האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Pedagogical Innovation in Science Education-Theory and Practice in the Educational Field - 34014

Last update 07-08-2022

HU Credits: *4*

Degree/Cycle: *1st degree (Bachelor)*

Responsible Department: *Teaching Training - Diploma*

Academic year: *0*

Semester: *Yearly*

Teaching Languages: *Hebrew*

Campus: *Mt. Scopus*

Course/Module Coordinator: *Dr. Adi Ben-David*

Coordinator Email: *adi.ben-david@mail.huji.ac.il*

Coordinator Office Hours: *By Appointment*

Teaching Staff:
Dr. Adi Ben-David

Course/Module description:
Science is the greatest achievement of the human spirit" (John Gribbin)
Indeed, science is a product of "human spirit": his thinking, curiosity, beliefs, tendencies, desires, and values. Science is a dynamic and ongoing process of exploration and discovery, carried out by the human through the processes of critical and creative thinking, which is subjective and contextual depending (time, place, culture, social conventions, technological capability, etc.). In the global-digital era, that subjected to constant changes and characterized by scientific-technological orientation, the scientific knowledge accumulates in vast quantities and are in the process of constant change. Therefore, the emphasis should be transferred from the acquisition of scientific knowledge to constructing meaningful knowledge and to developing cognitive, interpersonal and intrapersonal skills - 21st Century Skills (21 stCS), that enable independent lifewide and Lifelong learning. Pedagogical Innovation puts the learner's needs at the center and aims to develop independent lifewide and Lifelong learner. The course includes theoretical and practical aspects of Pedagogical Innovation, in line with the rationale and objectives of the natural sciences and mathematical curriculum.
The main goal of the course is to develop a pedagogical Innovation approach and teaching-learning-assessment practices in natural sciences and mathematics education.

Course/Module aims:
1. Delving into basic concepts in cognition and learning: high-order thinking (HOT), metacognition, epistemology and personal epistemic believes, constructivism and connectivism, self-directed learning (SRL).
2. To construct in-depth knowledge (Deeper Learning) on the concept "21st Century Skills" (21stCS) and to develop a pedagogical-educational practice, aimed at fostering 21st century learner skills.
3. To develop ability to design and implement learning activities based on a pedagogical innovation approach of "OECD-2030".
4. To Experience with active participation in "Professional Learning Community" (PLC) as a role model (Modeling).

Learning outcomes - On successful completion of this module, students should be able to:
1. Students will construct in-depth knowledge on basic concepts in cognition and learning: high-order thinking (HOT), metacognition, epistemology and personal epistemic believes, constructivism and connectivism, self-directed learning (SRL).
2. Students will construct in-depth knowledge on the concept "21st Century Skills"

(21stCS) and develop a pedagogical-educational practice at fostering 21st century learner skills.
3. Students will be able to design and implement learning activities based on a Pedagogical Innovation approach of "OECD-2030".
4. Students will actively participate in investigating teaching practice in "professional learning community".

Attendance requirements(%):
80

Teaching arrangement and method of instruction: Online performance assignments in the Moodle-Huji website. The course includes experiences in reflective peer-reviewed E-workshops and researching educational practice in the format of "Professional Learning Community"

Course/Module Content:
1. Basic concepts in cognition and learning: high-order thinking (HOT), metacognition, epistemology and personal epistemic arts, constructivism and connectivism, self-directed learning (SRL).
2. "21st Century Skills" (21stCS) and lifewide and Lifelong learing.
3. Pedagogical Innovation approach of "OECD-2030".
4. Investigating teaching practice in "professional learning community".

Required Reading:

איגר, ע. (2009). חשיבה מסדר גבוה: מבוא - תיחום, אפיון ומהות. בתוך: גלסנר, א. בן-דוד, ע. איגר, ע. (2009). פיתוח חשיבה מסדר גבוה – סקירת ספרות. האוניברסיטה הפתוחה, עמ' 27-7.

איזנברג, א', זליבנסקי, ע' (2019). התאמת מערכת החינוך למאה ה-21. פרק א: כישורי המאה ה-21. המכון הישראלי לדמוקרטיה.

בן-דוד, ע. (2009). מטה-קוגניציה בהוראה ובלמידה. אאוריקה, 27, 1-14.

