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The impact of project-based learning and direct instruction on the motivation and engagement of middle school students

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Abstract

This quantitative study sought to compare the levels of motivation and engagement for middle school students before and after the implementation of both project-based learning and direct instruction. Student participants completed the Intrinsic Motivation Inventory [IMI] (Deci & Ryan, 2017) to assess their levels of motivation prior to and after instruction. In addition, engagement data was obtained utilizing the Student Engagement Walkthrough Checklist (SEWC) created by the International Center for Leadership in Education. Surveys were used to collect data from a sample of 6th, 7th, and 8th grade students in a rural southwestern Tennessee school district in the United States of America before and after project-based learning and direct instruction lessons. Data analyses revealed significant differences in motivation and engagement levels before and after (a) project-based learning and (b) direct instruction. Significant differences in motivation and engagement of students were also found between groups of students who had experienced project-based learning as compared to direct instruction.

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Proje tabanlı öğrenme ve doğrudan öğretimin ortaokul öğrencilerinin motivasyon ve katılımları üzerine etkisi

Öz

Bu nicel çalışmanın amacı, ortaokul öğrencilerine proje tabanlı öğrenme ve doğrudan öğretim yöntemlerinin uygulanmasından önceki ve sonraki motivasyon ve katılım düzeylerini karşılaştırmaktır. Çalışmaya katılan öğrencilere, uygulamadan önce ve sonra motivasyon düzeylerinin değerlendirilmesi amacıyla Deci ve Ryan (2017) tarafından geliştirilen İçsel Motivasyon Ölçeği uygulanmıştır. Ayrıca, Uluslararası Eğitimde Liderlik Merkezince hazırlanan Öğrenci Katılımı Kontrol Listesi'nden yararlanılarak, öğrencilerin derse katılımlarına dair veriler toplanmıştır. Ölçekler, proje tabanlı öğrenme ve doğrudan öğretim modelleri uyarınca hazırlanan derslerden önce ve sonra olmak üzere, Birleşik Devletler Tennessee eyaletinde bulunan kırsal bir okul bölgesinde öğrenim gören 6., 7., ve 8. Sınıf öğrencilerine uygulanmıştır. Elde edilen bulgulara göre, (a) proje tabanlı öğrenme ve (b) doğrudan öğretim uygulamalarının öncesi ile sonrası arasında, öğrencilerin motivasyon ve katılım düzeyleri bakımından anlamlı farklılıklar görülmüştür. Ayrıca, proje tabanlı öğrenme grubu ile doğrudan öğretim uygulanan öğrenci grubu arasında da motivasyon ve katılım açısından anlamlı farklılıklar bulunmuştur.

Introduction

Overcoming student apathy requires teachers to discover what interests their students have. Teachers need to take the time to connect lessons to student interests. When students can experience the connection between the lesson and their own lives, there is less apathy and more engagement (Anderson, 2016). The creation of engagement in the classroom tends to reduce the failure rates of students on standardized tests (Allen, Gregory, Mikami, Lun, Hamre, & Pianta, 2013). Since standardized tests are typically the measure used to determine whether a student has mastered the required state standards and whether the teachers and schools have succeeded in teaching these standards to the students, finding strategies to improve achievement levels is imperative (Allen et al., 2013). By implementing lessons that can increase student autonomy, competence, relatedness, and relevance, educators may be able to increase student engagement and motivation (Ferlazzo, 2015; Turner, Christensen, Kackar-Cam, Trucano, & Fulmer, 2014; Jenson, 2005).

Increasing student motivation and engagement as a method for increasing student achievement was supported in a study conducted by Korpershock, Kuyper, and van der Werf (2015). Korpershock, Kuyper, and van der Werf (2015) found that students who were above average in motivation levels were also highly committed to school and were confident in their ability to succeed. Their findings also suggest that students in their study were motivated to succeed in school in order to achieve mastery of a subject, to improve performance, or to obtain social acceptance. Additionally, some students are motivated simply by the need to avoid failing, and if they do experience failure, then they are even more discouraged (Hoy & Hoy, 2013). Carol Dweck (2006) found that students with fixed mindsets showed a decrease in grades due to a lack of motivation to improve. Students with fixed mindsets were more apathetic towards success because they believed they were unable to succeed. This apathy is one of the biggest challenges for middle school educators (Hoy & Hoy, 2013). Regarding engagment, Antonetti and Garver (2015), concluded that students cannot be engaged in someone else's work. Students can only be entertained by other's work and must be active participants in their own work to be truly engaged. Ateh and Charpentier (2014) similarly concluded that work, which is relevant to a student's life, and tends to be student-centered, provides the most opportunities for student engagement. It is reasonable to suggest that middle school educators need to know the best instructional strategies to use to increase student engagement and motivation (Korpershock et al., 2015).

