

Enhancing differentiated instruction and critical thinking with Station Rotation Model: An action research in Greece

Vasiliki Anagnostopoulou

DIRECTORAS

ANA GARCÍA-VALCÁRCEL MUÑOZ-REPISO

SONIA CASILLAS MARTÍN

PLAN DE INVESTIGACIÓN

PROGRAMA DE DOCTORADO FORMACIÓN EN LA SOCIEDAD DEL CONOCIMIENTO

UNIVERSIDAD DE SALAMANCA

7 DE JUNIO DE 2023

INTRODUCTION

The swift advancement of digital technology will continue to alter the ways in which knowledge is produced, comprehended, and conveyed, opening the door for new instructional strategies and resources. Digital innovation has the potential to revolutionise education and change how universal access to education is delivered (UNESCO, 2023). Meanwhile, new pedagogies and models are quickly entering the educational landscape as educators scramble to provide students with the knowledge and skills necessary for the 21st century (Kim, 2021; Yang & Newman, 2019).

Online and blended learning attracted the attention of many educators and researchers worldwide after the COVID-19 pandemic (Lonigro, 2021). Blended learning is a student-centred method, where there are involved features of student-teacher, student-student and student-content collaboration (Ogude & Chukweggu, 2019). It places the student at the centre of the learning process by leveraging technology to create more engaging, productive, and goal-oriented learning environments (Powell et al., 2015).

The Station Rotation Model (SRM) is one of the four rotation models that according to Horn and Staker (2015) are included in the broader term of blended learning. It includes a set of educational activities (stations) that students rotate among during class time, depending on the subject or course. The students can rotate in groups at the stations that the teacher has set up in one classroom or several classrooms (Staker & Horn, 2012). SRM could be used to connect a previous topic to a new one, review a unit, or introduce a new one (Hite et al., 2022). A teacher-led station, small group work, and at least one station for online learning is typically included. There might be other stations like individual tutoring, pencil-and-paper assignments, small group instruction, manipulatives and group projects (Hover & Wise, 2020; Novak & Tucker, 2021; Staker & Horn, 2012; Walne, 2012).

SRM appears to be a promising strategy with several advantages for both the teachers and the students. The utilisation of project-based learning as a station to go along with the online learning station is also made easier by this concept. The learners can construct the knowledge individually by doing problem analysis or collaboratively building the understanding together with their peers, something that could be an important factor for the development of critical thinking (Othman et al., 2016; Prasetya, 2016). Critical thinking is an imperative transferable skill for students, because it enables them to analyse and compare information as well as construct arguments (Basri et al., 2019).

On the other hand, teachers need more than one framework to meet the needs of diverse students and turn their classrooms into flexible learning environments. Therefore, they can achieve this by connecting Blended Learning Models with the Universal Design for Learning (UDL) (Novak & Tucker, 2021). It is important to offer an inclusive environment to all students, bearing in mind not only the emerging number of learners with special educational needs (UNICEF, 2021), but also that each and every student will benefit from a differentiated instruction (Hite et al., 2022).

The rapid growth of the implementation of blended learning has created a gap in research in primary education. The majority of studies of SRM are focused on secondary settings, on higher education and/ or vocational training, even though it seems to be a quite popular and common approach in primary education (Fazal & Bryant, 2019; Fulbeck et al., 2020; Lonigro, 2021). Therefore, there is a need for more evidence-based research on a primary setting. Moreover, literature shows that there are more studies focusing on the blended learning approach of flipped classroom, rather than the Station Rotation Model (Lonigro, 2021; Truitt, 2018; Yang & Newman, 2019). In the study proposed, a primary school setting was chosen for the implementation of the SRM, firstly due to the gap on research, and secondly to ensure equity related to access to technological devices with an in-class

implementation. In addition, the Greek educational setting was chosen because of the familiarity and personal interest of the researcher-practitioner and because no similar research has been conducted till now in Greece. Last, studies in varying context and population could bring value to other investigations carried out so far, as technology and pedagogy constantly evolves (Ioannou et al., 2020).

