. Before implementing the activities, the students were pre tested with the quantitative data collection tools which were science attitudes, science anxiety and perceptions of STEM fields. After the pre-tests, the students were informed about the study through explaining STEM education, the 5E integrated STEM based activities, the activities handouts and other important matters such as participation, attendance etc.

“Matter and Heat” science topic was taught using the 5E integrated STEM based activities. After the study, the students were post tested and they were also questioned with semi-constructed interviews for the qualitative data of the study.

### **An example of the 5E integrated STEM based activity: “My Favorite House”**

*Engagement step:* Before the activity, the students were separated to small study groups (4 or 5 students each). “My favorite house” activity handout that developed according “Students can classify matters according their heat conduction features” learning objective, were given to the students to direct their attention and interest to the topic. They were asked to read the problem situation (given below) in the given activity handout carefully and then it was read by the teacher loudly once more. Their ideas to the problem situation were taken by question-and-answer method. With this way, children’s curiosity and awareness were directed to the topic and it was also aimed for the students to generate new ideas by using their prior experiences and knowledge.

*Problem Situation:* “Contractor Mr. İbrahim, who owns a construction company, has been building and selling houses for about 5 years. However, he receives complaints about the houses he sells. The homeowners who buy the house say that their houses are very cold in the winter season, they do not get warmer, so they burn central heating at high temperatures and this leads to higher gas bill. In the summer, they complain that although they run air conditioners all day long, their homes are still too hot, and they pay high amounts of electricity bills. They say that they have a limited income that cannot afford the excess electricity and natural gas consumption. They want to return the houses they bought for such reasons. In the face of this situation, İbrahim told the owners that he will solve these problems in a short time and left them. When İbrahim realizes that he cannot solve this situation alone, he goes to his friend Mr. Ali, who is an engineer, and asks for help. He would be very happy with the ideas given by Ali and immediately set to work. Soon the homeowners' troubles resolved.”

*Exploration step:* The students were asked to find possible solutions to the answers about the problem situation. At the same time, students did research about possible solutions from the science book and other research materials. Students also undertook active roles to discuss their ideas with their peers.

*Students asked to answer the following questions about the topic:*

1. What do you think are the reasons why homes are too cold in winter and very hot in summer?
2. If you were engineer Ali, what kind of ideas would you give?

*Explanation step:* Students expressed and discussed their ideas and their own understandings with their peers. The researcher (was the teacher) presented the scientific and conceptual information about students’ explanations and their ideas from the previous step. Clarifications for any possible misconceptions were also provided. Then, it moved on to next step in order to make the provided information more lasting in students minds. The following information provided to the students:

#### *Heat Insulation:*

*In some cases, we want to preserve the heat and, in some cases, we want to be protected from its harmful effects. For example, we try to preserve the temperature of our house environment in winter, while we try to prevent it from heating in summer. In such cases, we use heat insulating materials with very little heat conduction. The purpose of thermal insulation is to prevent heat exchange. In other words, we try to prevent the inside heat to go out or the outside heat to come in. Heat insulation is achieved by covering the areas where the indoor and outdoor environments directly contact each other with heat insulating materials. For example, for heat insulation in buildings, the outer surfaces of buildings are covered with heat insulating materials.*

*Any process performed to protect the heat of the materials by preventing heat exchange is called heat insulation. Heat insulating materials used for heat insulation are called insulation materials. Insulation materials; It is made of heat insulating materials that do not conduct heat well. As insulation material, generally wood, plastic, glass wool, rock wool, plastic foam, tar, Bakelite, and air gap is used. The best example of the use of air gap is the air between double glazing.*

*Elaboration step:* This was an important step for the integration of STEM based activities. It was aimed for the students to better understand the topic and to work the interdisciplinary connections with more active roles. The materials of the planned STEM based activities were handed to the small student groups by the teacher. The purposes of the activities for each STEM fields were as the followings:

- **Science:** The aims were to teach students about heat conduction and heat insulation, how to define and classify matters according their heat conduction features, and the criteria for selecting effective heat insulation materials.
- **Mathematics:** The aims were to encourage students to apply their knowledge and skills of mathematics to think logically and spatially, make decisions about the dimensions of the house using short and long sides, and measure temperatures.
- **Technology:** The aims of the activity were appropriate material selections, the use of materials and the importance of their usefulness. In addition to material features, the students were also expected to choose materials according their economic costs and utility.
- **Engineering:** The objectives of the activity were to use engineering design process and to be able to choose appropriate materials. Finally, students were asked to design and draw a house model from these STEM steps while explaining their material choices.

*Evaluation step:* The students were asked to answer the questions given to them in order to evaluate the effectiveness of the STEM based learning activities and to see how much students learned from these activities. The products that produced by the students from the STEM activities were also evaluated. In addition, the students were asked to develop a house model that they designed according STEM steps as a project assignment.

In this activity, assessment process took place from the beginning to the end of the lesson. In the introduction to the lesson, the teacher examined the students' prior knowledge and understandings about temperature, insulation and heat. The students designed home models and provided information about their products. In this way, the products and the learning process were evaluated.

### **Data analysis**

The quantitative data from the questionnaires were analysed using SPSS and Microsoft Excel software. Effect size (r score) and non-parametric Wilcoxon signed rank test were calculated and used for the quantitative data analyses. Effect size calculated using  $r = z/\sqrt{N}$  formula (z stands for z score and N is the total number of observed participants in the study) (Field, 2013).  $0.10 < r < 0.30$  constitutes a small effect,  $0.30 < r < 0.50$  constitutes medium effect and  $r = 0.50$  and higher score constitute a large effect (Field, 2013). The qualitative data from the semi-constructed interviews analyzed using thematic analyses.

## **RESULTS**

This section explains the effect of the 5E integrated STEM based activities on students' science attitudes, their science anxiety and their perceptions of STEM fields. Due to using small sample size and not able to use random allocations, the effects on the dependent variables were

measured using effect size difference and non-parametric analysis by Wilcoxon Signed Ranks Test. Thematically analyzed qualitative data from the students' interviews were used to support the quantitative data and provide better understanding of the effects.

### The effect on students' attitudes towards science

The effect of the 5E integrated STEM based activities on students' attitudes towards science was determined from pre- and post-test results difference from students' science attitudes scores. Table 3 demonstrated the descriptive statistic results, mean and median scores.

**Table 3. The descriptive statistics results for the students' attitude scores**

Gender	Test	N	Mean	Std. Dev. (SD)	Median
Boys	Pre-Test	18	74.44	16.56	78.00
	Post Test	18	90.05	9.62	94.00
Girls	Pre-Test	10	84.50	8.46	84.50
	Post Test	10	89.20	7.97	88.50
Total	Pre-Test	28	78.03	14.85	82.00
	Post-Test	28	89.75	8.92	93.00

In Table 3, pre-test median score was 82 and post-test median score was 93. The median scores from both tests were high, but post-test median score was considerably higher. Regarding gender, pre-test median score was 74.44 for boys and 84.50 for girls. Girls' pre-test median score was considerably higher than boys. Both boys' (Median=94.00) and girls' post-test median (Median=88.50) scores increased after the implementation.

Table 4 provided effect size and non-parametric Wilcoxon Signed Ranks Test results from students' attitudes towards science questionnaire.

