האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Teaching geometry in high school - 34158

Last update 29-08-2019

HU Credits: 2

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Teaching Training - Diploma

Academic year: 0

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Dr. Alik Palatnik

Coordinator Email: Alik.Palatnik@mail.huji.ac.il

Coordinator Office Hours: Thursday, 9:00-10:00

Teaching Staff:

Dr. alik palatnik

Course/Module description:

The course deals with various aspects of high school geometry instruction: definitions, proofs, problem solving, visualisation and modelling. The course introduces different teaching and learning approaches to topics and objects that are unique to geometry: similarity, symmetry, transformations, circle, angles and more. In the course, we will introduce students' perceptions of mathematical concepts and ways in which a teacher can influence these perceptions. The course presents diverse study materials, mathematical assignments and different assessment methods, intending to shape the pedagogical-didactic mathematical identity of the students.

Course/Module aims:

Learning outcomes - On successful completion of this module, students should be able to:

Get acquainted with the Israeli high and middle school geometry curriculum at various levels and groupings.
Sort and evaluate a variety of textbooks and teaching resources on geometry.
Implement different teaching and learning methods for key issues in planar and spatial geometry.
Plan lessons / instructional units.
Experiment with a lesson plan/ play and its actual implementation.
Solve typical problems in various subjects, emphasizing possible ways of teaching.

Attendance requirements(%):

90

Teaching arrangement and method of instruction: Group discussions, lectures, learning through problem solving, presentation of topics by students, scripting tasks.

Course/Module Content:

Introduction. Why study geometry at school?
Israeli middle school and high school curriculum. The position and role of geometry in the different curricula, levels, streaming and grouping.
How can we use the history of mathematics during high school geometry teaching?
Use a collaborative game of definitions and monster-barring when teaching basic

concepts.
Geometric Constructions.
Dynamic Geometry Software. Search for invariants.
Exploration and enquiry while learning Geometry.
Proofs in Geometry. The various roles of proof.
Proof without words.
Problem solving and problem posing.
The role of auxiliary constructions.
The productive failure method.
Embodiment and enactive approach to spatial geometry instruction: 3-D pens, physical aids and dynamic geometry software.
Flashes of creativity in the geometry classroom.

Required Reading:

אחיטוב, י. (2003) מה עוד אפשר לעשות עם תיכוני משולש? על"ה 30 , 5-12.
דה-ויליירס, מ. (2003) הוכחה – חשיבה מחדש. על"ה 30 , 19-26.
מובשוביץ- הדר, נ. (1990) משפטים במתמטיקה כמקור להפתעות.
http://kesher-cham.technion.ac.il/clickit_files/files/index/552619713/210642784/434269493.pdf
סטופל, מ. זיסקין, ק. (2015). בניות גיאומטריות. בעיות קלאסיות, אתגריות וממוחשבות. חיפה: מכללת שאנן.
סיגלר, א. (2004) מיומנו של מורה: משפט הפוך מעניין, בעקבות שאלה של תלמידה על"ה 31 , 26-28.
סיגלר, א. (2005) שלשות פיתגוריות ויותר מזה. על מקביליות ומרובעים נוספים שמידות האורך של צלעותיהם ואלכסוניהם הן מספרים שלמים. על"ה35 , 6-11.
פטקין, ד. ופלקסין, א. (2008) חפיפת משולשים, התנאים המספיקים והתנאים שאינם מספיקים. על"ה, 39 , 37-43.
רוזן, ג'., מובשוביץ- הדר, נ. (2010) סכום הזוויות במשולש הוא 180o האומנם?. על"ה 43.
רייז, ר. (2007) גילוי היופי שבהוכחות משפט פיתגורס – תוך שימוש במאגרי מידע. על"ה 37, 94-100.
לייקין, ר., לבב- ויינברג, א., ולטמן, א. (2012) ריבוי פתרונות לבעיה בגאומטריה והכללת הבעיה. על"ה 47.
תמיר, ד. (2002) יחס הזהב במשולשים דומים. על"ה, 29 , 10-11.

Chazan, D. (1993). High school geometry students' justification for their views of empirical evidence and mathematical proof. Educational studies in mathematics, 24(4), 359-387.

Jones, K., Fujita, T., & Miyazaki, M. (2013). Learning congruency-based proofs in geometry via a web-based learning system. Proceedings of the British Society for Research into Learning Mathematics, 33(1), 31-36.
Knuth, E. J. (2002). Secondary school mathematics teachers' conceptions of proof. Journal for research in mathematics education, 379-405.
Mason, M. (2009). The van Hiele levels of geometric understanding. Colección Digital Eudoxus, 1(2).

Mariotti, M. A. (2013). Introducing students to geometric theorems: how the teacher can exploit the semiotic potential of a DGS. ZDM, 45(3), 441-452.
Menon, R. (1998). Preservice teachers' understanding of perimeter and area. School Science and Mathematics, 98(7), 361-367.
Palatnik, A., & Dreyfus, T. (2018). Introduction of auxiliary lines by high school students in proving situations. The Journal of Mathematical Behavior. https://doi.org/10.1016/j.jmathb.2018.10.004.

Palatnik, A., & Sigler, A. (2019). Focusing attention on auxiliary lines when introduced into geometric problems. International Journal of Mathematical Education in Science and Technology, 50(2), 202-215.
Palatnik, A., & Koichu, B. (2019). Flashes of creativity. For the Learning of Mathematics, 39(2), 8-13.
Sinclair, N., Bussi, M. G. B., de Villiers, M., Jones, K., Kortenkamp, U., Leung, A., & Owens, K. (2016). Recent research on geometry education: an ICME-13 survey team report. ZDM, 48(5), 691-719.
Turnuklu, E., Gundogdu Alayli, F., & Akkas, E. N. (2013). Investigation of Prospective Primary Mathematics Teachers' Perceptions and Images for Quadrilaterals. Educational Sciences: Theory and Practice, 13(2), 1225-1232.
Zazkis, R. Turn vs. shape: teachers cope with incompatible perspectives on angle. Educational Studies in Mathematics, 1-21.

Additional Reading Material:

Douaire, J., & Emprin, F. (2015, February). Teaching geometry to students (from five to eight years old). In CERME 9-Ninth Congress of the European Society for Research in Mathematics Education (pp. 529-535).

Course/Module evaluation:

End of year written/oral examination 0 %
Presentation 15 %
Participation in Tutorials 10 %
Project work 60 %
Assignments 15 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information: