Using Flipped Classroom in Middle Schools: Teachers' Perceptions

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Although flipped classroom is a relatively new method in children's education, it is quickly gaining importance because it creates time for more active learning and develops learning practices by integrating technology. This study examined the perceptions of fifty-seven middle school teachers regarding flipped classroom. The teachers' survey designed by Gough et al. (2017) was used to collect the data. The results of the study suggested that Mathematics and Science teachers are more welcoming to implementing flipped classrooms and much more willing to use new experiences compared to Social Studies and English Language Arts teachers in middle schools. The results of the study also suggested that before engaging in a flipped classroom method, teachers need to improve their knowledge and skills about using flipped classroom effectively.

Keywords: Flipped classroom; middle schools; teacher perceptions; Social Studies; English Language Arts; Mathematics; Science

Flipped classroom is grounded in consideration and respect for individual learning needs (Ray & Powell, 2014). It is defined as "shifting direct learning out of the large group learning space and moving it into the individual learning space, with the help of one of several technologies" (Hamdan et al., 2013). The main idea of the flipped classroom model is to shift the learning of new content and concepts before class in the form of videos and then spending in-class time applying the material through complex problem solving, deeper conceptual coverage, and peer interaction (Erbil & Kocabas, 2020; Gajjar, 2013; Sarawagi, 2013; Strayer, 2012; Tucker, 2012). In a flipped classroom model, students engage with lectures and other materials outside of class in order to prepare for an active learning experience in the classroom. Before classroom time, students are asked to watch short online lecture videos prepared or selected by their teachers followed by small online activities (a short quiz, online discussion, one-paragraph summary, concept map, etc.). During classroom time, students are asked to engage in concepts by participating in individual and/or group activities with the guidance of their teachers. Individual classroom activities might include polling (iclickers), designing concept maps, or individual problem solving (worksheets). Group activities might include think-pair-sharing, immediate feedback assessment technique (IF-AT), team matrix, fishbowl discussion, three-step interview, role play, reaction sheets, affinity grouping, dyadic essays, critical debate, case study, peer editing, and group investigation (Barkley et al., 2005).

The benefits of the individual and/or group activities include content mastery, development of critical thinking and problem-solving skills, and improved interpersonal skills (Johnson, Johnson, 1999). Fulton (2012) listed the following among the advantages of the flipped classroom: (1) students move at their own pace; (2) doing homework in class gives teachers better insight into student difficulties and learning styles; (3) teachers can easily customize and

update their curriculums and provide it to students immediately; (4) classroom time can be used more effectively and creatively; (5) teachers using this method report seeing increased levels of student achievement, interest, and engagement; (6) learning theory supports the new approaches; and (7) the use of technology is flexible and appropriate for 21st Century learning.

The flipped classroom concept has existed since the early 2000s, however, it has increased in implementation after 2010 at the K-12 level. Two chemistry teachers, Bergmann and Sams, made flipped classroom popular in 2007 argued that it was possible to engage all students in learning, regardless of the content area or individual differences among students, when students are asked to view videos of lectures prior to coming to class and then spending in class time discussing assignments, rather than receiving a lecture (Cheng et al., 2019).

Flipped Learning and Student Achievement

Flipped learning is increasing in popularity in K-12 classrooms (Ash, 2012; Bergmann, & Sams, 2012b; Hao, 2016; O'Flaherty & Phillips, 2015). In 2006, 71% of Byron High School students in Minnesota failed the state mathematics test (Minnesota Comprehensive Assessments). In 2009, the Mathematics Department decided to eliminate textbooks and asked teachers to re-write the curriculum, identify materials available for free on the Internet, and utilize flipped learning in their classes (Fulton, 2012). By 2011, the percentage of students passing the state test had increased to 73.8%. With this successful move, Byron High School won the Intel Schools of Distinction Award for High School Mathematics in 2011 (Fulton, 2012). Clintondale (MI) High School also flipped all of its 9th grade classes in 2010 (Clintondale High School, 2013). According to the school principal, Greg Green (2012), failure rates dropped by as much as 33 percentage points. Additionally, the number of student disciplinary cases dropped from 736 in 2009 to 187 in 2011, a decrease of 74% in two years. Parent complaints

also dropped from 200 to 7 after the change in instructional models. Encouraged by these results, the principal converted the entire school to a flipped learning model in Fall 2011.

