



Impact of iPads on secondary school children's learning from the teachers' perspective

Magzhan Kaulanov ^{a1}, Karaganda University named after E.A Buketov, 100028, Universitet St 28, Karaganda, Kazakhstan
Dinara Kazimova ^b, Karaganda University named after E.A Buketov, 100028, Universitet St 28, Karaganda, Kazakhstan

Suggested Citation:

Kaulanov, M. & Kazimova, D. (2024). Impact of iPads on secondary school children's learning from the teachers' perspective. *World Journal on Educational Technology: Current Issues*, 16(4), 327-340.
<https://doi.org/10.18844/wjet.v16i4.8895>

Received on May 2, 2024; revised on August 22, 2024; accepted on September 15, 2024.

Selection and peer review under the responsibility of Prof. Dr. Huseyin Uzunboylu, University of Kyrenia, Cyprus

©2024 by the authors. Licensee United World Innovation Research and Publishing Center, Sht. Ilmiye Sakir Sokak, No: 9/2 Ortakoy, Lefkosa, 2681, Cyprus

This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

©iThenticate Similarity Rate: 5%

Abstract

This article explored the impact of iPad-based learning on secondary school children's motivation and engagement with school subjects. The use of iPads in the classroom has become increasingly common in recent years, with many schools incorporating this technology into their curricula. However, there is a lack of research on the specific impact of iPad-based learning on student motivation and engagement. To address this gap in the literature, the present research conducted a study with a sample of secondary school students to assess the effects of iPad-based learning on motivation and engagement. The results indicated that iPad-based learning had a positive impact on both motivation and engagement, with teachers reporting increased interest and enjoyment of the students in their school subjects when using iPads in the classroom. These findings suggest that iPad-based learning has the potential to enhance student learning experiences and support student success in school. This article tried to find out the impact of using iPads on students' motivation and engagement among Kazakhstani secondary school teachers.

Keywords: Education technology; iPads; learning; motivation; students

* ADDRESS FOR CORRESPONDENCE: Magzhan Kaulanov, Karaganda University named after E.A Buketov, 100028, Universitet St 28, Karaganda, Kazakhstan.

E-mail address: travercy@gmail.com

1. INTRODUCTION

The words Technology and Education have been used over the last two decades as one meaning – using new technologies in the teaching and learning process (Selwyn, 2021; Taniguchi, 2023; Hatzigianni et al., 2023). Technology plays a huge role in education. The question is how devices can enhance effectively educational process and in what ways, in addition, which pedagogical aspects can boost the learning procedure. Professor Papert predicted a computer invasion of the child's world when the machine becomes an intellectual tool used by the child with the same immediacy with which he uses a pen and pencil but with a much greater variety. As proof, we can see disparate ways of using technologies from children to adults even among the elderly generation. According to a report from Ofcom.org.uk (2016), almost half (49%) of all 8-15s have a tablet computer and their usage of devices varies from “staying” online to watching and playing games. Due to the data provided, we can barely say that the day when children use devices at the same level as the pen is nearly coming.

A study undertaken in India called “Hole in the Wall” by Sugata Mitra showed that children who were tinkering the PCs improved their basic computer skills and their academic performance at school. The main issue was that there were not any instructions and children started self-learning. The initial intention to explore the machine started from their interest and then it motivated and engaged them to use the computer. Finally, unconsciously they learned fundamental computer skills.

My first experience using an iPad was about 5 years ago when I was working as a teacher assistant. In those moments, I did not use the iPad as a tool to teach, however when I just “showed” it to 7th-grade students their interest to know what this device was so high. Tablet's attractive graphics and colorful media are appealing to students and are a great way to “hook” their attention (Cubelic and Larwin, 2014; Meier & Kaspar 2024; Hori et al., 2024). From that point, the researcher started to explore the potential of iPads in education and try to implement them in my teaching and learning process.

The research question was: Does iPad-based learning impact students' motivation and engagement?

1.1. Theoretical framework

1.1.1. *Theory of student's motivation and engagement*

Motivation and engagement are critical components of the learning process. These concepts are closely interrelated, with a subtle distinction that is often challenging to define. In many studies, the terms are used interchangeably; for instance, the National Research Council and Institute of Medicine (Fredricks et al., 2004) treat "motivation" and "engagement" as synonyms. The primary goal of educators before delivering knowledge is to capture students' attention, fostering motivation and engagement with school subjects, which are directly linked to positive academic performance and achievement (Diemer et al., 2012).