**Table 4. Effect sizes and Wilcoxon Signed Ranks Test results for students' attitude scores**

Pre-Post Test	N	Mean Ranks	Sum of Ranks	z	p	Effect Size (r)
Boys	Negative Ranks	5	5.50	-2.529*	0.011	-0.421*
	Positive Ranks	13	11.04			
	Ties	0	-			
	Total	18				
Girls	Negative Ranks	4	11.70	-0.867*	0.386	-0.194*
	Positive Ranks	6	14.63			
	Ties	0	-			
	Total	10				
Total	Negative Ranks	9	9.89	-2.597*	0.009	-0.347*
	Positive Ranks	19	16.68			
	Ties	0	-			
	Total	28				

\*Based on negative ranks

Table 4 showed that there was statistically significant difference between pre and post-test results ( $z=-2.597$ ;  $p<0.05$ ). Effect size was medium with  $r=-0.347$ . This can suggest that the effect of the 5E integrated STEM based activities on students' attitudes towards science was positively medium. The effect size and Wilcoxon signed ranks test results demonstrated that the 5E integrated STEM based activities can positively increase students' attitudes towards science.

Regarding gender, Table 4 demonstrated that there was statistically significant difference between pre- and post-test results of boys' science attitudes scores ( $z=-2.529$ ;  $p<0.05$ ), but the difference of girls' scores was not statistically significant ( $z=-0.867$ ;  $p>0.05$ ). However, regarding effect size, boys' science attitudes was positively medium with  $r=-0.421$  ( $0.30<r<0.50$ ) and effect size

of girls' scores was small with  $r=-0.194$  ( $0.10 < r < 0.30$ ). Although girls' science attitudes scores were higher than boys at the beginning, both girls' and boys' science attitudes scores increased after the 5E integrated STEM based activities, but boys' gains were noticeably higher than girls.

The qualitative data from students' interview also supported the quantitative results. Some of students' replies were:

*S23: ...I already like science lessons, but I even started to like it more because I had fun and I learned better with the activities.*

*S22: ...These activities took my attention and contributed to like science.*

*S18: ...The activities made science lesson more fun so I liked it.*

*S3: ...science lessons were more fun and more effective. It made me to want more.*

*S19: ...It contributed to like science lesson. It would be more difficult for me to understand this topic without these activities.*

### **The effect on science anxiety**

The effect of the 5E integrated STEM based activities on students' science anxiety was determined from pre- and post-test results' difference from students' science anxiety scores. Table 5 displayed some descriptive statistic results, mean and median scores.

**Table 5. The descriptive statistics results for students' science anxiety scores**

Gender	Test	N	Mean	Std. Dev.(SD)	Median
Boys	Pre-Test	18	62.72	15.51	65.00
	Post Test	18	44.94	13.84	36.50
Girls	Pre-Test	10	59.10	13.92	57.50
	Post Test	10	43.80	12.81	38.50
Total	Pre-Test	28	61.00	16.59	63.00
	Post-Test	28	41.96	14.51	36.50

In Table 5, total pre-test median score was 63.00 and total post-test median score was 36.50. Post-test median score was considerably lower than pre-test median score. Regarding gender, pre-test median score was 65.00 for boys and 57.50 for girls. Both boys' (Median=36.50) and girls' post-test (Median=38.50) median scores decreased after the implementation. Students' science anxiety significantly decreased after using the 5E integrated STEM based activities.

Table 6 showed effect sizes and non-parametric Wilcoxon Signed Ranks Test results from students' science anxiety test.



**Table 6. Effect size and Wilcoxon Signed Ranks Test results for students' science anxiety scores**

Pre-Post Test	N	Mean Ranks	Sum of Ranks	z	p	Effect Size (r)
<b>Boys</b>	Negative Ranks	15	9.50	142.50	-3.125*	0.002
	Positive Ranks	2	5.25	10.50		
	Ties	1	-	-		
	Total	18				
<b>Girls</b>	Negative Ranks	9	5.33	48.00	-2.091*	0.037
	Positive Ranks	1	7.00	7.00		
	Ties	0	-	-		
	Total	10				
<b>Total</b>	Negative Ranks	24	14.42	346	-3.773*	0.000
	Positive Ranks	3	10.67	32		
	Ties	1	-	-		
	Total	28				

\*Based on negative ranks

Table 6 demonstrated that there were statistically significant differences between total pre and post-test results ( $z=-3.773$ ;  $p<0.05$ ). Effect size was large with  $r=-0.504$ . The effect size and Wilcoxon signed ranks test results can indicate that the effect of the STEM based activities on science anxiety was large and these activities could considerably decrease students' science anxiety.

Regarding gender, table 6 demonstrated that there was statistically significant difference between pre- and post-test results of both boys' ( $z=-3.125$ ;  $p<0.05$ ) and girls' science anxiety scores ( $z=-2.091$ ;  $p<0.05$ ). However, regarding effect size, boys' science attitudes was positively large with  $r=-0.520$  ( $0.50<r$ ) and effect size of girls' scores was medium with  $r=-0.467$  ( $0.30<r<0.50$ ). Both girls' and boys' science anxiety scores decreased significantly after using the 5E integrated STEM based activities.

The qualitative data from students' interview results supported these results. Some of students' replies were:

*S23...I was not scared and did not get stressed. I had lot of fun.*

*S22...(stress, concern) did not happen. It makes me happier. It gave me the opportunities to more involve in the lesson and to be more responsible.*

*S18...I understood the topic better and this improved my motivation.*

*S13...I did not have any concerns because the lessons were very fun.*

*S3...I used to not understand science lessons very well and used to say what if I couldn't do it, but I do not say it anymore.*

It can be seen from these results that most of the student enjoyed and had fun doing the activities. Since they enjoyed the activities and had fun doing them, their fears and worries decreased. This in turn could decrease their science anxiety.

#### **The effect on students' perceptions of STEM fields**

The effect of the 5E integrated STEM based activities on students' perceptions of STEM fields were determined from pre- and post-test results differences from students' perceptions of STEM fields mean scores. Table 7 demonstrated the descriptive statistic results, mean and median scores.

**Table 7. The descriptive statistics results for students' perceptions of STEM fields scale**

Subjects	Test	Mean	Std. Dev.(SD)	Median
Science	Pre-Test	5.60	0.89	5.80
	Post Test	6.06	1.02	6.20
Math	Pre-Test	5.30	1.60	5.70
	Post Test	5.90	1.28	6.40
Engineering	Pre-Test	5.30	1.07	5.50
	Post Test	5.86	1.29	6.40
Technology	Pre-Test	5.74	1.09	5.90
	Post Test	6.22	1.11	7.00
Career in STEM fields	Pre-Test	5.76	1.11	5.90
	Post Test	6.16	1.14	7.00
Total	Pre-Test	5.54	0.72	5.60
	Post Test	6.04	0.88	6.34

As seen in Table 7, students' perceptions of each STEM field median score increased positively. Median scores increased after implementing the STEM based activities for all STEM fields.

Table 8 demonstrated non-parametric Wilcoxon Signed Ranks Test results and effect size from students' perceptions towards STEM Fields test.