Flipped classrooms lead to students cooperating with each other more, which has a noticeable benefit on students' problem-solving skills. Strayer (2007) reported that students in a flipped classroom environment preferred the method and displayed a higher level of innovation (being able to solve problems in creative and unique ways) and cooperation (working with others to solve problems and discuss ideas), than students in a traditional classroom setting. Strayer also conducted another study and reported that as a result of studying statistics using the flipped classroom methodology, students became more open towards cooperative learning (Strayer, 2012). According to Avery et al. (2018) flipped classroom supports collaborative learning and teacher-student interaction. Based on data that was collected from fifteen journal articles, it was reported that the flipped classroom approach has a positive impact on K-12 student achievement (Lo & Hew, 2017; Lee, 2018).

Literature also shows that not all flipped classes result in success and satisfaction. Min (2014) concluded that even though a class applied flipped learning, and it might have had positive effects, it does not necessarily mean it is effective. This is because, in a 6th-grade math class that switched to a flipped classroom, there wasn't a significant difference that resulted from the change. Although the teacher noted increased engagement during collaborative activities in a flipped classroom in a middle school, the study found little difference in students' conceptual understanding (Kirvan et al., 2015). According to the results of their study, Johnson and Renner stated that there are no advantages to flipping a high school computer course (2012). Toto and Nguyen (2009) found that students get distracted more easily while watching video lectures. While the students enjoyed flipped classrooms because it provides additional time for problem-

solving and hands-on activities, overall, they valued traditional face-to-face lectures for their industrial engineering course. O'Bannon and his colleagues taught sections of an undergraduate technology course while some sections received traditional lectures. They found no significant difference in terms of student learning (O'Bannon, 2011; Gough et al., 2017).

Teachers perceptions on flipped learning is essential. Although some teachers pay more attention to flipped learning, some teachers want to continue teaching the traditional way. Eteokleous (2008) stated that if teachers believe that their traditional practice is reasonable, effective, and efficient, they are more likely to resist implementing computer innovations. However, integrating technology in education is inevitable and flipping the classrooms is a part of educational advancements. Because students spend the majority of their time using some form of technology, they are more active learners and less tolerant of passive learning situations (Beck & Wade, 2004; Gee, 2003; Snowden, 2012). Lu & Overbaugh (2009) stated that technology helps to increase teacher and student motivation. According to Bloom & Hanych (2002) teachers agreed that computer-based instruction can offer flexibility to individualize instruction, increase student motivations and teacher productivity.

Considering the positive effects of flipped learning outlined above, the purpose of this quantitative study was to examine the perceptions of middle school teachers on flipped classrooms. The following research questions guided this study:

- What are middle school teachers' perceptions of the flipped classroom model?
- What are the differences in the participants' perceptions of the flipped classroom model based on the content area taught?

Teachers' perception of flipped learning may impact whether or not they adopt this method. Therefore, understanding teachers' perceptions may help us understand how to present flipped learning to teachers.

Methodology

The sampling in this study was convenience sampling in nature. Convenience sampling is a type of nonrandom sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate in the study (Dornyei, 2007; Etikan et al, 2016). Groups of students (inservice teachers) from a university in the southeast part of the United States participated in this study. Data were collected using a survey. Data were analyzed using descriptive statistics and data points such as the mean and standard deviation of middle school teachers' perceptions of the flipped classrooms. An independent samples t-test was used to determine differences in middle school teachers' perceptions of the flipped classroom model based on the content they teach.

Participants

A total of 126 in-service teachers, students in a master's program, were asked to participate in the study and 57 of them responded to the survey with a 45% response rate. The 57 participants were all K-12 teachers seeking their master's degree in the Curriculum and Instruction Program at a southern university. One of the researchers was teaching in this program and distributed the online flipped classroom survey to the participants. The survey was administered to the participants through Qualtrics. The link for the survey and cover letter was emailed to the participants. The Institutional Review Board procedure was followed for the data collection. Participation was voluntary for the master's degree students, per IRB approval. The

survey was open to the participants for two weeks and all responses to the survey were anonymous. Table 1 shows the content area and gender of the participants.