Extensive research has been conducted to explore the relationship between students' motivation and engagement. Based on a literature review, this study focuses on the types of motivation and engagement that can be effectively enhanced through technology, specifically the use of iPads. Motivation is typically classified as intrinsic or extrinsic. Extrinsic motivation involves external rewards or incentives, whereas intrinsic motivation arises from personal satisfaction and the learner's internal drive. This study emphasizes the impact of iPad-based learning on intrinsic motivation, which is inherently tied to self-satisfaction and self-determination. Measuring motivation in the context of iPad use presents challenges due to the variety of available measurement tools. This study adopts Self-Determination Theory (SDT), which identifies three key constructs, competence, autonomy, and relatedness, as critical factors influencing student motivation (Ryan & Deci, 2000).

Student engagement is defined differently across studies, resulting in the development of various measurement tools. However, most researchers agree on three primary dimensions of engagement: cognitive, behavioral, and emotional. Emotional engagement refers to students' attitudes, positive or negative, toward

the teacher, peers, or learning environment. Behavioral engagement involves active participation in classroom activities, while cognitive engagement pertains to internal processes, such as self-regulation, task commitment, and a willingness to challenge oneself (Fredricks et al., 2004). This study specifically examines the positive effects of iPads on emotional and behavioral engagement.

1.2. Literature review

1.2.1. Engaging with iPad

It is known that the most effective method of teaching is a visual demonstration and active learning by the student. Classical and iPad integrated lessons, accompanied by multimedia content that provides the tablet, 3D animations, and software applications allow students to deepen knowledge gained earlier. Using iPads in the educational process teachers share with students a more vivid idea of what they learned in the books. Students are happy to immerse themselves in the lesson material. The iPad gives the teacher new opportunities, allowing the student to enjoy the fascinating process of cognition, it allows you to immerse yourself in a bright colorful world. Such an occupation causes emotional uplift in children, even lagging students willingly work with a tablet. The iPad does not replace live communication with the teacher and other sources of information, but given the children's interest in the device, it increases their interest in learning the subject.

Teachers use different tools and methods to engage their students. Many researchers argue that technology such as the iPad is one of the effective ways to facilitate students' engagement (Heinrich, 2012). iPads may engage and motivate students in the learning process. It creates an exciting, enjoyable learning environment. Cubelic and Larwin (2014) state that new-generation students are being more engaged by technologies in learning especially the use of iPads in the educational process. Although authors indicate that teachers create an exciting learning environment where "*intended learning outcomes require engagement*" and children student's learning progresses when they are engaged in lesson activities. iPad has the potential to increase student engagement which involves collaborative and active learning (Diemer et al., 2012). Diemer et al., (2012) reported that students showed a high level of engagement by iPads. Cubelic and Larwin (2014) state in their study that teachers from Auburn are satisfied with the level of student engagement since the implementation of the use of iPads in their teaching process.

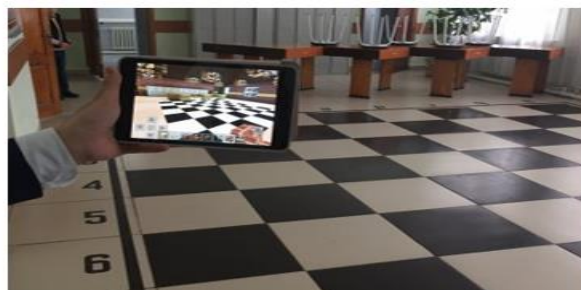
1.2.2. Motivating with iPad

Increased motivation and cognitive activity are achieved due to the diversity of functionality of iPad technology, the possibility of including a game moment is a motivation to learn through fun (Li et al., 2024; Stalheim & Somby, 2024). Ryan & Deci (2000) argue that learners are more likely to want to be involved, and engaged in classwork activity when their learning activity meets three physical constructs (competence, autonomy, relatedness) of intrinsic motivation. Jacobs (2012) states learner's motivation will appear when they get a sense of competence, can select what they want to focus on (autonomy), and can bridge meaningful connections (relatedness) to a larger learning community. iPad technology can create a learning environment that meets three of them.

It is assumed that students will feel *relatedness* and more engaged when they feel they belong to a classroom community among educators and peers (Fredricks et al., 2004). In a current technological context, it can be provided by digital tools such as iPad. From my little experience in the use of iPads in education, I witnessed examples of collaborative group work. I noticed their sense of belonging (relatedness) to one big school project and their emotional engagement while we were creating a 3D model of school in the iPad application called Minecraft (initially it was created as a game, later when Microsoft bought this company, but it became educational assistive game). A 3D model of the school was created by 7th-grade students approximately 4-5 days apart from the school lesson times. I have never seen such a desire and willingness to be a part of "something" meaningful. Moreover, their intention to finish the 3D school and be satisfied with the work done was driven by a high level of motivation and engagement. In the pictures below you can see inside the school taken real school locations and 3D models of them in Minecraft application (figure 1).