The originality of this research lays also on the fact that a combination of a blended learning approach and UDL guidelines will be done. Inclusion of all students with an opportunity to differentiate instruction is imperative as it can help them develop the transferable skills needed for the 21st century carriers (Kim, 2021). As Fulbeck et al. (2020) highlighted, there is still more to learn about the SRM as an approach for differentiation and personalised learning, so future studies could be carried out on understanding student engagement through this approach. In addition to the above, according to Lonigro (2021), SRM could be used as a model to address some of the problems generated from the Emergency Remote Teaching during the pandemic, like for example students' low engagement, the need for more collaborative and inclusive practices and thereafter the need for the teacher to work with smaller groups of students.

The purpose of this study is to explore the implementation of the Station Rotation Model in a Primary School Classroom in Greece. An SRM will be designed based on other models found in literature and on the ADDIE method for the designing of a blended learning approach (Branch, 2009). Moreover, the model will follow the Greek educational system and curriculum, whilst in order to provide an inclusive and differentiated instruction, the guidelines of Universal Design for Learning (CAST, 2018) will be taken into consideration at the time of creation and implementation of the activities/ stations. With action research, the investigator and practitioner will document and reflect on the use of such a model on a differentiated inclusive instruction and its effect on the motivation, engagement of students and their academic achievement. Last, the development of students' critical thinking skills will be explored as it is a crucial part of the transferable skills (Basri et al., 2019) and at the same time because the research about critical thinking in Greece is still at early stages according to the literature review of Fountzoulas et al. (2019).

WORKING HYPOTHESIS AND MAIN OBJECTIVES

The project objectives are considered as an important part of the research design. Research should not simply embark on an investigation without stating the reasons for it (Thomas, 2013). It is about stating what the project is supposed to achieve. In particular, this study has the following objectives:

General Objective

To design, implement and evaluate the Station Rotation Model in a Primary School classroom in Greece.

Specific Objectives

- To design and implement an SRM on a primary school classroom in Greece based on existing models in literature and utilising the ADDIE model for blended learning design.
- To adapt the SRM to the educational program of a primary school classroom that follows the Greek educational system and curriculum.
- To incorporate the UDL guidelines into the creation and implementation of the activities/ stations to provide inclusive and differentiated instruction.
- To explore students' and teacher's perceptions and experiences on the implementation of the SRM as well as the perceptions of the implicated families.

- To evaluate the effectiveness of the SRM in promoting students' motivation, engagement and academic achievement.
- To investigate the impact of SRM on the development of students' critical thinking skills.
- To determine the effectiveness of the Station Rotation Model in enabling inclusive and personalised teaching that caters to the needs of all learners, including those with the most learning difficulties.
- To provide recommendations for further improving the implementation of the adapted SRM in Primary School classrooms in Greece.

Research Questions

Having established the topic to be investigated and the nature of the objective to be fulfilled, the ideas should take the form of a more specific question or questions that will form the basis of the research (Thomas, 2013). The central questions of the project are:

How effective is the Station Rotation Model, adapted to the Greek Curriculum and incorporating UDL's guidelines, in promoting students' motivation and engagement, their academic achievement and lastly their critical thinking skills?

Does the Station Rotation Model allow for inclusive and personalised teaching appropriate to the development of the abilities of all learners, including those with the most difficulties?

Hypothesis:

H₁ The adapted Station Rotation Model provides students with a more inclusive and differentiated learning experience, resulting in increased student motivation and engagement and their academic achievement.

H₂ There is a significant difference in the development of students' critical thinking skills before and after the implementation of the Station Rotation Model.

H₃ The implementation of the Station Rotation Model provides to the teacher and implicated educational staff the equivalent satisfaction in organising and managing their classroom and accommodating all students' needs.

H₄ The implementation of the Station Rotation Model has positive impressions on the parents/guardians of the students.