Table 1

The Content Area of the Participants

Content area	Number of teachers	Gender
English Language Arts, and Social Studies	26	19 female, 7 male
Mathematics, Science	31	23 female, 8 male

Instrument

The open access teachers' survey on flipped classrooms designed by Gough et al. (2017) was used in this study. It utilized a 5-point Likert-scale (from 1=strongly disagree to 5=strongly agree). The original survey consisted of twenty questions. The researchers added four new items to the survey to obtain more information on teachers' perceptions on flipped classrooms. The survey has five subscales as areas 1 through 5. Area 1 has three questions on the benefits for students in the flipped classroom, area 2 has six questions on the instructional considerations in the flipped classroom, area 3 has three questions on learning in the flipped classroom, area 4 has seven questions on the student considerations in the flipped classroom, and area 5 has two questions on the parent considerations in the flipped classroom. Items 21 and 22 in area 2 and items 23, 24 in area 4 was added by the researchers. These questions are asking questions on instructional and student considerations in the flipped classroom such as 'preparing flipped learning materials was time consuming', and 'teaching flipped classroom model was more enjoyable than traditional classroom'.

The reliability of the sub-scales changed from α=.65 to α=.74. The reliability was calculated by the Cronbach's alpha internal consistency coefficient as follows: Area 1: .71, Area 2: .74, Area 3: .68, Area 4: .73 and Area 5: .65) Gough et al. (2017) established the validity of

the survey by basing the survey on the review of related research and literature. The authors reviewed more than fifty research papers on flipped classrooms to establish validity. It is documented as a matrix grid in order to correlate with the research questions and related literature. Teacher surveys on flipped classrooms went through a critique process by two administrators and four teachers, all of whom had experience in flipped classrooms. Evaluation of the content validity for the 24 items included two college professors who teach the flipped classroom strategies as part of their lectures as well as four middle school teachers who use flipped classrooms in their schools. Content validity is established by inspecting a test question to see whether it corresponds to what the user decides should be covered by the test (Barber, 2020). In addition to flipped classroom surveys, the researchers added demographic questions about the participants' background such as gender, age, and years of experience in the survey.

Results

This study investigated perceptions of middle school teachers regarding flipped classrooms and examined differences in those teachers' perceptions based on the content area taught. An independent sample t-test was used to determine the differences between the content areas taught. The t-test was used in order to determine if there were significant differences between English Language Arts and Social Studies teachers, as well as Mathematics and Science teachers in middle schools. Research questions were analyzed using descriptive statistics such as the means and standard deviations of middle school teachers' perceptions of flipped classrooms. Inferential statistics were conducted to test for differences between middle school teachers' flipped classroom perceptions and their content areas.

Middle School Teachers' Perceptions of the Flipped Classroom

Most middle school teachers agreed that flipping the classroom removes passive learning from the classroom (M= 4.23) and allows students to develop better relationships with their peers through cooperation and collaboration (M= 4.14). Middle school teachers agreed that in flipped classrooms, the students also have a sense of responsibility for their learning and coming prepared to class (M= 4.12). They also agreed the flipped classroom allows greater interaction between the students and teacher (M= 4.12). Flipping the classroom creates time for direct instruction, active learning activities, and content coverage (M= 4.11). Students prefer the flipped classroom over the traditional classroom (M= 4.05). Table 2 shows the perceptions of teachers in flipped classrooms.

Table 2

Middle School Teachers' Perceptions of the Flipped Classrooms

Flipped classroom perceptions	Mean	Standard Deviation
Q12 Flipping the classroom removes passive learning from the classroom	4.23	.50
Q18 The flipped classroom allows students to develop better relationships with their peers through cooperation and collaboration.	4.14	.58
Q17 In a flipped classroom, students have a sense of responsibility for their learning and come prepared to class.	4.12	.56
Q19 The flipped classroom allows teachers to have increased interaction with students.	4.12	.46
Q20 Flipping the classroom creates time for direct instruction, active learning activities, and content coverage.	4.11	.55
Q16 Students prefer the flipped classroom over the traditional classroom.	4.05	.66

Mathematics and Science teachers were in agreement when it came to their students preferring the flipped classroom over the traditional classroom (M= 4.45), as well as the students learning better in a flipped classroom (M= 4.39). English Language Arts and Social Studies

teachers agreed the most on the notion that flipping the classroom removes passive learning from the classroom (M= 4.19), and recorded lectures aid struggling students because they can re-watch portions of lessons if they did not understand them (M= 4.04). Table 3 shows the perceptions of Mathematics/ Science and English Language Arts/ Social Studies teachers.