Figure 1

Pictures of minecraft



When students' willingness to accomplish the lesson exercise in an appropriate way to his or her ability using an iPad can be driven by personal reasons, besides the external pressure from the educators, it is defined as *autonomy* intrinsic motivation (Fredricks et al., 2004). About the 3D model of our school in Minecraft I have not mentioned how started this project. Once we got our iPad class, me and my colleague started thinking about what we could do with these iPads to be involved in school learning life; what we could offer to students with the iPads to meet their desire, their "current trend out of school" and their hunger to tech-candy. We heard how secondary school students always discussed Minecraft in their free time. Then we asked them a question: "Can you create a building in a Minecraft game...what if we can build a 3D model of our school". The spark in the eyes of the children lit up and they took over this project.

Regarding *competence* Fredricks et al., (2004) examine that "when individuals' need for competence is met, they believe that they can determine their success, can understand what it takes to do well and succeed". In other words, we can say it when the learner is confident in his or her abilities, and knowledge. From this example, students were confident in creating the 3D model of the school, because they were playing the Minecraft game very well and they knew how to build constructions. Moreover, I can predict they probably knew that they would be successful in creating the school because they relied on to own game skills. In a base on this example, we can create a tool to measure students' need for competence by using an iPad.

The official website of SDT provides surveys to measure motivation regarding competence, autonomy, and relatedness (table 1). They consist of 7 types of Basic Psychological Need Satisfaction and every statement related to intrinsic motivation constructs has to be answered on a scale of 1 to 7, not true and true relatively (5 is a neutral answer when the situation is 50 to 50) (Maryse et al., 2012).

Table 1

Basic needs satisfaction scale

Basic Needs Satisfaction at Work Scale

Item#	Construct	Statement
1	Autonomy	I feel like I can make a lot of inputs to deciding how my job gets done
2	Relatedness	I really like the people I work with
3	Competence	I do not feel very competent when I am at work
4	Competence	People at work tell me I am good at what I do
5	Autonomy	I feel pressured at work
6	Relatedness	I get along with people at work
7	Relatedness	I pretty much keep to myself when I am at work
8	Autonomy	I am free to express my ideas and opinions on the job
9	Relatedness	I consider the people I work with to be my friends
10	Competence	I have been able to learn interesting new skills on my job
11	Autonomy	When I am at work, I have to do what I am told
12	Competence	Most days I feel a sense of accomplishment from working
13	Autonomy	My feelings are taken into consideration at work
14	Competence	On my job, I do not get much of a chance to show how capable I am
15	Relatedness	People at work care about me
16	Relatedness	There are not many people at work that I am close to
17	Autonomy	I feel like I can pretty much be myself at work
18	Relatedness	The people I work with do not seem to like me much
19	Competence	When I am working I often do not feel very capable
20	Autonomy	There is not much opportunity for me to decide for myself how to go about my work
21	Relatedness	People at work are pretty friendly towards me

1.3. Purpose of study

This article explored the impact of iPad-based learning on secondary school children's motivation and engagement with school subjects.

2. METHOD AND MATERIALS

2.1. Data collection tool

Inspired by studies in education technology, particularly on the use of iPads in education, the research initially focused on quantitative, large-scale methods, including surveys and interviews with students, teachers, and parents. However, due to the school holidays coinciding with the research period, the focus shifted to exploring the impact of iPads on students’ motivation and engagement with school subjects through qualitative methods. This approach, as suggested by Selwyn (2020), provides deeper insights into the dynamics of educational technology use.

To gather data, an edited survey was utilized to explore educators’ perspectives on iPads in education. This was complemented by qualitative methods to address gaps left by each method, aligning with the recommendation to integrate approaches for richer insights (Selwyn, 2020). The research also incorporated electronic interviews, chosen over Skype due to their ability to overcome challenges related to geographical location and time zone differences. Electronic interviews offer practical advantages, such as eliminating the need for transcription and reducing interviewer bias, which can affect participant comfort levels (Selwyn, 2020).

The survey was based on the SDT framework regarding Basic Psychological Need Satisfaction (BPNS) at Work Scale and was adapted to reflect teachers' perspectives on iPad use in classrooms. Following the survey, interviews were conducted using ten questions designed to assess student engagement on behavioral and emotional engagement scales.