METHODOLOGY TO BE USED (PROVIDE CONSENT FORMS/REPORTS/PROTOCOLS

At a first stage, for the exploration of the theoretical background, a Systematic Literature Review (SLR) will be conducted with specific inclusion, exclusion and quality criteria the relevant studies around the word regarding the state of the research question (García-Peñalvo, 2022) following the guidelines of PRISMA (Page et al., 2021). This is an important step in order to check the state of the art of the research question and use this information for the conduction of research and interpretation of the results obtained (García-Peñalvo, 2022). At a second stage, a preliminary study will be conducted. The research methodology to be used is the action research with a mixed method approach. Action research is "research that is undertaken by practitioners for the purpose of helping to develop their practice and it is usually done at the same time as performing that practice" (Thomas, 2013, p.249).

Action research is very typical in educational contexts, as the researcher and practitioner could be the same person and it could be used as a process to improve the educational practice, implement a new instructional method, improve the curriculum, solve issues among students or school members (Hine, 2013; Lufungulo et al., 2021). In the case of this study, I will be the researcher and teacher to implement the new instructional approach and reflect on the use of the Station Rotation Model in my classroom. One cycle of the action research will be documented.

Regarding the sample of the study, this will be a classroom of a public Primary School in West Attiki, in Greece. As it will be an action research, the sample is a convenience sample and closely related to the researcher and practitioner, who will implement the new method and try to enhance the motivation and engagement of students as well as their critical skills.

The literature has long explored the benefits of the mixed method approach. It employs both qualitative and quantitative methodologies, either simultaneously or sequentially, resulting in data triangulation that improves the results' validity (Thomas, 2013; Yilmaz, 2013). For this study, more than one method will be used to collect data. For the data collection will be used: questionnaires, participatory observation, rubrics, research journal, focus group and interviews. Specifically, below it is presented the methods and instruments for each variable:

- Students' perceptions of the learning experience, motivation and engagement: First, the "Perception of flipped learning experience" questionnaire which is a 5-point Likert Scale of Chen Hsieh et al. (2017) will be adapted to the Station Rotation Model, as it is another model of Blended Learning, and it will also be translated into Greek. This questionnaire was used to evaluate 4 different constructs: motivation, effectiveness, engagement and overall satisfaction. Apart from this, semi-structured observation from the instructor and her journal notes will be used to determine students' motivation and engagement. Last, to explore better and in-depth students' perception about the learning experience, semi-structured focus group interviews will be conducted.
- Critical Thinking Skills: A questionnaire with different scenarios and open-ended questions will be given before and after the implementation of the instructional method to the students. Their answers will be evaluated with the rubric "The Holistic Critical Thinking Scoring Rubric – HCTSR" of Facione and Facione (2011) which is a rating measure that can be used to assess the observable critical thinking demonstrated in the questionnaire. Apart from this, the instructor's journal notes will be used to obtain information.
- Academic Achievement: students' progress will be assessed according to the overall score of all the assessment tests of the first trimester before the implementation compared to that one after the implementation of the SRM by the end of the second trimester.
- Teachers and parents/guardians' perceptions: For the teacher's perceptions on the effectiveness of the SRM, the notes from her journal will be used. For the parents' perceptions, unstructured interviews will be done during the teacher-parent monthly meeting.

For the analysis of data, thematic analysis will be used for all the qualitative data following Braun and Clark (2006) guidelines and with the use of ATLAS.ti 9. On the other hand, statistical analysis will be used for the quantitative data (Miller & Brewer, 2003). Descriptive statistics will be used to examine the participants' responses. The statistical hypotheses will be tested by comparing the difference between the mean values of the dependent variables which will be calculated in the same scale with the student's t-test (depending on the data normal distribution) at two different times (pre-and post-test). The statistical analysis will be facilitated with the use of SPSS v27 tool.

The research conducted in social sciences should serve all human welfare and should always consider some ethical guidelines, as it involves human participants. These ethical issues include the good conduct of the researcher and the protection of each participant's dignity (Thomas, 2013). All the ethical considerations will be taken into account throughout the study following the guidelines for educational research of the British Educational Research Association [BERA] (2018). Ethical approval will be guaranteed from the respective Institution and Committee prior to the study. Parental consent forms, information sheets and no harm to participants will be all secured (Miller & Brewer, 2003). Anonymity and confidentiality are two more elements of ethics, which will be taken into consideration (Kvale, 1996).