**Table 8. Effect size and Wilcoxon Signed Ranks Test results students' perceptions of STEM fields scale**

Subjects: Pre-Post Test	N	Mean Ranks	Sum of Ranks	z	p	Effect Size (r)
Science	Negative Ranks	6	11.42	-2.118*	0.034	-0.283*
	Positive Ranks	17	12.21			
	Ties	5				
	Total	28				
Math	Negative Ranks	10	11.70	-1.488*	0.137	-0.198*
	Positive Ranks	16	14.63			
	Ties	2				
	Total	28				
Engineering	Negative Ranks	9	12.67	-1.804*	0.071	-0.241*
	Positive Ranks	18	14.67			
	Ties	1				
	Total	28				
Technology	Negative Ranks	9	12.61	-1.320*	0.187	-0.176*
	Positive Ranks	16	13.22			
	Ties	3				
	Total	28				
Career in STEM Fields	Negative Ranks	8	14.50	-0.973*	0.331	-0.130*
	Positive Ranks	16	11.50			
	Ties	4				
	Total	28				
Total	Negative Ranks	10	11.30	-2.050*	0.040	-0.273*
	Positive Ranks	18	16.28			
	Ties	0				
	Total	28				

\*Based on negative ranks

In table 8, it could be seen that there were statistically positive differences between pre and post-test results for students' perceptions of science ( $z=-2.118$ ;  $p<0.05$ ) and perceptions of STEM fields' total scores. ( $z=-2.050$ ;  $p<0.05$ ). However, the differences for Math ( $z=-1.448$ ;  $p>0.05$ ), Engineering ( $z=-1.804$ ;  $p>0.05$ ), Technology ( $z=-1.320$ ;  $p>0.05$ ) and Career in STEM fields ( $z=-0.973$ ;  $p>0.05$ ) were not statistically significant. However, the effect size for each individual field and total

scores were small ( $0.1 < r < 0.3$ ). Although the differences for some fields were not significant, the effect size differences could suggest that there was positive small effect of the 5E integrated STEM based activities. These results could mean that the effect of the activities on students' perceptions of each STEM fields was positively small.

The qualitative data from students' answers to the interview questions demonstrated positive experiences regarding perceptions of STEM fields. Some of the replies from students were:

*S18... (integrating technology, math and engineering with science lessons) was perfect. The lessons were what I needed for choosing a suitable career.*

*S22...I liked it. I think my science lesson and my engineering ability were improved.*

*S19...It was good, I felt like an architect and an engineer. I would like to learn human body systems topic like this.*

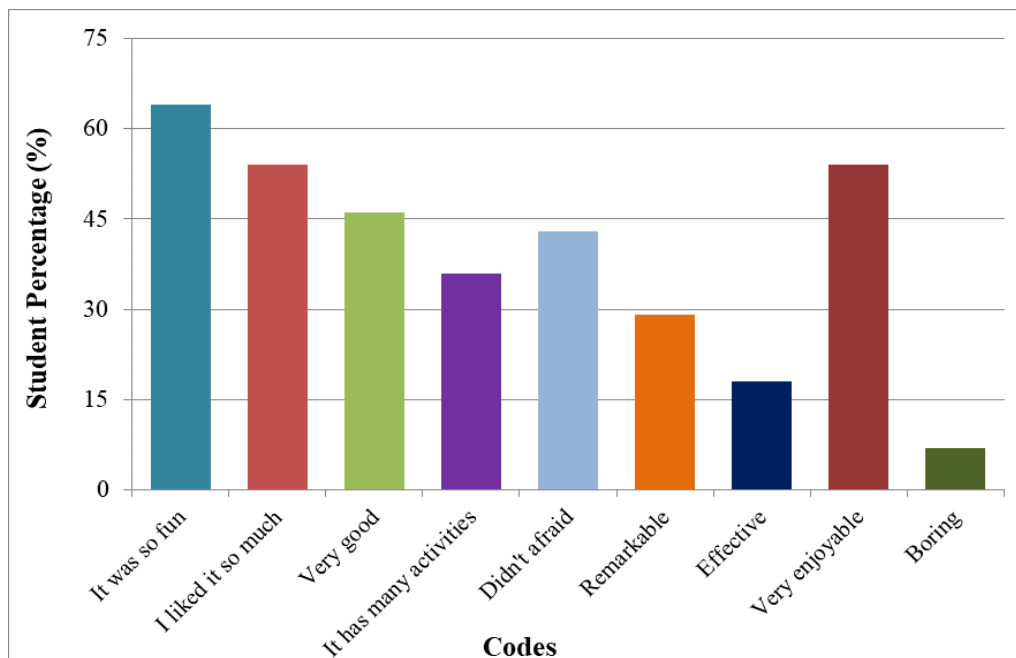
*S15...I think it was good. I liked the materials we did. I get some ideas about the topic at home and it was good.*

*S10...It was good. To become an engineer, you will need to study Science and Maths.*

*S16...I liked the STEM activities because I want to become an engineer.*

#### Students' ideas about the 5E integrated STEM based activities

28 students interviewed after the implementation of the 5E integrated STEM based activities to get their ideas about these activities. The results from students' answers coded and the percentage of these codes were shown in Fig. 1. Almost all the students reported positive experiences regarding science related outcomes and the STEM based activities, but two students reported that they bored during the activities.



**Figure 1. The percentage of coded replies from students' interviews**

Most of the students found the activities to be very fun, enjoyable and like doing them. They stated that the STEM based activities supported them to produce different ideas in their lessons by

making them more active in their learning. These activities also helped them to decrease their fear, anxiety and worries about science lessons. The fear of “what if I become unsuccessful” turned to be having fun, being happy and learning effectively. This supported with one of the students reply as “*I didn’t have any fear or worry, I understood and did the topic very well, which made me very happy*”. The students also reported that they like doing the lessons with interdisciplinary activities. Some of the replies were “*doing the lesson with other subjects was fun (S2)*” and “*it was fun doing math with science*” (S4). In addition, some of the students stated that these activities changed their ideas about their career in STEM fields. They felt like being an architect or an engineer while doing the activities. “*It was good. I felt like an architect and engineer (S19)*”, “*I liked the activities because I want to be an engineer (S10)*” and “*This kind of activities were exactly what I want for choosing a career (S18)*” were some of the replies from the students. In general, the students liked and enjoyed the 5E integrated STEM based activities through helping them to improve their different ideas, making them to be curious, improving their perspectives and making them to learn their lessons by being more active in their lessons.

## DISCUSSIONS, CONCLUSIONS AND IMPLICATIONS

This study investigated the effects of using 5E integrated Science Technology Engineering Mathematics (STEM) based activities that include teaching activities of “Matter and Heat” science topic, on 6<sup>th</sup> grades students’ attitudes towards science, their science anxiety and their perceptions of STEM fields. Discussions, conclusions and implications of this research were given below.

The quantitative and qualitative results of this study demonstrated that STEM integrated activities positively increased students’ attitudes towards science. Although both boys and girls had prior positive attitudes towards science, their attitudes increased after doing the activities, but boys’ attitudes substantially increased more than girls. The students stated that the 5E integrated STEM based activities improved their engineering and designing skills, made their learning more efficient, turned their lessons to be more fun, improved their interest towards engineering and helped them to better decide about their future careers. This result was consistent with some of the studies in the literature. Yamak et al., (2014) found that 5th grade students’ attitudes towards science increased positively after participating to STEM integrated activities. Guzey et al., (2014) stated that there is positive influence of STEM education programs on middle school children attitudes towards science. Toma and Greca (2018) found that integrative STEM approach program increased children’s attitudes towards science. Although Fernandez-Cezar et al., (2020) found small effect of STEM outreach program on students’ attitudes towards science; they reported positive influence of STEM education programs on students’ attitudes towards science. In another study, Şimşek (2019) reported that the integrated STEM activities had positive effect on students’ attitudes towards science and the students liked and enjoyed doing the activities.

The 5E integrated STEM based activities positively decreased students’ science anxiety. Both girls’ and boys’ science anxiety considerably decreased after doing the activities. The students also reported positive experiences regarding their science anxiety. Although there was no study in the literature examined the effect of STEM education on science anxiety, some studies reported positive effects of STEM education on math anxiety (Aosi et al., 2019). Aosi et al. (2019) studied STEM based learning to overcome math anxiety. They reported that STEM based learning helped to decrease students’ math anxiety. Involving students in active, entertaining and interesting STEM activities may decrease their fear of doing science and this in turn could decrease their science anxiety.