The purpose of this study was to compare teaching strategies, specifically project-based learning and direct instruction, in order to determine which were more significantly connected to middle school students' engagement and motivation to achieve. Project-based learning is a type of student-centered instruction, where students have greater autonomy regarding their learning. An increase in autonomy, as well as relatedness, competence, and relevance, are all evident with project-based instruction (Stefanou, Stolk, Prince, Chen & Lord, 2013). Project-based learning also provides teachers with the opportunity to teach beyond the textbook, incorporate engaging real-world activities and projects into lessons, and actively teach alongside students as they learn. Project-based learning further enables students to develop not only the knowledge, but also the skills necessary for success in school and in life (Larmer et al., 2015). Contrarily, Hoy and Hoy (2013) explain that direct instruction is a teacher-centered form of instruction, where teachers focus on providing instruction to the student. Direct

instruction is well suited for learning basic skills, which have a clear structure (such as science facts, mathematical function, and vocabulary) (Hoy & Hoy, 2013).

Achievement in the classroom, according to Allen, Gregory, Mikami, Lun, Hamre, and Pianta (2013), can often be related to experiences that are emotionally and intellectually engaging to students. However, not all students arrive in the classroom with their minds set on achievement (Hoy & Hoy, 2013). Some students are uninterested in learning often times because they cannot see the benefit in the learning, relate the the learning to their own lives, and/or see how it might be used (Anderson, 2016). Additionally, some students are motivated simply by the need to avoid failing, and if they do experience failure, then they are even more discouraged (Hoy & Hoy, 2013). This apathy is one of the biggest challenges for middle school educators (Hoy & Hoy, 2013).

Increasing student intrinsic motivation and engagement in the classroom is addressed through autonomy, competence, relatedness, and relevance (Sackstein, 2017). Success in middle school grades requires active engagement of students as well as teachers (National Middle School Association [NMSA], 2010). By empowering students and having them gain some control over their own learning, their intrinsic motivation and level of engagement will change (Sackstein, 2017). Ostroff (2016) states that motivation comes from the genuine curiosity that is part of every human's consciousness. If teachers can get students to follow their curiosity, then the students will most likely stay on a path towards discovery.

This curiosity is often dampened by the use of traditional instructional strategies (Ostroff, 2016). Traditionally, teachers have taken measures to control their classrooms, which does not always provide students the opportunity to be curious and generate their own questions (Sackstein, 2017). Student curiosity reveals itself through student inquiry, which makes the learning relevant for students and they then take more ownership of their own learning (Pahomov, 2014). Deci (1995) stressed the importance of establishing conditions where students will motivate themselves. Providing students with the classroom conditions where they can take more control of their own learning will increase their intrinsic motivation and engagement (Deci, 1995).

According to *This We Believe* (NMSA, 2010), for students to be successful in school and in life, educators need to provide students with the knowledge and skills they need to take control of their lives. Larmer, Mergendoller and Boss (2015) found that when students are given the opportunity to learn through project-based learning, they become more responsible, and improve the quality of their work. Project-based learning provides students with choices about their own learning experience, which are strong motivators for students (Brophy, 2013). Students who are actively involved in learning and have a greater voice in their own education find more opportunities for collaboration and they create their own understanding of concepts (Larmer et al., 2015). When students work collaboratively, as through project-based learning, achievement levels could increase along with motivation and engagement (Rollins, 2017). Collaboration involves not only students, but teachers as well, which may increase student ownership and improve student comprehension far more than other types of non-collaborative instructional strategies (NMSA, 2010).

Methodology

Research design

This quantitative study incorporated an experimental design involving two groups of students involved in two different types of instructional strategies: (a) project-based learning and (b) direct instruction. The study was guided by the following research questions:

1.   Is there a significant difference in the intrinsic motivation of middle school students before and after the implementation of (a) project-based learning and (b) direct instruction?

2.   Is there a significant difference in the engagement of middle school students before and after the implementation of (a) project-based learning and (b) direct instruction?

3.   Is there a significant difference in the (a) intrinsic motivation and (b) engagement of students who were taught with project-based learning compared to direct instruction?