Table 2
Scale items

Item #	Construct	Basic Needs Satisfaction at Work Scale	Modified questionnaire for teachers
1	Autonomy	I feel like I can make a lot of inputs to deciding how my job gets done	Students feel like they can decide how to do their task with iPad
2	Relatedness	I really like the people I work with	Students friendly interact with their peers when using iPad
3	Competence	I do not feel very competent when I am at work	Students do not feel competent when they are with iPads in the class
4	Competence	People at work tell me I am good at what I do	Students good at their task using iPad
5	Autonomy	I feel pressured at work	Students feel pressured at iPad-based class
6	Relatedness	I get along with people at work	Students get along with the peers at iPad-based lesson
7	Relatedness	I pretty much keep to myself when I am at work	Students pretty much keep to on their own and do not have a lot of social contact during the iPad-based learning
8	Autonomy	I am free to express my ideas and opinions on the job	Students feel free to express their ideas and opinions on the iPad-based class
9	Relatedness	I consider the people I work with to be my friends	Students consider the peers they interact with to be their friends
10	Competence	I have been able to learn interesting new skills on my job	Students have been able to learn “interesting” new skills learning with iPad
11	Autonomy	When I am at work, I have to do what I am told	Students have to do what they told in the iPad
12	Competence	Most days I feel a sense of accomplishment from working	Students feel a sense of accomplishment from what they learnt with iPad
13	Autonomy	My feelings are taken into consideration at work	Students during interaction at iPad class pay attention to each other’s feelings
14	Competence	On my job, I do not get much of a chance to show how capable I am	Students do not get a chance to show how capable they are in learning with iPad
15	Relatedness	People at work care about me	Students care about each other during the iPad-based class
16	Relatedness	There are not many people at work that I am close to	Students do not interact
17	Autonomy	I feel like I can pretty much be myself at work	Students feel like he/she can be their selves at iPad class
18	Relatedness	The people I work with do not seem to like me much	Students do not seem to like each other much when using iPad at the session
19	Competence	When I am working I often do not feel very capable	Students do not feel very capable using iPad at lesson
20	Autonomy	There is not much opportunity for me to decide for myself how to go about my work	There is not much opportunity to students to decide for themselves how to do the iPad task (related to lesson)
21	Relatedness	People at work are pretty friendly towards me	Students are generally pretty friendly to each other while learning with iPads

2.2. Participants

The research participants comprised three qualified and experienced teachers who actively integrate iPads into their teaching practices. The participants included a biology teacher and a geography teacher from a former school in Kazakhstan. Participant consent and information forms were discussed and finalized before the commencement of the study. After completing the adapted BPNS survey, the participants engaged in e-interviews to provide detailed insights into their observations and experiences regarding student engagement and the use of iPads in educational settings.

2.3. Coding

MK- Magzhan Kaulanov; Participant 1 – P1; Participant 2 – P2;

3. RESULTS

3.1. Scoring information

SDT’s BPNS at Work Scale guides how to measure collected data. From the answers provided by participants on a scale from 1-7, Not True and Very True respectively we have to reverse negative answers by subtracting answers between 1-4 from 8 (for instance if the given answer is 3 then $8-3=5$). After that, we have to average all the answers related to each construct. Number of questions related to

Autonomy: 1,5,8,11,13,17,20;

Relatedness: 2,6,7,9,15,16,18,21

Competence: 3,4,10,12,14,19

3.2. Results of P1’s survey

The index of Autonomy from Participant 1 showed 6.4 out of a maximum indicator of 7 which is equal to a “very true” statement. The mean of Relatedness is 6.25 and Competence is 6.1. If indicator 7 is “very true” we can assume that 6 can be just “true”.

P2’s survey results were quite close to P1’s answers. Overall, he was on the positive side of the iPad’s influence towards motivation and engagement. Autonomy is 5.7, Relatedness is 5.1 and Competence is 6.

Table 3

Results of P1’s survey

Participant	Mean of Autonomy	Mean of Relatedness	Mean of Competence
P1	6.4	6.25	6.1
P2	5.7	5.1	6
Average	6.05	5.6	6.05

3.3. Analysis of the interview

3.3.1. Answering to research question: do iPads impact student’s motivation?

3.3.1.1. Need for Relatedness (intrinsic motivation).

Both interview and survey results revealed quite similar results in the case of engagement and motivation. “Motivating students is one of the major challenges teachers face every day” (appendix p 1). Different teacher uses different methods to motivate their learners. Walsh (2012) in his study identified that “students are more motivated when using iPad” and “motivated students are more excited to learn and participate” (appendix p1). Although P1 said that “using iPad has increased student motivation, motivation among unenthusiastic students has increased as well...” (appendix p2). P1 scored 6.25 in a case of Relatedness which covers the statements related to iPad’s opportunity to provide learners a sense of belonging and being part of one big community. From P1’s experience, she believes that students are pretty friendly to each other and together they create a friendly learning environment (questions 2,15,21; see table 2). iPad-based environment “encourages open communication and free thinking with students to make them feel important” and “gets them involved: making participating fun by giving each student a job to do. Making students work in groups and assign each a task or role” (appendix p1). Moreover, iPad provides applications to work collaboratively and to be connected to big lesson projects from their tablets, “instead of using big posters and markers, teacher can use iPad app such as Nearpod (Draw it activity) to ask learners to put up a poster on some topic” (appendix p2). It is important to give students a feeling of being part of society and “showing them that a subject is used every day by “real” people (which) gives () its new importance. If a student does not believe that what they’re learning is important, they won’t want to learn, so it’s important to demonstrate how the subject relates to them” (appendix p2-3).

3.3.1.2. Need for autonomy

Data related to Autonomy is provided from the both interview and survey answers. Overall, they are quite positive. The average mean of Autonomy from an edited version of the BPNF survey revealed 6.05 which we said they almost agree that iPad creates a learning community where learner feels free to achieve lesson tasks in an appropriate way to their skills without being controlled and pressured by the educators (questions 1,5,8,20; see the table 2). Participants of the survey truly (mean of Autonomy is 6.05 = true) believe that children in their iPad-based classes have the freedom to choose. Students like to express their thoughts suitably to their abilities and they “like talking in the language of iPad. They can use their creativity, art or other skills to make tasks in different ways” (appendix p4). It allows students to choose in what ways they want to complete the lesson task.

3.3.1.3. Need for Competence

Need for Competence is when a learner feels confident that he or she can succeed in achieving the task and is sure about his/her abilities (Fredricks et al., 2004). My former colleagues by scoring an average of 6.05 in a competence construct truly believe that students feel confident by learning with iPad. They are also of the same opinion that students feel competent and they are good at using iPads in lessons. Although students

with the help of iPads can demonstrate their capability and learn new skills (question related to competence, see scoring information part and table 2). As many current students grew with technologies such as the iPad, they "absorb the knowledge better when it's delivered via iPad, which's language easy for them to understand" (appendix p4). "Expanding the range of iPad apps engages students in the application of geographical skills and spatial thinking" (appendix p2).

3.3.2. Answering to research question: do iPads impact on student's engagement

3.3.2.1. Need for emotional engagement

When learners receive either positive or negative emotions from the learning process Fredricks et al., (2004) define it as emotionally engaged. "Engaged students demonstrate more effort, experience more positive emotions, and pay more attention in the classroom, compared to less engaged ones" (appendix p1). Thence it's when "they all happy to learn" (appendix p4). iPad can engage students by "making participating fun" (appendix p1) so they can learn in an enjoyable environment. In addition to engaging students iPad can provide "teaching through games" (appendix p1. "In geography lessons, students can virtually travel to any place in the world, have fun playing map games and map puzzles, think critically when using such apps as Quiver, Animal 4D+, Nearpod, etc., and expand their horizon using Google Earth app." (appendix p2). Since the implementation of iPad to educational process P1 noticed an improvement in students' engagement to her lessons providing it with the answer "students are more excited to attend the lessons" (appendix p2). P2 states that since using iPads students' engagement has increased and students "total assessment average is rise to 20%" (appendix p4). Although P1 states that in iPad-based lessons with the help of the device, she tries to create "open communication and free thinking with students to make them feel important" (appendix p1).

3.3.2.2. Need for behavioral engagement

Behavioral engagement of the student can be seen by their actions and involvement during the learning session. "Engaged students demonstrate more effort...and pay more attention in the classroom" (appendix p1) activities and in iPad classes "students are more excited to attend the lessons, more willing to do as many tasks and activities as they can, more attentive and more creative" (appendix p2). Although P1 witnessed students' behavioral engagement when they "...have fun playing map games..." (appendix p2) in her geography lessons. Another behavioral engagement occasion appeared in P2's experience when students "started to hurry up to his iPad-driven classes" (appendix p4).

4. DISCUSSION

In this research, by revealing the link between the influence of iPads on learners and their engagement and motivation we were able to cover research questions. Participants state that iPad facilitates students' motivation and engagement. Additionally, it meets students' needs for relatedness, competence, and autonomy and provides student's behavioral and emotional needs in a case of engagement.

The last two questions of the interview were related to the iPad's negative features and limitations regarding students' motivation and engagement. Participants of the present study answered that they hadn't met them yet. However, the researcher noticed that in the use of the iPad to engage and motivate there is a possibility of distraction in the case of lack of control during an iPad session which can then lead to disengagement. Despite the possibility of distraction during the iPad class, P2 argues that you can avoid it by "managing the class well" (appendix p4).

Given time constraints, this research focuses on exploring the impact of iPads on students' motivation and engagement in school subjects from the perspective of teachers. Ideally, this aspect of the device's influence would be studied using a mixed-methods approach, incorporating both qualitative and quantitative methods to enable extensive data collection through surveys, interviews, and observations. Further research is necessary to examine the nuanced aspects of motivation and engagement facilitated by iPads.