Table 3

English Language Arts/ Social Studies and Mathematics/ Science Middle School Teachers' Perceptions of the Flipped Classroom

Areas	Ela/ SS M	Ela/ SS SD	Mat/ Sci M	Mat /Sci SD
Area 1: Benefits for students in the flipped classroom				
Q4 Absent students benefit from a flipped classroom.	3.77	.65	4.03	.48
Q9 Students do not need the teacher present for direct instruction, but students need the teacher present for solving problems.	3.81	.69	4.03	.48
Q14 Recorded lectures aid struggling students because they can re-watch portions of lessons that they do not understand.	4.04	.44	4.16	.37
Area 2: Instructional considerations in the flipped classroom				
Q6 Time created for in-class activities in the flipped classroom allows for more active learning and increased higher order thinking for students.	3.88	.58	4.10	.53
Q13 The flipped classroom allows teachers more time to personalize instruction for students.	3.92	.62	4.06	.51
Q19 The flipped classroom allows teachers to have increased interaction with students.	3.88	.32	4.32	.47
Q20 Flipping the classroom creates time for direct instruction, active learning activities, and content coverage.	3.77	.43	4.39	.49
Q21 Preparing flipped learning materials was time consuming.	4.42	.50	4.38	.66
Q22 It was difficult to ensure that students had truly watched the videos.	4.23	.42	4.06	.35
Area 3: Learning in the flipped classroom				
Q8 English Language Learners benefit from a flipped classroom.	3.65	.48	4.06	.35
Q12 Flipping the classroom removes passive learning from the classroom.	4.19	.56	4.26	.44
Q15 Students learn better in a flipped classroom.	3.73	.45	4.39	.49
Area 4: Student considerations in the flipped classroom				
Q5 The flipped classroom is difficult for some students to access due to the additional technology required outside of school.	4.19	.40	4.10	.39
Q7 Student discipline issues decrease in a flipped classroom.	3.58	.50	4.16	.52

Q16 Students prefer the flipped classroom over the traditional classroom.	3.58	.50	4.45	.50
Q17 In a flipped classroom, students have a sense of responsibility for their learning and come prepared to class.	3.88	.58	4.32	.47
Q18 The flipped classroom allows students to develop better relationships with their peers through cooperation and collaboration.	3.88	.58	4.35	.48
Q23 Teaching flipped classroom model was more enjoyable than traditional classroom.	3.73	.45	4.16	.37
Q24 The flipped classroom helped me communicate with my students better than the traditional classroom.	3.76	.42	4.16	.45
Area 5: Parent considerations in the flipped classroom				
Q10 In a flipped classroom, video lectures make the class more transparent to parents.	4.00	.40	4.10	.30
Q11 Discussions with parents center more on learning than they do on classroom behavior when using a flipped classroom.	3.96	.44	4.10	.30

Scale: 1= Strongly disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly agree

Middle School Teachers' Concerns of the Flipped Classroom

Despite the benefits of flipped classrooms, middle school teachers agreed strongly on one thing: preparing flipped classroom materials was time consuming (M= 4.40). They also agreed that it was difficult to ensure if the students had truly watched the videos (M= 4.14), and it was also difficult for some students to access due to the additional technology required outside of the school (M= 4.14). Table 4 shows middle school teachers' concerns about the flipped classroom.

Table 4

Middle School Teachers' Concerns of the Flipped Classroom

Flipped classroom perceptions	Mean	Standard Deviation
Q21 Preparing flipped learning materials was time consuming.	4.40	.59
Q22 It was difficult to ensure that students had truly watched the videos.	4.14	.46
Q5 The flipped classroom is difficult for some students to access due to the additional technology required outside of school.	4.14	.39

Differences in Teachers' Perceptions of the Flipped Classroom Based on Content Area Taught

Mathematics and Science teachers' scores were significantly higher than English Language Arts and Social Studies teachers on the flipped classroom areas 2, 3 and 4. Mathematics and Science teachers agreed that flipping the classroom allows teachers to have increased interaction with students as well as creating more time for direct instruction, active learning, and content coverage (Area 2). Another thing they agreed on was students learning being better in a flipped classroom and flipping the classroom removes passive learning from the classroom (Area 3). Mathematics and Science teachers also shared the same thoughts when it came to students preferring the flipped classroom over the traditional classroom and students having a sense of responsibility for their learning which leads to them coming prepared to class (Area 4).