Apart from the above, it is important to mention that the instructional design method to be used for the designing of the blended learning approach is the ADDIE, which stands for Analyse, Design, Develop, Implement, and Evaluate. "It is a product development paradigm and not a model per se". ADDIE is a systematic development of a course/ product with the educational philosophy of a student-centred intentional learning (Branch, 2009. p.1). Even though it is usually used in Higher Education, the basic steps of this approach could be taken into consideration in this study as SRM is a type of blended learning approach with the same purpose to create an effective and inclusive learning environment.

MATERIAL MEANS AND RESOURCES AVAILABLE

This research will be conducted as part for the fulfilment of the PhD degree of Education in the Knowledge Society at the University of Salamanca. Moreover, as the researcher of this study, I am a collaborator of the Digital Innovation and Education Research Group (EduDIG) of the University of Salamanca and more information about the Investigation Group can be found at <https://edudig.usal.es/>. The communication and advances of the research will also be accessible within the portal of the doctoral program at <https://knowledgesociety.usal.es/> (García-Peñalvo et al., 2019).

The resources and materials available are:

- For the literature review, data access provided by the University of Salamanca, as well as any other Open Access resource.
- The necessary software to carry out the qualitative and quantitative analyses required for the doctoral thesis.
- For the organisation of material and documents, Microsoft and Google Suite and Mendeley will be used.
- For the creation of activities for the instructional model will be taken into consideration:
 - the Greek Curriculum (<http://www.pi-schools.gr/programs/depps/>)
 - the National Aggregator of Educational Content "Photodentro" (<http://photodentro.edu.gr/aggregator/>)
 - the interactive Greek school books (<http://ebooks.edu.gr/ebooks/>)
 - other interactive apps or web apps, like Edpuzzle, Quizizz, Mindomo.

In addition to the above, the coordination of the thesis' supervisors and the help of the cross-disciplinary training of the doctoral programme is also available.

TIMING SCHEDULE OVER THREE YEARS

For practical purposes, the planning is divided into years, with which the proposed activities will be carried out:

Year 1 (2022 - 2023)

- Elaboration of the theoretical framework. Exhaustive research in scientific publications and books. Systematic review of the literature regarding the topic.
- Application for the permission to carry out the research.
- Gradual dissemination of the investigation plan and advances obtained through publications and/ or participation in conferences.
- Participation in activities of the Doctoral Programme, the cross-disciplinary training of the School of Doctorate or any other international opportunities, such as courses, conferences, seminars, international summer schools.

Year 2 (2023 - 2024)

- Selection of the educational centre to develop the project and contact with the school director.
- Preparation of the teaching project for the academic year based on the Station Rotation Model instructional model.
- Selection and elaboration of the instruments for collecting information and also the consent forms.
- Organisation and preparation of the materials as well as creation of activities during the first trimester of the school year.
- Implementation of the instructional model (Station Rotation Model) during the second trimester of the school year and reflection at the end of the school year.
- Gradual dissemination of the advances and results obtained through publications and/ or participation in conferences.
- Possible international stay abroad.

Year 3 (2024 - 2025)

- Analysis, interpretation and discussion of the results obtained.
- Elaboration of the final report of the thesis.
- Publication of the results obtained and/ or participation in conferences.
- Presentation and defense of the doctoral thesis.

Plan of intended publications

- Publish one article for the Systematic Literature Review which will be conducted with the relevant studies around the word regarding the state of the research question. Planned to be done by the end of first and beginning of second year.
- Attend a conference to present the plan of investigation. Planned to be done at the beginning of second year.

- Attend a conference to present the Station Rotation Model in detail and how it can be adapted to a Greek classroom. Planned to be done by the end of second year.
- Attend a conference to present the final results of the investigation. Planned to be done in the third year.