Although the effect of the 5E integrated STEM based activities on students’ perceptions of each STEM fields was small, these activities positively increased students’ perceptions of each STEM fields. Some studies investigated the effect of STEM education on students’ perceptions of STEM fields (Koyunlu et al., 2016; Gülhan and Şahin, 2016; Uğraş, 2018). Gülhan and Şahin (2016) investigated the effect of STEM integrated activities on 5th grade students’ attitudes and perceptions towards STEM fields. They found that STEM integrated activities improved students’ attitudes and their perceptions towards STEM fields. Knezek et al. (2013) reported environmental power monitoring

activities that used as project-based activities improved students' perceptions of STEM fields and career positively.

Education programs that included STEM integrated approaches can positively help students to improve their attitudes towards science, decrease their science anxiety and increase their perceptions of STEM fields and careers in STEM related subjects. Although the effects for students' perceptions of each STEM fields were small in this study, other studies suggested positive effect. These changes in middle school students' science related outcomes can follow with better academic achievement in science and more career preferences in STEM fields. Therefore, the following suggestions were made:

- Science lessons should be planned to involve more STEM based activities.
- Courses about how to effectively use STEM education should be provided to teachers and schools.
- Lessons plans should be prepared according STEM education.
- Studies with better methodological designs and with more participants should be conducted for both science and other subjects.

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**Ethical Statement:** This study was approved by the Kilis 7 Aralık University Ethics Committee (Confirmation number: 2019/08). This research was conducted with ethic rules specified in "Higher Education Institutions Scientific Research and Publication Ethics Directive".

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## **Teachers' Experiences of the Potential of Flipped Classrooms: A Research Study of Dance Movements Including Students with Different Educational Needs**

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### **Abstract**

The pedagogical approach in the flipped classroom (FC) reverses traditional in-class lectures by delivering content instructions outside the classroom followed by practice as homework. Although several studies develop the FC model in science, technology, engineering, mathematics (STEM), and Higher Education or High School, few educational studies for inclusive education at primary school levels are conducted. From a teachers' perspective, this small-scale research project explored the potential of the FC approach in one Swedish primary school (n=25), including ten students with different educational needs. This study aims to investigate how FC contributes to students' ability to discern and perform choreographed dance movements to music in Physical Education and Health (PEH) according to the teachers' views. The data collection contained teachers' PowerPoint presentations of two dance lessons for colleagues, pre-and post-meeting, and three delayed post-interviews with four teachers. Descriptive and content analysis methods were used to analyse the data. The results provide evidence for a potential advantage that the FC supports a general structure of inclusive education. However, there is a risk that students with different educational needs spend more time out of school hours to reach the same level as other students, which requires further investigation.

**Keywords:** Flipped Classroom, Inclusive Learning, Teachers' Perspectives, Primary School Level.

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## INTRODUCTION

As technological advances increase, it places new demands on using technology in K-12 classrooms to develop powerful teaching models for students' equal rights. A shift from teacher-centred education to more student-centred education is needed. One example of digital instruction, technology-enhanced pedagogy, and a student-centred focus is the flipped classroom (FC) (Abdul Kader, 2020; Sam's & Bergmann, 2013). According to Arslan (2020), this paves the way for the FC to become a progressive educational model. FC is based on the teacher creating instructions for the upcoming lesson for the students to participate in. The most prominent pedagogical artefacts that FC relies on are videos, reading texts, written instructions, and other resources from the classroom. The students are expected to acquire conceptual knowledge through the given pre-class material to prepare for the in-class activity. During the in-class time, it is assumed that the students can show understanding of the material through their active involvement in the collaborative activities instead of being passive listeners to traditional lectures (Butt, 2014). These instructions are usually given a few days prior to the lesson. According to Pelger and Ljungqvist (2018) and Sam's and Bergmann (2013), FC is a blended model of learning that increases interaction and contact between teachers and students. According to Osguthorpe and Graham (2003), FC is most likely used differently depending on the teacher, content taught (Hwang *et al.*, 2015), and which digital resources were used in the past. Teacher can devote class time to various activity learning between students and spends less time introducing the task to the class and instead increases the students' active learning and enabling collaboration with the classmates (DeLozier & Rhodes, 2017; Lucznik *et al.*, 2020).

Three systematic reviews compared the effects of the FC and ordinary teaching models on student performance (Lo & Hew, 2017; Strelan, *et al.*, 2020; Van Alten *et al.*, 2019). Findings were similar regarding the learning achievement across disciplines and education levels. Students who have the opportunity to work with the FC model achieve significantly higher outcomes than those in traditional classrooms. Strelan, *et al.* (2020) stressed that it is worth implementing FC, but careful attention should be given to how exactly this is done. Their reviews also show that FC effects are relatively weak in the STEM field and that the most substantial results are within the humanities. Since FC contributes to active and individualized learning in the pre-class phase, it also helps the teacher know how much students perform concerning the content at the in-class phase. Sam's and Bergmann (2013) believe that FC offers students to apply the knowledge gained at a deeper level while sharing their ideas and offering different perspectives on the content through collaboration with their peers. Similarly, Larcara (2015) explore that peer interaction and collaboration are the most beneficial aspects of FC compared to traditional lectures.

Although there is limited research conducted on FC for students with different educational needs, there are indications that it can be beneficial for such learners (Altemueller & Lindquist, 2017; Lin *et al.*, 2018; Needham-Beck & Aujla, 2021). Focusing on the use of FC for learners with special educational needs, Brewer and Movahedazarhouli (2019) investigated FC learning in special education in two undergraduate courses. The learning model encouraged students' problem-based learning, and digital instructions resulted in fewer misunderstandings regarding the content compared with instructions given face-to-face. Though there are still challenges regarding the 'take-away' transitions of FC approaches, the model could be used to offer student-active learning with a focus on learner responsibility and empowerment where learners are encouraged 'to take charge of their own learning' (*ibid*, p.140). Altemueller and Lindquist's (2017) review pointed out that FC promotes a positive peer spirit for students to help each other achieve the lesson's goal. However, despite the encouraging student focus, the teacher's views of experiencing FC have not been explicitly researched (Hultén & Larsson, 2018), which this study referring to.

### **Aim of the study**

By referring to the teachers' views, the aim is to investigate how FC contributes to students' ability to discern and perform choreographed dance movements to music in Physical Education and Health (PEH) in fourth grade. The research questions (RQ) were:

RQ1: How do teachers experience students' access to the content in inclusive flipped learning?

RQ2: What content was made discernible for the students by offering material prior to the lesson?

RQ3: How do teachers communicate their experiences of the flipped classroom to other teachers?

## **METHODOLOGY AND FRAMWORK**

### **Physical Education and Health in the Swedish curriculum context**

When dance is scheduled in the subject of Physical Education and Health (PEH) in the Swedish curriculum context, it is mainly about learning how to perform different steps to music and to copy movements (Swedish National Agency for Education [SNAE], 2018, p. 50). The activities are defined as 'dance and movements to music' (SNAE 2018, p. 49). In the PEH syllabus, dance movements are structured according to the purpose of the exercise. They are a form of training and warming up to music, pace, and rhythm in games (Lundvall & Meckbach, 2007; Mattsson, 2016), or for the purpose of assessing movement. The teacher's goal is not primarily to conduct a dance intervention in which students acquire a specific artistic form (Mattsson, 2016). Rather, it is to investigate how the FC can support teachers' teaching design to increase dancing skills in the subject of PEH.

The teachers' choice of the learning objective for the instructions of the current study was related to the curriculum goal and the core content of the subject: 'Teaching in physical education and health should aim to develop students' all-round movement capacity and an interest in being physically active...' (SNAE, 2018, p. 48).