Science teachers volunteered to be a part of the study. One teacher from each grade (6th, 7th, and 8th) employed direct instruction while one teacher from each grade was trained on successful research-based methods from the Buck Institute for Education PBL 101 workshop. The teachers from each grade employed their respective type of instruction for one month, focusing on the same science standards. All student participants completed the Intrinsic Motivation Inventory [IMI] (Deci & Ryan, 2017) to assess their levels of motivation prior to and after instruction. This inventory included 21 questions in which students had to determine to what degree a statement was true (i.e. I like science very much). Cronbach's alpha coefficients were evaluated using the guidelines suggested by George and Mallery (2016) where > .9 excellent, > .8 good, > .7 acceptable, > .6 questionable, > .5 poor, and ≤ .5 unacceptable. The 21 Likert-scale items for measuring intrinsic motivation had a Cronbach's alpha coefficient of 0.89, indicating good reliability. In addition, engagement data was obtained per student participant utilizing the Student Engagement Walkthrough Checklist (SEWC) created by the International Center for Leadership in Education. Teachers observed student behavior and completed the SEWC for each student at the beginning and end of each type of instruction.

Data analyses

Regarding research question 1 and 2, paired samples t-tests were conducted to examine differences in the (a) intrinsic motivation and (b) engagement of students before and after each type of instruction. Independent samples t-tests were applied to explore whether intrinsic motivation and engagement were significantly different between the students involved in project-based learning and the students involved in learning utilizing direct instruction. All data analyses were conducted using Intellectus Statistics (2017).

Sample and demographics

A total of 631 students in 6th, 7th or 8th grade from a rural middle school in a southwest Tennessee school district in the United States of America participated in the study. Both male and female students from a variety of ethnic groups were included in the sample. The majority of the students were white (75%), and there were more males (52%) in the study than females (48%). Two science teachers from each grade ($n = 6$) (5 female and 1 male) consented to be a part of the study. Each teacher taught four separate classes. The researcher randomly selected one teacher from each grade level to utilize project-based learning or direct instruction to

cover the same standards within their four classes. The teacher and student sample was considered a sample of convenience. Table 1 provides a breakdown of the student demographic data.

Table 1. Demographic data

Demographic	*n*	Sample %
Grade		
6	131	34.39
7	108	28.80
8	136	36.27
Gender		
Female	179	47.73
Male	196	52.27
Race		
White	282	75.20
Black	34	9.07
Hispanic	15	4.00
Asian	2	0.53
Other	42	11.20

Note. Due to rounding errors, percentages may not equal 100%.

Findings

Research question 1

The first research question investigated whether there was a significant difference in the intrinsic motivation levels of middle school students before and after the implementation of (a) project-based learning and (b) direct instruction. Paired samples *t*-tests were conducted to examine these differences before and after each type of instruction. The result of the paired samples *t*-test for comparing student motivation before and after project-based learning was not significant, $t(241) = 1.29$, $p = .197$ [Table 2], suggesting no significant change after this type of instruction. However, the result of the paired samples *t*-test comparing student motivation before and after direct instruction was significant, $t(132) = 4.20$, $p < .001$ [Table 3]. Intrinsic motivation significantly decreased ($M_{before} = 3.21$; $M_{after} = 2.78$). Based on the results from this research question, while there was no significant difference in student motivation when the students were given the opportunity to learn through project-based learning, there was a significant difference in the motivation prior to and after the implementation of direct instruction. Students who received direct instruction were less motivated after instruction than they were before instruction.

Table 2. Paired Samples t-test for the difference between motivation before the implementation of project-based learning and motivation after the implementation of project-based learning

motivation before project-based learning		motivation after project-based learning				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
3.17	0.49	3.09	0.79	1.29	.197	0.11

Note. Degrees of Freedom for the *t*-statistic = 241. *d* represents Cohen's *d*.

Table 3. Paired Samples t-test for the difference between motivation levels before and after the implementation of direct instruction

motivation before direct instruction		motivation after direct instruction				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
3.21	0.48	2.78	1.21	4.20	< .001	0.47

Note. Degrees of Freedom for the *t*-statistic = 132. *d* represents Cohen's *d*.