This study includes insights from two educators with experience in integrating iPads into education. While valuable, such limited input represents only a small contribution to the broader understanding of this topic.

Kaulanov, M. & Kazimova, D. (2024). Impact of iPads on secondary school children's learning from the teachers' perspective. *World Journal on Educational Technology: Current Issues*, 16(4), 327-340. <https://doi.org/10.18844/wjet.v16i4.8895>

To comprehensively reveal the impact of iPads on students' motivation and engagement, a large-scale study is required.

5. CONCLUSION

This research sought to identify the impact of iPad-based learning on student's motivation and engagement. Examining student's motivation and engagement regarding iPad, we identified that:

- Students are more motivated
- Students experience more positive emotions
- Students hurry up to iPad classes

As they like to have tasks done by iPad, they prefer to absorb knowledge transformed by the tablet. We learned that iPad can create a learning environment where learners can feel competence, autonomy, and relatedness. Although we have explored that iPad can afford to user emotional and behavioral platform where the learner can be more engaged. We identified that iPads by visualizing subject material can involve, engagement in lessons. iPad provides many collaborative applications that bring learners together. Thereby providing the opportunity to feel like a part of one big community, which increases student's motivation to learn and explore the world.

A broader study is required to examine this topic comprehensively, exploring the broader connections between iPad use, motivation, engagement, lifelong learning, and academic performance. Enhanced student engagement is associated with improved achievement and success in school subjects, while student disengagement is linked to higher drop-out rates. However, the use of iPads also has potential negative affordances, such as contributing to technological addiction and negatively affecting users' eyesight, potentially leading to myopia. Further research should focus on these aspects, with particular emphasis on iPad-enhanced learning within the context of education technology.

Conflict of Interest: The authors declare no conflict of interest.

Ethical Approval: The study adheres to the ethical guidelines for conducting research.

Funding: This research received no external funding

REFERENCES

- Cubelic, C. C., & Larwin, K. H. (2014). The use of iPad technology in the kindergarten classroom: A quasi-experimental investigation of the impact on early literacy skills. *Comprehensive Journal of Educational Research*, 2(4), 47-59.
- Diemer, T. T., Fernandez, E., & Streepey, J. W. (2012). Student perceptions of classroom engagement and learning using iPads. *Journal of Teaching and Learning with Technology*, 13-25. <https://scholarworks.iu.edu/journals/index.php/jotlt/article/view/3084>
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research*, 74(1), 59-109. <https://journals.sagepub.com/doi/abs/10.3102/00346543074001059>
- Hatzigianni, M., Stephenson, T., Harrison, L. J., Waniganayake, M., Li, P., Barblett, L., ... & Irvine, S. (2023). The role of digital technologies in supporting quality improvement in Australian early childhood education and care settings. *International Journal of Child Care and Education Policy*, 17(1), 5. <https://link.springer.com/article/10.1186/s40723-023-00107-6>
- Heinrich P., (2012). The iPad as a tool for Education. Naace, pdf, [online] Available at: <http://blogimages.bloggen.be/gnomon/attach/273643.pdf>
- Hori, R., Fujii, M., Toguchi, T., Wong, S., & Endo, M. (2024). Impact of an EFL Digital Application on Learning, Satisfaction, and Persistence in Elementary School Children. *Early Childhood Education Journal*, 1-12. <https://link.springer.com/article/10.1007/s10643-024-01653-5>