### **Thematic analysis**

Castleberry and Nolen (2018) consider that thematic analysis can build reliability and credibility when researchers need to identify, analyse, and report patterns (themes) within the collected data (p. 808). Thematic analysis is a descriptive method that helps reduce data and makes it more flexible to interpret. The first step is to find a meaningful way to compile and organise the results (Castleberry & Nolen, 2018; Larsen, 2017). In this study teachers' conversations and discussions in the teacher group we transcribed, and analysed video-recorded PowerPoint presentations. To become intimately acquainted with data it has to be read and reread. In qualitative research, data must be aggregated into a small number of themes, 'about five to seven' according to Creswell and Creswell (2017, p. 245). To strengthen trustworthiness, the selected themes were discussed with senior researchers at seminars. This external review of the thematic process aimed to ensure transparency and increase credibility, which according to Silverman (2011, p. 360) is about motivating why one draws the conclusions one makes. The teachers participating in this study were also able to contribute to the article-writing process through reviewing the interpretations made.

### **Improvement science as a framework for teachers' professional development**

This study is based on data collected during a larger practice-based professional development project involving an entire school (Lelinge, 2022; Lelinge & Alwall, 2022.)

Stemming from the field of healthcare, improvement science has recently been adapted as a research approach in applied school research (Christensson, 2018; Holmqvist Olander, 2015). By linking research questions directly to identified needs for improvement, the implementation phase is minimised. According to Langley et al. (2009), there are two principles of improvement: ‘Knowing why you need to improve and having a way to get feedback to let you know if the improvement is happening’ (p. 16). Improvement science is often used as a collaborative process (Lewis, 2015) in which a team of teachers plans, enacts, and examines an intended improvement to instruction (Lewis & Hurd, 2011). Improvement science treats implementation and setting as important sources of information (Lewis, 2015), through an iterative plan-do-study-act (PDSA) cycle.

Although the improvement science framework is rarely used in educational research, its aims promote the improvement efforts of teachers’ collaborative professional development. In this research study, teachers defined a problem question, that is the development of dancing skills and movements to music in Grade 4. The research presented here is based on data of teachers’ experiences of using the flipped classroom model to promote higher participation and students’ preparation before the in-class lesson.

### Participants

This study was part of a two-year practice-based school development research project undertaken in a large city in Sweden between the academic years 2017–2019. The overall goal was to develop different collaborative learning models to increase teachers’ content knowledge and inquiry-based learning and develop their inclusive classroom environment.

A group of six teachers were the participants of the study. The teachers’ details are presented in Table 1. The teachers’ experiences were closely linked to their teaching of students.

**Table 1. Overview of the participating teachers.**

Participants	Age	Sex	Certified/uncertified	Teacher’s degree	Teaching subject	Work experience in years (Current school)
TA	36	Male	Yes	19	History and English as a foreign language	10 (1)
TB	26	Female	Yes	4–6	Swedish language, mathematics, science subjects and in English as a foreign language	3 (1)
TC	26	Male	No	4–6	Religion and history	1 (1)
TD	26	Female	Yes	K–3	Swedish language, mathematics, English English as a foreign language, and civics	3 (1)
Leisure time teacher	20	Male	No	K–3	No subject teaching. Supporting leisure time work	1 (2)
IT-pedagogue	32	Male	No	K–4	4 (4)	

Notes: The number in brackets are the number of years that the participants had been employed at the current school in spring 2018. The number before the brackets shows the total number of years as a certified or uncertified teacher. Teachers A, B, C, and D are abbreviated as TA, TB, TC, and TD.

Although student data were not collected in this study, the students were also an important part of the study. Studying teachers' experiences with the FC model in an inclusive school setting required a class with students with special educational needs.

There were 25 participating Grade 4 students, with an average age of 11 years, and including 13 females and 12 males. The students were shown a dance video choreography as a teaching element in the PEH subject. The instructions were shared three days in advance on a common platform. One main goal of the study was to examine what teachers focus on when sharing their experiences of teaching and learning through the flipped model with other colleagues, and how they discuss heterogeneous students. Four of the students had an Assessment of Education, Health and Care need program and six had special educational adjustments due to concentration difficulties. This means that ten of the students were identified as students with special educational needs included in an ordinary school setting.

### **Data collection**

For the present research study data were collected during April–May 2018. There were five collegial teacher meetings where the author of this study participated as a 'critical friend.' Each meeting lasted for two hours. Of the six participating teachers, three agreed to participate in the delayed follow-up interviews. Two interviews (with TA and TB) were done by telephone.

12 months after the project ended, using a semi-structured approach (Larsen, 2017), and lasting approximately 25 minutes each. An unstructured interview lasting about 9 minutes took place with TC in the classroom at the school where he was employed, six months after the study ended. All transcripts were then sent back to each teacher for checking prior to thematic analysis. No changes were required by the teachers.

All students had access to a Chromebook for the in-class activity so they could watch, follow, and support each other during the dance video instruction. The teacher divided the students into five groups that were scattered throughout the training hall.

Two lessons were conducted in the same class lasting for 60 minutes each time. They were video-recorded and transcribed verbatim. The layout for both PowerPoint presentations was similar and included: 1. Teachers shared and described the aim of the lesson (approx. 15 min) with 15 other colleagues. 2. The results of their PowerPoint presentations were analysed with colleagues and researcher (approx. 15 min). 3. After the collegial discussions, the teacher teams further discussed and planned for the next lesson (approx. 15 min). 4. During the last 10–15 minutes, the team discussed how they intended to develop the lesson and redesign it based on the merits and disadvantages discussed.

After completing the first lesson, the teachers shared their experiences with their colleagues through a PowerPoint presentation consisting of four frozen images and eleven video sequences that lasted between one and six seconds. The lesson began together with the students with a review of the dance, rules of the activity and the use of the Chromebooks. The presentations showed images and video sequences of students working together in different groups. All groups had their Chromebooks to help them follow the dance choreography. It could be seen how the students studied the dance instructions together, guided each other, shared feedback and monitored the process (in Chromebooks) in different ways to master the object of learning. In the last video sequence in the teachers' PowerPoint, the students stood in rows on the floor and performed movements to the music (lasting for 85 seconds). The lesson ended with a short class discussion where the students briefly reflected on the in-class activity and how they had experienced the process. During the teachers' lesson-planning they decided to use flipped classroom and a prior pre-class activity containing a short video-instructed choreography. The video was bought and downloaded, with supplementary written information. The dance instruction was published on the students' Google Classroom three days before the in-class activity and consisted of video-recorded choreography (3 minutes, 17 seconds). Simplified

choreography was done by a commercial material purchased to be used during the PEH lessons and performed by six students (not from the current school) aged 10–14 years.

### **Ethical considerations**

The researcher was responsible for the validity and trustworthiness of the study and gave careful attention to research transparency and obtaining informed consent from participants (Swedish Research Council, 2017). The Swedish Research Council's guideline for Good Research Practice (2017) emphasises the obligation of researchers to follow the Good Research Practice guidelines, i.e., not to act in personal interest or to influence or manipulate participants in any way. Good research is characterised by systematic work shared with the participants, and there should be no conflicts of interest, or concerns with methods or reliability.

Information about the research was provided to the participating teachers by the author of this article. It was clearly stated that there was no interest in personal data in this research. Teachers were informed that they had the right to withdraw before the process was finished. Participating teachers signed a consent form, where the aim of the study was clearly stated. They were assured of anonymity and that no video-recorded sequences would be shared. Information about the aim of the research was provided to the parents and their children, both verbally and in information letters, by the participating teachers, principal of the school and author of this article. The information letter defined the focus of the study, i.e., on teachers' collaborative professional development, development of teaching design, and their experiences of students' learning outcomes. Data were analysed and used by the teachers to improve their knowledge of how to develop their students' dance abilities, and not shared in any context outside of the school.