Research question 2

The second research question investigated whether there was a significant difference in the engagement of middle school students before and after the implementation of (a) project-based learning or (b) direct instruction. Paired samples *t*-tests were also conducted to examine the difference between engagement levels before and after each type of instruction. The result of the paired samples *t*-test comparing student engagement before and after project-based learning was significant, $t(241) = -12.69$, $p < .001$ [Table 4]. Student engagement after the implementation of project-based learning ($M_{after} = 3.68$) was significantly higher than engagement before the implementation of project-based learning ($M_{before} = 2.86$), suggesting a significant increase in engagement after instruction. The result of the paired samples *t*-test comparing student engagement before and after direct instruction was also significant, $t(132) = 2.59$, $p = .011$ [Table 5]. Student engagement after direct instruction ($M_{after} = 2.88$) was significantly lower than student engagement before direct instruction ($M_{before} = 3.05$), suggesting a significant decrease after instruction.

Table 4. Paired Samples t-test for the difference between engagement levels before and after the implementation of project-based learning

engagement before project-based learning		engagement after project-based learning				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
2.86	0.80	3.68	1.16	-12.69	< .001	0.82

Note. Degrees of Freedom for the *t*-statistic = 241. *d* represents Cohen's *d*.

Table 5. Paired Samples t-test for the difference between engagement levels before and after the implementation of direct instruction

engagement prior to direct instruction		engagement after direct instruction				
M	*SD*	*M*	*SD*	*t*	*p*	*d*
3.05	0.82	2.88	0.78	2.59	.011	0.22

Note. Degrees of Freedom for the *t*-statistic = 132. *d* represents Cohen's *d*.

Research question 3

The final research question examined whether there was a significant difference in the (a) intrinsic motivation and (b) engagement of students who were involved in project-based learning compared to direct instruction. Independent samples *t*-tests were conducted to investigate whether motivation and engagement were significantly different between groups of students involved in project-based learning and direct instruction. The result of the independent samples *t*-test comparing student motivation was significant, $t(194.66) = 2.69$, $p = .008$ [Table 6]. Motivation connected to project-based learning ($M_{PBL} = 3.09$) was significantly higher than motivation connected to direct instruction ($M_{DI} = 2.78$). Likewise, the result of the independent samples *t*-test comparing engagement was significant, $t(357.80) = 7.91$, $p = .008$ [Table 7]. Student engagement connected to project-based learning ($M_{PBL} = 3.09$) was significantly higher than engagement connected to direct instruction ($M_{DI} = 2.78$). These results indicate that students exhibited significantly more motivation and engagement when involved in project-based learning as compared to direct instruction.

Table 6. Independent Samples t-test for the difference between motivation levels in project-based learning and motivation levels in direct instruction

	project based learning		direct instruction				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
Motivation	3.09	0.79	2.78	1.21	2.69	.008	0.31

Note. Degrees of Freedom for the *t*-statistic = 194.66. *d* represents Cohen's *d*.

Table 7. Independent Samples t-test for the difference between engagement levels in project-based learning and direct instruction

	project based learning		direct instruction				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*

| Engagement | 3.68 | 1.16 | 2.88 | 0.78 | 7.91 | < .001 | 0.81 |

Note. Degrees of Freedom for the *t*-statistic = 357.80. *d* represents Cohen's *d*.

Discussion

According to Hoy and Hoy (2013), increasing student motivation in classrooms requires teachers to address three goals. These goals are to involve students in the classroom, motivate students to improve their cognitive engagement in the content, and aid students in developing autonomous motivation so that they will become lifelong learners. Project-based learning motivates students to perform at their highest level and engages them in the process of learning. Project-based learning requires a complex, authentic task—one that is of real interest to the students as well as the community outside of the classroom. Students are making their own choices on how to complete the project, which gives them a true interest in the results. Additionally, with project-based learning, students work collaboratively to make decisions about how to move the project through to conclusion (Robinson, 2013).

Since this was the students' first exposure to a non-traditional instructional strategy (project-based learning) they may have been unprepared for the critical thinking skills necessary and the need to work collaboratively to create a final product. The slight decrease in motivation could be attributed to the recognition that students had to work harder. The students in this study would have benefited from participation in skill and culture building lessons prior to the launch of this study (Larmer et al., 2015).

The motivational decrease after direct instruction could be attributed to a lack of relatedness between the lessons and students' lives. In project-based learning, students are charged with asking their own questions and taking ownership of their learning experience (Pahomov, 2014). Students may begin lessons eager to learn, but when they decide that the information is irrelevant to their own lives, they become unmotivated (Hoy & Hoy, 2013).

Stephanou, Stolk, Prince, Chen and Lord (2013) stated that when students have control over their own learning, engagement increases. During this research study, students were provided with the opportunity to make choices and have more control over their own learning through project-based learning, which increased their engagement in the lessons. Behavioral engagement increases during project-based learning due to students having opportunities to work collaboratively with peers (Stephanou et al., 2013). Students enjoy engaging in project-based learning because it is different from the typical direct instruction they are accustomed to, and when students enjoy instruction, they are more engaged (Robinson, 2013).

Direct instruction, as a traditional instructional strategy, creates classroom environments, which are more teacher-controlled than student-controlled. These controlled situations do not allow students to think or learn in creative ways. Direct instruction is teacher-centered, and strategies that are teacher-centered are more controlled. Controlled environments do not provide students with opportunities to be autonomous and students become disengaged. This supports the findings in this research study, where engagement decreased after the implementation of direct instruction. Through direct instruction, students are expected to absorb information, but not act on it (Turner et al., 2014). When students are not given opportunities to demonstrate control over their own learning, they are less engaged in lessons (Deci, 1995).

Conclusion

The research data from this study indicated that both motivation levels and engagement levels of students were higher with project-based learning than with direct instruction. There were significant differences in the mean levels of engagement and motivation, both of these means increased with project-based learning. These results are supported given the findings from previous research. Ateh and Charpentier (2014), and Ferlazzo (2015) both found that project-based learning increased student autonomy. Dean et al. (2015) stated that project-based learning provides students with opportunities to show their own knowledge and become more accountable for their own work. The study by Stephanou et al. (2013) determined that project-based learning increased student autonomy and gave students the opportunity to think deeper about concepts, both of which enhance student learning and increase student engagement and motivation. Robinson (2013) found that students who make their own choices regarding their learning, work collaboratively, and can relate their lesson to real world situations will work harder to produce high-quality results.

Data from this study confirmed for this population of students that project-based learning was connected to significantly higher student motivation and engagement when compared to direct instruction. Specifically, intrinsic motivation significantly decreased after direct instruction whereas student engagement significantly increased after project-based learning and significantly decreased after direct instruction. Considering these results, the students given the opportunity to participate in project-based learning might provide effective and beneficial results in the classroom, specifically with regard to increasing engagement and intrinsic motivation. This research aligns with other literature confirming the benefit of project-based instruction that could potentially improve students' critical thinking skills, responsibility to their work product, and ownership of the education process. The apathy, which can exist among 21st century students, is a detriment to their future but might be thwarted with the implementation of effective project-based learning strategies.

Suggestions

The research did show that student motivation and engagement increased when students received instruction in a project-based learning environment. Students who adapt more readily to project-based learning would be able to proceed at an accelerated pace, thereby satisfying their need to learn at a greater rate than their classmates. Students who need more scaffolding would receive this benefit as teachers would also have adapted to the flexibility project-based instruction can bring to the classroom.

Teachers want their students to be actively engaged in lessons and want to teach in ways that students find interesting. Project-based learning provides teachers with the opportunity to teach beyond the textbook, incorporate engaging real-world activities and projects into lessons, actively teach alongside students as they learn and enable students to develop not only the knowledge, but also the skills necessary for success in school and in life (Larmer et al., 2015). Students today need more opportunities to be autonomous with their education and project-based learning meets this need. Making choices in their own educational experience reduces apathy and increases motivation. Choices provide students with opportunities for deeper learning, which promotes engagement (Anderson, 2016).

Deeper engagement and motivation leads to higher achievement, which is the goal of education (Dotterer & Lowe, 2010). Incorporating positive components of project-based instruction (such as autonomy and deeper thinking) into classroom instructional techniques would enable teachers to maintain their comfort level with direct instruction while continuing to improve the quality of their instruction. High quality instructional strategies should be relevant, student centered, related to real-world situations, improve student competence in their academic abilities, and provide students with choices (Ateh & Charpentier, 2014; Ferlazzo, 2015).

A few limitations were noted at the conclusion of this research study, which included the lack of adequate training for teachers engaging in project-based instruction and the lack of comparisons within grade levels, which might control for differences in proficiency levels. Future researchers would benefit from allowing time for teachers to experience more training and to become comfortable with the aspects of project-based instruction before implementing it into the classroom. Additionally, implementing project-based instruction over a longer period of time would provide opportunities for student and teacher acclimation to the elements of project-based instruction. Future research could also include a qualitative component focusing on student perceptions and observations of their learning related to project-based learning compared to direct instruction.

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