- Kaulanov, M. & Kazimova, D. (2024). Impact of iPads on secondary school children's learning from the teachers' perspective. *World Journal on Educational Technology: Current Issues*, 16(4), 327-340. <https://doi.org/10.18844/wjet.v16i4.8895>
- Jacobs, G. E. (2012). Rethinking common assumptions about adolescents' motivation to use technology in and out of school. *Journal of Adolescent & Adult Literacy*, 56(4). <https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=10813004&asa=N&AN=83711912&h=9tag7qVlxJxJSNqr6MGFrcgBjU%2FVvhknefaiFIB%2FQVxYZsCGZ7hxjUfd14moWAG9oCzu9prtHqaJbcXXF9g%3D%3D&crl=c>
- Li, X., Yang, Y., & Chu, S. K. W. (2024). How does gamification bring long-term sustainable effects on children's learning? Implications from a crossover quasi-experimental study. *Educational technology research and development*, 1-25. <https://link.springer.com/article/10.1007/s11423-023-10341-x>
- Maryse, B., Jacques, F., Geneviève, A., Pascale, D., Luc, B., & Estelle, M. M. (2012). The Basic Psychological Needs at Work Scale: Measurement Invariance between Canada and France. *Applied Psychology: Health and Well-Being*, 4(2), 167–187. https://selfdeterminationtheory.org/SDT/documents/2012_-_Brien_APHaWB.pdf
- Meier, J. V., & Kaspar, K. (2024). How schoolchildren use digital media in class and outside of school over several weeks: A quantitative case study with media diaries. In *Frontiers in Education*, 9, 1379755. <https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2024.1379755/full>
- Ofcom.org.uk, 2016. *Children and parents: media use and attitudes report*. [online] Available at: https://www.ofcom.org.uk/data/assets/pdf_file/0034/93976/Children-Parents-Media-Use-Attitudes-Report-2016.pdf
- Rm, R. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25, 54-67.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1), 54-67. <https://psycnet.apa.org/journals/amp/55/1/68/>
- Selwyn, N. (2020). *Telling tales on technology: Qualitative studies of technology and education*. Routledge.
- Selwyn, N. (2021). *Education and technology: Key issues and debates*. Bloomsbury Publishing.
- Stalheim, O. R., & Somby, H. M. (2024). An embodied perspective on an augmented reality game in school: pupil's bodily experience toward learning. *Smart Learning Environments*, 11(1), 24. <https://link.springer.com/article/10.1186/s40561-024-00308-7>
- Taniguchi, K. (2023). The impact of parental confidence in using technology on parental engagement in children's education at home during COVID-19 lockdowns: evidence from 19 countries. *SN Social Sciences*, 3(6), 84. <https://link.springer.com/article/10.1007/s43545-023-00672-0>
- Walsh, K. (2012). Study finds benefits in the use of iPad as an educational tool. *Emerging Ed. Tech*.

Appendix 1

Interview with P1, a Geography teacher with the experience of 8 years

Q#	Question	Participant answer
2	How do you understand student's motivation and engagement?	Motivating students is one of the major challenges teachers face every day. Engaged students demonstrate more effort, experience more positive emotions, and pay more attention in the classroom, compared to less engaged ones. Motivated students are more excited to learn and participate.
3	In your opinion, what are the essential components of students' motivation/engagement regarding iPads?	<ol style="list-style-type: none"> 1. Encouraging open communication and free thinking with students to make them feel important. 2. Getting them involved: making participating fun by giving each student a job to do. Make students work in groups and assign each a task or role. 3. Giving rewards. Rewards give students a sense of accomplishment and encourage them to work with a goal in mind.

		<p>4. Teaching through games and discussions instead of lectures encourages students to debate and enrich the subject matter with visual aids, like colorful charts, diagrams, and videos.</p> <p>5. Showing them that a subject is used every day by “real” people gives it new importance. If a student does not believe that what they’re learning is important, they won’t want to learn, so it’s important to demonstrate how the subject relates to them.</p>
4	Describe how have you witnessed students’ motivation/involvement since using iPads in your lessons.	Using iPads has increased student motivation and engagement. The academic motivation among unenthusiastic students has increased as well when different kinds of technology are being implemented correctly.
5	Have you seen any progress in students’ engagement with the subject since the implementation of iPad-based learning? If so, how?	Of course, students are more excited to attend the lessons, more willing to do as many tasks and activities as they can, more attentive, and more creative.
6	In your opinion, is there are considerable differences in students’ motivation and engagement with your lesson when it is without and with iPad? If so, how do you describe it? [Could you please write one demonstrative example of a motivated and/or engaged student when learning with an iPad]	A good example would be time management. Without iPads, a lesson would seem to be taking too long for students, and teachers can save time on checking test answers. Second example, fewer resources are involved. Instead of using big posters and markers, the teacher can use iPad apps such as Nearpod (Draw it activity) to ask learners to put up a poster on some topic.
7	How do you think why iPad motivates students to learn the lesson material?	In geography lessons students can virtually travel to any place in the world, have fun playing map games and map puzzles, think critically when using such apps as Quiver, Animal 4D+, Nearpod, etc., and expand their horizons using the Google Earth app.
8	How do you think why iPad engages students in school subjects?	The expanding range of iPad apps engages students in the application of geographical skills and spatial thinking.
9	Have you seen the negative features of motivating and engaging students with iPads?	No, I have not.
10	Have you ever encountered limitations in terms of motivation and engagement while using an iPad?	Yes, for instance, low Internet connection and not enough iPads in school.