### **Data analysis**

Data analysis was carried out in three stages. The first stage was related to RQ1. The unit of analysis contained teachers' PowerPoint presentations of two dance lessons for colleagues, pre- and post-meeting, and three delayed post-interview transcripts analysed together using thematic qualitative analysis (Castleberry & Nolen, 2018; Creswell & Creswell 2017). Teachers' viewpoints and experiences of two FC lessons in the subject of PEH (dance and movements to music), provided rich material for thematic analysis. Thematic analysis was carried out using a process of thematic coding to answer RQ1, with each theme exemplified by extracts from participants. The themes were subsequently shared and discussed, in, e.g., higher seminars, before being applied in this article. The following themes were embedded in the selected extracts: students' personal development, technical equipment, fewer student conflicts, developmental instructions, and a safe and inclusive working environment.

The second stage (RQ2) referred to aspects of the content (video choreography) that were discernible for the students. Aspects analysed in the in-class activity were divided into four groups: movement of arms, hips, legs, and room position.

RQ3 focused on teachers' collaborative experiences, and teaching colleagues' reflections were added in the extracts. Analysis units comprised teachers' collaborative lesson plans, PowerPoints presented to other teachers, collegial discussion of the FC design, and three post- interview transcripts.

## RESULTS

The results are presented based on the research questions.

### *Teachers' experiences of content accessibility for all students*

In addition to general approaches, three specific themes emerged, namely, peer-to-peer feedback, use of technology, and peer collaboration for increased equality.

#### **General approaches**

TA believed that the subject, PEH, in some natural way created a 'safe environment' because everybody had access to the same support, artefacts and instructions:

#### **Excerpt 1:**

TA: Many were at the same [knowledge] level. /.../ The students' previous knowledge was fairly even. Nobody felt that they were at some disadvantage level or superior level. I think it became a, a safe environment – maybe because we worked with such a theme [dance].

On several occasions, the teachers returned in their discussions to the lesson design. The teachers considered the flipped model a vital component to achieve the lesson objectives. They felt it contributed to student knowledge and the way in which small group collaborations fostered peer responsibility. In excerpt 1, TB experienced that the flipped model provided more inclusive opportunities and contributed to ensuring equality between students.

#### **Excerpt 2:**

TB: I note that they have experienced that the digitised dance lesson has been much more advantageous in terms of personalising the object of learning. They were able to distinguish that those [peers] that have extra customisations were not negatively treated by their peers. This depended on the activity, that according to the teachers had an inclusive approach in itself where everyone had the same access to the same tool, namely the Chromebook and the dance [instructions] in Google Classroom three days before the in-class activity.

TA: And there were fewer conflicts and irritation because they did not have to wait for each other.

TB described less irritation and conflict between the students. She attributed this to students being able to practice dance movements at their own pace in the small groups which then reduced possible irritations that can occur when waiting for others.

### *Peer-to-peer feedback*

After the first lesson, the teachers wanted to observe the feedback students had given each other and focus more on content knowledge about how to use muscles and movements in a more technical way. Teachers believed that these elements need to be highlighted for the students to understand the dance as a whole, the different movements and which muscles they need to train to perform the dance choreography best. From the teachers' viewpoint, it seemed that the instructions together with the flipped model provided a universal structure that allowed the students to learn from each other.

#### **Excerpt 3:**

TA: With the help of the computer, they could decide for themselves how quickly or slowly they wanted to study the movements on their own Chromebooks. If they wanted to pull down

the pace of the dance, see the steps more easily and work out at a slower beat and then increase the pace.

TB: Everyone doesn't have to be doing the same movements; everyone doesn't have to listen to exactly the same instruction at the same time or be quiet at the same time. I think of those who have been diagnosed [with concentration difficulties] and say or do things impulsively.

#### *Use of technology*

The teachers discussed how students needed to imitate the dance by watching it on their Chromebooks, and help each other develop the necessary skills. Students worked with the beat (pace), rhythm, coordination, and body control synchrony in every sequence with their peers. An explanation for the increased inclusion of all peers correlates with students being given responsibility for the task, and for educating and guiding each other – this could be a critical reason for students achieving the object of learning.

#### **Excerpt 4:**

TB: The inclusion of those students in need of additional adaptations became replaced by the model. The whole class was now using the computer which the students with additional adaptations often used.

TC emphasised that the structure and preparations for the digitalised dance instruction provided all students with the same learning opportunities.

#### **Excerpt 5:**

TC: In the classroom, these students can be seen in specific ways; we give them [e.g.] headphones, different materials adapted to their level. In this case [lesson], after all, nothing was specially adapted, everyone had the same digital tools. I think when you give the same adjustments to all students, it doesn't become something special for one or three students – because now /.../.

The pre-class activities and guidelines that the teachers had placed on the Google Classroom three days before the lesson had an impact on the students' learning environment. The teachers highlighted how computer-based study enhanced their learning and made it more efficient using the new approach.

#### **Excerpt 6:**

TC: The students developed their skills much faster than when the teacher himself led the dance activity.

TB: I think it became perfect that they [the students] could see the movie [dance instructions on the video] themselves and could pause and watch over and over again.

The teachers argued that the digital instructions elucidated and increased students' dancing skills faster than when a teacher led the dance element in the PEH lesson in person. This new approach also ensured that the goal of the activity was achieved. When the teachers shared their experiences after the second lesson, they described how they had varied the lesson from the first one. They had started the lesson by explaining the skills the students were expected to develop during the dance activity. They went through all the dance steps before the lesson started, which was the part that the students would assess in the matrix at the end of the lesson. Their PowerPoint presentation contained a short (4 min 7 sec) video sequence where students in their groups imitated the dance movements by watching their Chromebooks. Unlike the first lesson, the teachers had divided the

sequences into seven learning areas: knowledge requirements, the matrix for self-assessment, training with peer feedback, dance, appreciation in the matrix, and summarising the lesson.

#### *Peer collaboration for increased equality*

In the PowerPoint presentation, the teachers described how students had been seen prior to the lesson practising the dance together on breaks. Sharing the instructions three days in advance of the lessons seems to have promoted an inclusive learning perspective outside the actual lesson with the students discussing the different parts of the dance before the lesson in their peer groups. This appeared to have helped speed up the distinction between the different steps, and increased students' understanding of the choreography. There is no evidence that all students practised the dance during the breaks, but the teachers' report suggests that the task engaged several students before the lessons.

#### *Content offered prior to the lesson at school*

The second research question set out to describe what the students were offered to discern during the lessons. These aspects are identified here based on the different sources the students received: video clip, written instructions, and teachers' lesson instructions.

#### *Video clip*

The main source for the students was the video clip (3 min 17 sec), which includes movements of arms, hips, and legs as well as placement in the room. The choreography shared with the students encouraged them to simultaneously master the movements needed in the foreground and background. Students needed to distinguish the positioning of the arms: whether a rigid formation was needed or if they should move their arms in a horizontal or vertical line. In the same way, they needed to distinguish the movement patterns of the hips, related to formations of the arms and legs, simultaneously and synchronously with the music and their peer group. The analysis of the material focusing on what aspects were made discernible, both separately and simultaneously in patterns of movements. The analysis identified both single movements and movement series, and how they were repeated in different ways. Results of the analysis show how complex the dance is and how many different patterns were made discernible during a short amount of time.

The choreography requires students to discern and master movements synchronously with other dancers as well as knowing where to be positioned in the room. The analysis shows that the dance choreography is complex, with several different movements and variations, presenting a definite challenge for students with special educational needs and probably difficult for all students to master during an ordinary lesson.