ברזלי, ש' וזוהר, ע' (2011). "איך אתם יודעים?" אפיסטמולוגיה אישית ולמידה ממקורות מידע מקוונים. בתוך ד. חן וג. קורץ (עורכים). תקשוב, למידה והוראה (עמ'77-100). אור יהודה: המרכז ללימודים אקדמיים.

פסיג, ד. (2006). ה"השבחה" כמיומנות חשיבה מסדר גבוה של אינטליגנציה עתידית. הלכה ומעשה, גיליון 18, משרד החינוך, ירושלים.

Costa, A. L. (2008). The Thought-Filled Curriculum. Teaching Students to Think. Educational Leadership, 65(5), 20-24
McTighe, J. (1997). What Happens Between Assessments? Educational Leadership,

Vol 54(4), 6-12.
Pellegrino, J. W.OECD. (2018). The Future of Education and Skills. Education 2030. OECD Publishing, Paris. (2017). Teaching, learning and assessing 21st century skills. In: Guerriero, S. (ed.). Pedagogical Knowledge and the Changing Nature of the Teaching Profession. Educational Research and Innovation. pp. 223-248.

Additional Reading Material:

בן-דוד, ע' (2012). תהליך החקר המדעי בכיתה – מהתיאוריה למעשה. אאוריקה 33, 1-19.

גריבין, ג. (2010). היסטוריה של המדע 1543-2001. הוצאת ספרי עליית הגג וידיעות ספרים. תרגום מאנגלית: דפנה לוי.

הרפז, י' (2006). חינוך החשיבה: מיומנויות, נטיות, הבנה. בתוך ד. גורדון (עורך). מקצועות לימוד במבחן: חלופות להוראה הקונבנציונלית בבית הספר (עמ' 150-187). ירושלים: מכון ון-ליר והוצאת הקיבוץ המאוחד.

זוהר, ע' (2013). ציונים זה לא הכל - שיקומו של השיח הפדגוגי. (עמ' 37-71). תל-אביב: ספרית פועלים.

ליביו, מ. (2013). שגיאות גאוניות. הוצאת אריה ניר, תרגום מאנגלית: עמנואל לוטם.

Bailey, A., Kaufman, E., & Subotic, S. (2015). Education, technology, and the 21st century skills gap. Retrieved from: https://www.bcg.com/publications/2015/public-sector-education-technology-21st-century-skill-gap.aspx

Ferguson, R., Barzilai, S., Ben-Zvi, D., Chinn, C.A., Herodotou, C., Hod, Y., Kali, Y., Kukulska-Hulme, A., Kupermintz, H., McAndrew, P., Rienties, B., Sagy, O., Scanlon, E., Sharples, M., Weller, M., & Whitelock, D. (2017). Innovating Pedagogy-2017. Open University Innovation Report 6. Milton Keynes: The Open University, UK.

Freeman, A., Becker, S. A., & Cummins, M. (2017). NMC/CoSN Horizon Report: 2017 K-12 edition. The New Media Consortium.

Herodotou, C., Sharples, M., & Scanlon, E. (2018). Citizen Inquiry: Synthesising Science and Inquiry Learning. Routledge.

Holon IQ 2030, (2019). Robotics in Education. An AI-powered future. Global Education Market Intelligence Platform.

Mevarech, Z. R., & Kramarski, B. (2014). Critical Maths for innovative societies: The role of metacognitive pedagogies. Paris: OECD, Publishing.

OECD. (2016). Trends Shaping Education. OECD Publishing, Paris.

Pellegrino, J.W., & M. Hilton (eds.) (2012). Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century. National Academies Press, Washington, DC.

Schoon, I., & Lyons-Amos, M. (2016). Diverse pathways in becoming an adult: the role of structure, agency and context. Research in Social Stratification and Mobility. ISSN 02765624.

Siemens, G. (2006). Knowing Knowledge. Lulu.com; null edition.

United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development.

Uzzo, S.M., Graves, S.B., Shay, E., Harford, M., & Thompson, R. (2018) (Eds.) Pedagogical Content Knowledge in STEM: Research to Practice. Publisher: Springer.

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 80 %
Reports 20 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:
An online course conducted in an asynchronous format using the Moodle-Huji. Personal and group guidance is provided by appointment,as needed.