The English Language Arts and Social Studies teachers, as well as the Mathematics and Science teachers, did not show significantly different results in Areas 1 and 5. They all agreed on recorded lectures definitely aiding struggling students because they can rewatch portions of lessons that they do not understand (Area 1). Both groups also agreed that video lectures make the class more transparent to parents, and discussions with parents center more on learning than they do on classroom behavior when using a flipped classroom (Area 5). Table 5 provides the differences in perceptions of middle school teachers in terms of content area taught.

Table 5

Differences in Perceptions of Middle School Teachers in terms of Content Area Taught

Flipped Classroom Perceptions	*ELA/Social Studies (n=26)*		*Mathematics /Science (n=31)*		*95% CI for Mean Difference*		t	df	p
	M	SD	M	SD	Lower	Upper			
Area 1 Benefits for students	3.87	.37	4.07	.39	-.408	.001	-1.98	55	0.52
Area 2 Instructional consideration	4.01	.22	4.22	.30	-.344	-.057	-2.81	55	.007*
Area 3 Learning in flipped class	3.85	.37	4.23	.30	-.558	-.197	-4.19	55	.001*
Area 4 Student considerations	3.80	.33	4.24	.24	-.597	-.286	-5.68	55	.001*
Area 5 Parent considerations	3.98	.41	4.09	.30	-.305	.073	-1.22	55	.225

* $p < .05$

Mathematics and Science teachers scored significantly higher than English Language Arts and Social Studies teachers in the areas 2, 3, and 4 on flipped classrooms.

This study provides evidence that Mathematics and Science teachers have more positive perceptions on the flipped classroom than Social Studies and English Language Arts teachers, however, Social Studies and English Language Arts teachers still perceive the flipped classroom as beneficial for their subject matter.

Conclusion

Middle school teachers had positive perceptions toward flipped classrooms/learning. They agreed that flipping the classroom removes passive learning from the classroom and allows students to develop better relationships with their peers through cooperation and collaboration.

All teachers agreed on one point, in a flipped classroom, the students have a sense of responsibility for their learning and come prepared to class. Hulten and Larsson (2018) indicated "it could take time to get students acquainted with the flipped classroom method, but that they would start to see the benefits of it with time and then feel more inclined to comply with the requirements of the method, such as to come prepared and engage in classroom discussions" (p.438).

Furthermore, teachers believed that they covered the content and made the lectures more transparent to parents by applying flipped classroom strategies. Raths (2014) provided examples for involving parents in flipped learning practices by creating parent videos, online newsletters, and emails. This leads to parents getting excited about their children's learning and supporting the teachers. Cheng and Weng (2017) focused on parental involvement when they were studying the key roles that affect the success of a flipped classroom. According to Fulton's study (2012), 84 % of the parents preferred flipped classrooms for instructional delivery. The same author stated that parents can watch instructional videos with their children and recall what they learned many years ago about the same or similar subjects.

According to the results of this study, flipped classrooms work both in Mathematics/ Science as well as English Language Arts/ Social Studies classes. Although the t-test results showed significant differences statistically, all subject areas had more than 3.80 as the mean score on five of the flipped classroom areas. This means that English Language Arts teachers did not have a negative view on flipped classrooms. In fact, they were significantly positive, but not as positive as the Mathematics and Science teachers. Certain content areas, such as English Language Arts (ELA) or other humanities-related subjects, may be less suited to flipping when

compared to Mathematics and Science, where yes or no answers are more applicable (Moran & Young, 2013).

Muir and Chick (2014) stated that the Mathematic teachers and students were all positive on the flipped classroom approach and believed flipped classrooms could provide additional support to students. Moreover, all students in a senior Mathematics secondary class recommended the use of teacher prepared tutorials to other students. Students performed better in flipped classrooms compared to traditional lecture classes in the STEM -science, technology, engineering, and mathematics (Cronhjort et al., 2017; Deslauriers et al., 2011, Freeman et al., 2014; Hake, 1998; Mazur, 1997). In the realm of flipped classroom research in STEM education, most studies have reported a positive impact on student learning (Barba et al., 2016; Stohr, 2020). Schultz and her colleagues conducted a study in 6-12 classrooms and reported that advanced placement chemistry students scored higher on classroom assessments than students in traditional classes (2014). Winter (2018) stated that when effectively implemented, flipped classrooms are beneficial for averagely achieving students in middle schools. Heo & Choi (2014) found out that video learning has positive effects on student achievement in a 7th grade Mathematics class.

On the other hand, according to the results of this study, it takes time to prepare flipped classroom materials. Schmidt and Ralph (2016) pointed out something to be considered: flipped classrooms are a lot of work to utilize. The report on flipped classrooms prepared by the Yale University Center for Teaching and Learning (2018) indicates that flipping the classroom does not ease instructor time. In fact, they have to spend more time preparing lecture videos, out-of-class content, in-class practices, and efficient assessment methods. K-12 history teachers

expressed concerns about the amount of time they had to devote in order to design new activities and material (Aidinopoulou & Sampson, 2017; Townsend, 2010).

Teachers were also concerned that some of the students did not watch the instructional videos at home because they did not have access to the required technology. Schmidt and Ralph (2016) pointed out that in a flipped classroom, students are supposed to come to class ready to start solving problems, analyzing text, or investigating solutions after they watch videos, PowerPoint's, and complete readings at home. However, some teachers are surprised that many of their students did not have internet access or even a computer at home. They also indicated that it is hard to make sure if the students actually watched the instructional videos at home.

Implications

The teacher and the curriculum play critical roles in facilitating the use of technological tools (King-Sears, 2009; Roschelle et al., 2010; Suh, 2010). Dick and Hollebrands (2011) stated that the strategic use of technology strengthens teaching and learning. This study examined English Language Arts/ Social Studies and Mathematics/ Science teachers' perceptions of flipped classrooms.

The results of this study found that teachers and students benefit from flipped classrooms. Before teachers and students engage in this new flipped classroom technique, they need to improve their knowledge and skills in using flipped classrooms effectively. Students need to learn strategies to use their time efficiently at home, being aware of their responsibility for their own learning, increasing active learning, and interacting with peers and teachers. The aim of the flipped classroom should be helping students become self-learners and teaching them to seek access to information on their own (Franciszkowicz, 2008). Gough et al. (2017) stated that

students are more engaged in learning and spend more time on higher-order thinking skills in a flipped classroom model.

The concept of flipped classrooms with preservice teachers, in-service teachers, university supervisors, parents, and students show that they believe the flipped classroom is vital and can produce great rewards for all concerned parties. The results of this study suggest that workshops, seminars, and techniques on flipped classroom strategies should be implemented for middle school teachers. Furthermore, teacher education programs need to make sure to provide the required knowledge, skills, and practices to help preservice teachers. Each preservice teacher should be able to learn how to use flipped classroom strategies and work with students in order to contribute to their learning. O'Flaherty and Phillips (2015) stated that since the flipped classroom is seen as a strategy that can genuinely improve the student learning experience through increased interactivity, it leads to added pressure for many educators to renew their curriculum with an approach that they may not fully understand. The flipped classroom approach is an effective use of technology that shows great promise (Bergmann & Sams, 2012a; Brunsell & Horejsi, 2013; Ray & Powell, 2014) for teacher preparation. As a result of this, it should be used in teacher preparation programs (Ray & Powell, 2014). According to NCTM (2020), teacher education programs and professional development must continually update practitioners' knowledge of technology and its application to support learning. These include the development of lessons that take advantage of technology-rich environments and the integration of digital tools in daily instruction (Nelson et al., 2009; Pierce & Stacey, 2010).

Future Research

First of all, the number of participants in the study was small. There were 57 participants (teachers) who were seeking their master's degree in a southeastern university. Therefore, future

studies could replicate this study to help generalize the findings to a greater audience from different states, experience levels, and subject areas.

Further studies in the area of flipped classrooms should be considered in elementary and high school. Studies showed very little research exists on flipped classroom not only at the middle school level, but also with K-5 and 9-12 levels (Alpay & Gulati, 2010; Avery et al., 2018; Bergman & Sams, 2012a; Flumerfelt & Green, 2013; Fulton, 2012; Gough et al., 2017; Heilesen, 2010; Hew, 2009; Johnson & Renner, 2012; Milman, 2012; Redekopp & Ragusa, 2013). Pulley (2019) stated that after almost two decades of teachers implementing flipped classroom models, very limited research exists at grade levels 6-12. More studies investigating flipped learning across subjects is recommended (Akcayir & Akcayir, 2018; Bond, 2020).

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