REFERENCES

- Basri, H., Purwanto, As'ari, A. R., & Sisworo. (2019). Investigating Critical Thinking Skill of Junior High School in Solving Mathematical Problem. *International Journal of Instruction*, 12(3), 745-758. <https://doi.org/10.29333/iji.2019.12345a>
- Branch, R. M. (2009). *Instructional Design: The ADDIE Approach*. Springer.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- British Educational Research Association [BERA]. (2018). *Ethical Guidelines for Educational Research, Fourth Edition*. <https://www.bera.ac.uk/publication/ethical-guidelines-for-educational-research-2018>
- CAST (2018). *Universal Design for Learning Guidelines version 2.2*. <http://udlguidelines.cast.org>
- Chen Hsieh, J. S., Wu, W. C. V., & Marek, M. W. (2017). Using the flipped classroom to enhance EFL learning. *Computer Assisted Language Learning*, 30(1–2), 1–21. <https://doi.org/10.1080/09588221.2015.1111910>
- Facione, P. A. & Facione, N. C. (2011). *The Holistic Critical Thinking Scoring Rubric - HCTSR*. California Academic Press/ Insight Assessment. <https://www.insightassessment.com/article/holistic-critical-thinking-scoring-rubric-hctsr>
- Fazal, M., & Bryant, M. (2019). Blended Learning in Middle School Math: The Question of Effectiveness. *Journal of Online Learning Research*, 5(1), 49–64.
- Fulbeck, E., Atchison, D., Giffin, J., Seidel, D., & Eccleston, M. (2020). *Personalizing Student Learning With Station Rotation: A Descriptive Study*. American Institutes for Research.
- Fountzoulas, G. K., Koutsouba, M. I., & Nikolaki, E. (2019). Critical Thinking and Its Assessment: A Literature Review with Special Reference in Greece and Cyprus. *Journal of Education & Social Policy*, 6(2), 69–80. <https://doi.org/10.30845/jesp.v6n2p9>
- García-Peñalvo, F. J. (2022). Developing robust state-of-the-art reports: Systematic Literature Reviews. *Education in the Knowledge Society*, 23, Article e28600. <https://doi.org/10.14201/eks.28600>
- García-Peñalvo, F. J., Rodríguez-Conde, M. J., Verdugo-Castro, S., & García-Holgado, A. (2019). *Portal del Programa de Doctorado Formación en la Sociedad del Conocimiento. Reconocida con el I Premio de Buena Práctica en Calidad en la modalidad de Gestión*. In A. Durán Ayago, N. Franco Pardo, & C. Frade Martínez (Eds.), *Buenas Prácticas en Calidad de la Universidad de Salamanca: Recopilación de las I Jornadas. REPOSITORIO DE BUENAS PRÁCTICAS (Recibidas desde marzo a septiembre de 2019)* (pp. 39-40). Ediciones Universidad de Salamanca. <https://doi.org/10.14201/0AQ02843940>
- Hadiprayitno, G., Kusmiyati, K., Lestari, A., Lukitasari, M., & Sukri, A. (2021). Blended Learning Station-Rotation Model: Does it Impact on Preservice Teachers' Scientific Literacy? *Jurnal Penelitian Pendidikan IPA*, 7(3), 317–324. <https://doi.org/10.29303/jppipa.v7i3.676>
- Hine, G. S. C. (2013). The importance of action research in teacher education programs. *Issues in Educational Research*, 23(2), 151–163.
- Hite, R., Greenhalgh-Spencer, H., & Childers, G. (2022). Differentiation in the Life Science Classroom Using Station Rotations. *Science Scope*, 45(5), 52–59.
- Horn, M. B. & Staker, H. (2015). *Blended: Using Disruptive Innovation to Improve Schools*. Jossey- Bass.
- Hover, A., & Wise, T. (2020). Exploring ways to create 21st century digital learning experiences. *Education 3-13*, 50(1), 40–53. <https://doi.org/10.1080/03004279.2020.1826993>