#### *Written instructions*

The second material for the students to discern the content taught was text describing the dance sequence. Themes and rhythm were described on the left side of the page, while on the right side, movements and pace were presented. Students were able to distinguish between two different verses, repeated in two different places and always one after the other. Likewise, students could distinguish between a two-beat or an eight-beat pace and rhythm. On five occasions, a reference part was repeated based on written instructions for the students to understand and distinguish between small nuanced differences with each new reference part. For example, the original reference was to swing sideways with wide legs, arms above the head and swinging in the air; spin on the spot – first in one direction then the other – and finish with the arms crossed. The next time the reference part appeared, the students distinguished that they should not have their arms crossed.

Students needed to discern three major elements that frame the entire choreography. They were given two verses and something called 'bridge', which requires discerning several different steps at the same time, while simultaneously making big handshakes above the head, big crosses with the



arms, putting hands on their thighs, swaying sideways and jumping with one fist in the air. In addition, the students also distinguished that the choreography has introductory and concluding parts that are similar and a robot dance track, termed 'freestyle' in the written material. The students could read and follow the manual-based instructions while also being able to see how the steps could be carried out by following the video.

#### *Teachers' lesson instructions*

Both lessons began in a similar way with students sitting in a circle on the floor listening to the teacher's instructions about the content and elements of the dance, as well as the rules of conduct for the task. The big difference between lesson one and two was that during the second lesson, the teacher described the goals of the lesson more clearly based on the requirements of the syllabus. In the second lesson, the teacher also described how the students would need to assess their contribution based on a matrix containing assessment levels ('to some extent', 'relatively well' and 'well') and the four assessment categories (pace, rhythm and flow, movement and coordination). Altogether, the materials show how students were offered different types of learning materials and instructions to enhance their ability to capture the dance movements. The pattern of variation used both contrasts, as different movements were contrasted with each other, as well as description through the written instructions. Generalisation was also used: one movement was separated from changing movement patterns and used in several different sequences. This meant the specific aspect could be separated from its representation in a series of movements, and inserted into new sequences of movements. Finally, fusion was used as the movements were changing, focusing on different parts of the body at the same time as movements were made in the room and in the order of movements in the movement patterns.

#### *Teachers shared collaborative experiences of the flipped classroom model*

Six themes revealed what the teachers chose to share: peer-to-peer feedback, content access for all, enhanced interest, the impact of the technology, motivation to stimulate learning outcomes, and explanations of development.

#### *Peer-to-peer feedback*

In excerpt 7, TA discussed students' spontaneous feedback with the other teachers. This feedback had surprised him in a positive way. He emphasised the power of the flipped model where all students can participate equally in the activity. He also realised that the lesson setup was giving him more time to observe and support the students.

#### **Excerpt 7:**

TA: What surprised me most was that they split up within the groups; where someone was sitting on the floor watching the dance movements, and others try to imitate the movements. Synchronically they give each other feedback on the movements and how to develop. And this was nothing that I have told them to do. /.../ I think it is easier to get more people starting to like this. It is also easier for me to see what they are doing. Otherwise, I have to be an active dancer, encourage them and have eyes on my back to see that all students are on the right moves.

The support and guidance of the group developed during the in-class activity while students were in their comfort zone. The teacher noted that he could use his time to observe the students when the flipped digital model was used prior to the lesson. This meant that more time could be given to help students who needed different types of support.

*Content access for all*

Teaching colleagues were positive about the inclusive nature of the lesson. They commented that everyone was dancing, moving rhythmically and synchronically with the other dancers, in time to the music: 'I just think it was incredibly good. The whole thing. I thought it was amazing!' (One of the other teachers). After the teachers presented and shared the second lesson, a colleague expressed: 'This form of learning model clearly showed that the students supported each other and learned from the better ones.' Another colleague said: 'I think you have a model here for peer response that the whole school could benefit from and take after! And something we can start with already in preschool so that they get in the habit of giving each other feedback [that can] become a way for our [school] to systematically work.'

*Enhanced interest*

The teachers discussed their planning and experiences after the lesson.

**Excerpt 8:**

TC: When we presented our first lesson, the students had access to digital tools [Chromebooks] to learn the dance /.../ we saw that this was benefiting the students /.../ that they could take the time they needed to learn the dance [at home]. There were also fewer conflicts between them [in the lesson].

TB: This time, we wanted to focus on the peers' response, how such peer-to-peer response looks, how it works inside each group and if the students have any supporting pep-talk afterwards.

During their PowerPoint presentation, one colleague expressed: 'I think it would have been great if the whole school had been able to teach like this [using the flipped classroom model] and actively work with the students' feedback. It is just like everyone has created this together and then showed it. It is great! What great inspiration!'

*Impact of the technology*

At the end of the second presentation, the teachers discussed whether the iterative PDSA model, containing the digital approach in flipped learning, had taken more planning time than their regular lessons. According to TB and TC, it had taken more time to film and edit their presentations, but the extra time taken was not significant. TC explained: 'Sure it takes a little bit more time in the beginning, but then you become an expert on it and then it goes faster.' The video-recorded material meant that teachers were able to study how they began the lesson, how they introduced the object of learning once all students were aware of the instructions, and whether the intended objectives had been achieved. This flipped approach developed the students' dance abilities more than the teachers could have imagined.

*Motivation to stimulate learning outcomes*

All three teachers emphasised the students' sense of engagement, responsibility, and awareness of the object of learning. TB and TA share their beliefs about students' in-depth knowledge in excerpt 9.

**Excerpt 9:**

TB: Through the flipped classroom, the students become more inspired to deepen their dance knowledge.

TA: They even stood out in the corridor and practice before the lesson! It felt like it was a deeper knowledge than just learning and then forgetting about it /.../ They were happy when they saw that they could.

The teachers continued to reflect on how students perceived the choreography of the dance and how they mastered the dance instructions to perform the whole dance synchronically with their peers at the end of the lesson.

#### **Excerpt 10**

TA: The method helped the students gain a deeper knowledge of movement and rhythm. /.../ and purely in terms of subject matter it was developing for their motor skills and dance skills, the movement to music /.../ and handling the computer and the video-instructions.

#### *Explanations of development*

TC was convinced that three things played a unique role in the outcomes of the object of learning. First, students received dance instructions three days in advance so they could train themselves as often as they wanted, wherever they wanted. Second, through this lesson plan, they were given more responsibility to help each other achieve the outcome of one unit, and complete the dance choreography before the lesson was over. Third, the students guided each other to master the whole dance, ensuring that they were more receptive to learning than when the teacher was nagging them.

The teachers' discussion indicated that the students' feedback to each other had a critical impact on the object of learning, which helped develop their dance skills: 'You might try counting between the steps' and 'Watch the movie right there, they jump like that, you can practice a bit more on it, ok' (students' voices through the teachers' reflections).

### **DISCUSSION**

This study analysed teachers' experiences of making content accessible for all students in an inclusive school setting. Focusing on the first RQ, three specific themes were revealed: use of technology, peer-to-peer feedback, and peer collaboration for increased equality, within a broad perspective of content accessibility for all students. Based on these assumptions, the teachers continued to design a learning situation aiming to enact their intentions during their lessons. They chose to use the FC model. Finally, their experiences were articulated and shared among their colleagues in the follow-up sessions. In this discussion, the results from the analyses are discussed in relation to previous research.