Appendix 2: Survey result of P1

Item #	Modified questionnaire for teachers (Basic Needs Satisfaction at Lessons with iPad Scale)	For each of the following statements, please indicate how true it is from your perspective, using the following scale						
		1	2	3	4	5	6	7
		not at all true			somewhat true			very true
1	Students feel like they can decide how to do their task with iPad	7						
2	Students interact with their peers when using iPad	7						
3	Students do not feel competent when they are with iPads in class	2						
4	Students are good at their tasks using iPad	6						

5	Students feel pressured in iPad-based class	1
6	Students get along with their peers in iPad-based lesson	6
7	Students pretty much keep to their own and do not have a lot of social contact during the iPad-based learning	2
8	Students feel free to express their ideas and opinions on the iPad-based class	7
9	Students consider the peers they interact with to be their friends	7
10	Students have been able to learn "interesting" new skills learning with iPad	7
11	Students have to do what they told on the iPad	1
12	Students feel a sense of accomplishment from what they learn with the iPad	5
13	Students interaction at iPad class pay attention to each other's feelings	5
14	Students do not get a chance to show how capable they are in learning with iPad	2
15	Students care about each other during the iPad-based class	6
16	Students do not interact with many peers in class using iPad	2
17	Students feel like he/she can be their selves in iPad class	6
18	Students do not seem to like each other much when using iPads during the session	2
19	Students do not feel very capable of using iPads during the lesson	1
20	There is not much opportunity for students to decide for themselves how to do the iPad task (related to the lesson)	2
21	Students are generally pretty friendly to each other while learning with iPads	6

Autonomy: $7+7+7+7+5+6+6=45/49$ 6.4/7

Relatedness: $7+6+6+7+6+6+6+6=50/56$ 6.25/7

Competence: $6+6+7+5+6+7=37/42$ 6.1/7

Appendix 3: Interview with P2, biology teacher

Q#	Question	Participant answer
2	How do you understand student's motivation and engagement?	When they are all happy to learn

3	In your opinion, what are the essential components of students’ motivation/engagement?	Interest and involvement
4	Describe how have you witnessed students’ motivation/involvement since using iPads in your lessons.	interest, freedom, accessibility They started to hurry up to my iPad classes
5	Have you seen any progress in students’ engagement with the subject since the implementation of iPad-based learning? If so, how?	Yes, the total assessment average is risen to 20 percent.
6	In your opinion, is there are considerable differences in students’ motivation and engagement with your lesson when it is without and with iPad? If so, how do you describe it? [Could you please write one demonstrative example of a motivated and/or engaged student when learning with an iPad]	Yes, they find it exciting when the knowledge, which is not absorbing for most of them, can be in the device, whose language is easy for them to understand.
7	How do you think why iPad motivates students to learn the lesson material?	Interesting activities and applications, because the iPad allows you to visualize 3D figures, the content in the device looks more attractive.
8	How do you think why iPad engages students in school subjects?	As I said before, students like talking in the language of the iPad. They can use their creativity, art, or other skills to make tasks in different ways.
9	Have you seen the negative features of motivating and engaging students with iPads?	No, if you can manage well
10	Have you ever encountered limitations in terms of motivation and engagement while using an iPad?	No

Appendix 4: Survey result of P2

Item #	Modified questionnaire for teachers (Basic Needs Satisfaction at Lessons with iPad Scale)	For each of the following statements, please indicate how true it is from your perspective, using the following scale						
		1	2	3	4	5	6	7
		not at all			somewhat true			very true
1	Students feel like they can decide how to do their task with iPad	6						
2	Students interact with their peers when using iPad	6						
3	Students do not feel competent when they are with iPads in class	1						
4	Students are good at their task using iPad	6						
5	Students feel pressured in iPad-based class	1						
6	Students get along with their peers in iPad-based lesson	4						
7	Students pretty much keep to their own and do not have a lot of social contact during the iPad-based learning	2						
8	Students feel free to express their ideas and opinions on the iPad-based class	7						

9	Students consider the peers they interact with to be their friends	4
10	Students have been able to learn "interesting" new skills learning with iPad	6
11	Students have to do what they told on the iPad	4
12	Students feel a sense of accomplishment from what they learn with the iPad	4
13	Students during interaction in iPad class pay attention to each other's feelings	4
14	Students do not get a chance to show how capable they are in learning with iPad	2
15	Students care about each other during the iPad-based class	4
16	Students do not interact with many peers in class using iPad	4
17	Students feel like he/she can be their selves in iPad class	6
18	Students do not seem to like each other much when using iPads during the session	1
19	Students do not feel very capable using iPads during the lesson	1
20	There is not much opportunity for students to decide for themselves how to do the iPad task (related to the lesson)	2
21	Students are generally pretty friendly to each other while learning with iPads	6

Autonomy: $6+7+7+4+4+6+6=40/49$ 5.7/7

Relatedness: $6+4+6+4+4+4+7+6=41/56$ 5,1/7

Competence: $7+6+6+4+6+7=36/42$ 6/7