- Ioannou, M., Ioannou, A., Georgiou, Y., & Boloudakis, M. (2020). Orchestrating the technology-enhanced embodied learning classroom via learning stations rotation: A case study. *CEUR Workshop Proceedings*, 2712, 25–28.
- Kim, J. H. (2021). Music teachers' understanding of blended learning in Korean elementary music classes. *Music Education Research*, 23(3), 311–320. <https://doi.org/10.1080/14613808.2020.1862776>
- Kvale, S. (1996). *InterViews: An Introduction to Qualitative Research Interviewing*. Sage Publications.
- Lonigro, M. (2021). Rotation stations for a blended approach. *CEUR Workshop Proceedings*, 2817. <https://ceur-ws.org/Vol-2817/paper33.pdf>
- Lufungulo, E. S., Mambwe, R., & Kalinde, B. (2021). The Meaning and Role of Action Research in Education. *Multidisciplinary Journal of Language and Social Sciences Education*, 4(2), 115–128.
- Miller, R. and Brewer, J. (2003) *The A-Z of Social Research. A Dictionary of Key Social Science Research Concepts*. Sage Publications.
- Novak, K. & Tucker, C. R. (2021). *UDL and Blended Learning: Thriving in Flexible Learning Landscapes*. IMpress.
- Ogude, B. A., & Chukweggu, C. O. (2019). The Effects of Station Rotation Model (SRM) and Lecture Method on Blended learning on Secondary School Students' Performance on Reading Comprehension. *Journal of Advances in Education and Philosophy*, 03(10), 376–383. <https://doi.org/10.36348/jaep.2019.v03i10.006>
- Othman, S.Z., Zaid, N.M., Abdullah, Z., Mohammed, H., & Aris, B. (2016). Enhancing meaningful learning in MRSP120 rotational model. *Man in India*, 96, 525-536.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The BMJ*, 372. <https://doi.org/10.1136/bmj.n71>
- Powell, A., Watson, J., Staley, P., Patrick, S., Horn, M., Fetzer, L., Hibbard, L., Oglesby, J., & Verma, S. (2015). Blended Learning: The Evolution of Online and Face-to-Face Education from 2008-2015. *The International Association for K–12 Online Learning*, 1–20.
- Prasetya, S. P. (2016). The Differences in Learning Outcomes of Geography Students Using Rotation Models. *Proceedings of the 1st International Conference on Geography and Education (ICGE 2016)*, 357-361. <https://doi.org/10.2991/icge-16.2017.69>
- Saifuddin, Setyosari, P., Kamdi, W., Dwiyogo, W. D., & Nugroho, H. S. W. (2018). The effect of blended learning and self-efficacy on learning outcome of problem solving (Learning strategy improvement for health students). *Indian Journal of Public Health Research and Development*, 9(11), 365–369. <https://doi.org/10.5958/0976-5506.2018.01481.X>
- Staker, H., & Horn, M. B. (2012). Classifying K – 12 Blended Learning. INNOSIGHT Institute, 1–22. <https://www.christenseninstitute.org/wp-content/uploads/2013/04/Classifying-K-12-blended-learning.pdf>
- Thomas, G. (2013). *How to do Your Research Project: A guide for students in education and applied social sciences* (2nd ed.). Sage Publications.
- Truitt, A. A., & Ku, H.-Y. (2018). A case study of third grade students' perceptions of the station rotation blended learning model in the United States. *Educational Media International*, 55(2), 153–169. <https://doi.org/10.1080/09523987.2018.1484042>
- UNESCO. (2023). *What you need to know about digital learning and transformation of education*. <https://www.unesco.org/en/digital-education/need-know>
- UNICEF. (2021). *Nearly 240 million children with disabilities around the world, UNICEF's most comprehensive statistical analysis finds*. <https://www.unicef.org/eap/press-releases/nearly-240-million-children-disabilities-around-world-unicefs-most-comprehensive>

- Walne, M. B. (2012). *Emerging Blended-Learning Models and School Profiles*, 1–26. <https://www.edustart.org/wp-content/uploads/2012/10/Emerging+BL+Models+and+School+Profiles+FINAL+09.21.12.pdf>
- Yang, S., & Newman, R. (2019). Rotational Blended Learning in Computer System Engineering Courses. *IEEE Transactions on Education*, 62(4), 264–269. <https://doi.org/10.1109/TE.2019.2899095>
- Yilmaz, K. (2013). Comparison of Quantitative and Qualitative Research Traditions: epistemological, theoretical, and methodological differences. *European Journal of Education*, 48(2), 311–325. <https://doi.org/10.1111/ejed.12014>