When Brewer and Movahedazarhouli (2019) investigated the use of flipped learning in special education in two undergraduate courses, they emphasised that the model encouraged students to use problem-based learning. They were able to state that the model's digital instructions led to fewer misunderstandings about content. In this study, there were no misunderstandings regarding the objectives. According to the teachers, this was related to the design of the lesson and that the students received the same instructions on a common platform several days before the lesson, in the form of short video instruction (dance choreography) and supplementary written instructions. TA believes this learning approach created a 'safe [learning] environment' (Excerpt 1) for all students. Brewer and Movahedazarhouli (2019) concluded that the FC offers student-active learning, where students take great responsibility for their own learning together with others. Teachers in the present study returned on several occasions to how the flipped model seemed to have affected the students' collaboration and promotion of an inclusive learning atmosphere. TA believes that an important part of this experience has to do with the subject, where dance and movement to music challenged all students in a similar way, '(...) the flipped model provided more inclusive opportunities and contributed to increased equality between the students' (Excerpt 1).

I have depicted how several studies (cf. Lo & Hew 2017; Lin et al., 2018; Aidinopoulou & Sampson, 2017; Strelan et al., 2020; Van Alten et al., 2019) have described the flipped model in higher education and STEM fields, but that there is limited information about how it works from a special didactic educational perspective. This study contributes to knowledge of how Grade 4 teachers experience the flipped approach and see it contributing to increased equality in the student group, with the students guiding and supporting each other to master their dance skills. Students' access to Chromebooks during the group activity strengthened their dancing and commitment to what and how the movements should be performed.

In excerpts 1–4, the teachers expressed how the flipped environmental tools contributed to increased inclusion of all students. According to the teachers, this was one of many reasons that correlate with greater responsibility for the task and for educating and guiding each other. These findings are encouraging and show the critical value of the flipped learning model. First, guidance through a short video (choreography) and written instructions where the movements, tempo and rhythm were in the foreground, created a safe environment. Second, the need for a well-planned active learning approach supports a universal general structure (Excerpt 3) of an inclusive classroom context that benefits both individuals and groups (Lelinge, 2022). Third, more time was given to achieve the objectives and tasks that enable students to learn by doing (Strelan et al., 2020). Finally, the results also indicate that teachers paid more attention to lesson design, where both the flipped model and the collaborative improvement science model have a prominent place.

The teachers highlighted how the process contributed to high satisfaction and effectiveness in relation to the specific learning objectives. It is reasonable to assume that the step-by-step process of the PDSA cycle contributed to teachers' shared understanding of the flipped classroom and encouraged an increasingly positive attitude regarding an inclusive classroom environment (cf. Hultén & Larsson, 2018). This study identified valuable knowledge that teachers acquired using the flipped learning model (Altemueller & Lindquist, 2017) for inclusive learning.

Regardless of special needs, all students had the same opportunities and plenty of time to prepare at home and in hallways with their classmates before the lesson. Results show that students' critical responses regarding content understanding (cf. Hwang *et al.*, 2015) allowed for creative (cf. Lucznik *et al.*, 2020) and immediate feedback between the students. This also fits with teachers' willingness to change the balance from a teacher-student relationship to a peer-to-peer relationship (Herreied & Schiller, 2013). The teachers found the flipped model was effective for flexible learning (Excerpt 8), and having many opportunities to repeat the content prior to the classroom activity gave all students access to the object of learning. Needham-Back and Aujla's (2020) study showed that it is important to create high quality and systematic training possibilities for young dancers with disabilities. It is also essential to equip students with dancing skills for the confidence to access training. In the present study, the teachers valued the peer-to-peer feedback and saw it as playing a significant role in achieving the objectives.

The findings emphasised teachers' awareness of using the improvement science collaborative PDSA step-by-step approach (Lewis, 2015) by using the flipped classroom model (Pelger & Ljungqvist, 2018; Sams & Bergmann, 2013) to create an environment where all students belong regardless of learning difficulties and special educational needs. The communication and video instructions in this study increased the students' collaborative learning and interaction opportunities in the physical classroom environment as well as their digital skills. It is reasonable to assume that the teachers' curiosity about digitalising the dance element in the subject of PEH, through the FC model, was an essential part of enhancing students' skills, movements, rhythm, pace, and coordination attitudes. The teachers also highlighted the significance of their interest in the students' peer assessment (student feedback) for the learning outcomes (Excerpt 7). This was a substantial contribution as almost all students were able to perform most of the choreography at the end of the second lesson (cf. Van Alten *et al.*, 2019).

Teachers who shared their experiences of the FC model with their colleagues emphasised six themes: peer-to-peer feedback, content access for all, enhanced interest, the impact of the technology, motivation to stimulate learning outcomes, and explanations of development. One theme that seemed particularly important was the need for motivation to achieve learning outcomes. No data were collected about the amount of time each child took to learn the steps, but it could be assumed that students with special educational needs spent more time learning the sequences than other students. It might be easier for students to prepare by themselves and learn without the stressful comparison of how fast other students are learning the same dance pattern. One main goal was to examine what teachers focus on when they share their experiences of the flipped model with colleagues, and how they discuss the diverse group of students. It became clear from the results that it is more advantageous to personalise the object of learning (TB, Excerpt 2). Students with special educational needs were not negatively treated by their peers. The teachers made the important assumption that this was related to the in-class activity and its inclusive approach. Every student has the same access to the same tools (Excerpt 10), and this leads to high levels of satisfaction. One of the teachers that took part in reviewing the study's results emphasised that the learning model needs to be discussed further with all colleagues at the school so that, '[Here we have] a model that the whole school could benefit from and take after [and] something we can start with already in preschool so that they get in the habit of giving each other feedback [that can] become a way for our [school] to systematically work.'

Several colleagues shared their views with the teachers after their PowerPoint presentations. These colleagues expressed a highly positive outlook on the impact of the flipped model on student collaboration, performance, and responsibilities. They were amazed at the inclusive and collaborative atmosphere that was described. Some colleagues provided specific comments on the sequences that the teaching team analysed during follow-up discussion. Comments about all students dancing, moving rhythmically and synchronously with the other dancers and in time with the music, were common. They also appreciated the whole structure and design of the study. The most intriguing comments pertained to how this learning model clearly illustrates that students encourage and support each other, learning through demonstration, pointing, and imitation from those who exhibit more advanced moves and rhythm, aligning with the theory of proximal development and fostering a collaborative learning environment.

Further research is needed to find out if the time spent on the preparation phase is too extensive for students with special educational needs, and to find out how the preparation phase without access to teachers' guidance would impact students' learning opportunities. As the model transfers learning responsibility from teachers to students (Altemueller & Lindquist, 2017), there is a need to study the effect of increased responsibility further and to learn more about outside school time especially for students with special educational needs in inclusive settings when using the digital flipped model.

### **Implications**

Despite this being a small-scale study with limited participants and only one class, it points to several important outcomes regarding digitalised FC lessons, which may have implications for future policies and practice-based professional developments.

From the teachers' views, it seems that the instructions together with the flipped model provided a universal structure that allowed the students to learn from each other. More research is recommended to see if this digital model could be used further to support inclusive classroom settings.

The methodology, although time-consuming, contributes to new opportunities to plan for upcoming dance lessons in the subject of PEH and facilitate content selection in ways that increase students' content knowledge and ensure inclusive practice. A consideration to take into account is the lack of data capturing the flexible time spent by students prior to the in-class activity. Further investigations are needed to determine if students with different educational needs had to spend more time learning the content than the rest of the class, and if the lack of teacher guidance during this

phase had implications for students' learning. If this student needs to spend more time and have more difficulties in learning the content, even if they seem to perform at the same levels as their peers in the following in-class activities, the burden on the student might be too heavy without special adjustments. Therefore, it is recommended that future qualitative studies concerning flipped classrooms, dance education and students with different educational needs should consider students' views in addition to teacher perceptions to give a broader perspective regarding the value of such approaches.

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