



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Analiza in razvoj kurikuluma
Course title:	Analysis and development of curriculum

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1. ali 2.	1., 2. ali 4.
PHYSICS		1. or 2.	1., 2. or 4.

Vrsta predmeta / Course type

Izbirni za modul Izobraževalna fizika

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
10	5				165	6

Nosilec predmeta / Lecturer:

Robert Repnik

**Jeziki /
Languages:**

**Predavanja /
Lectures:** slovenščina / slovene

Vaje / Tutorial: slovenščina / slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Ni pogojev.

Prerequisites:

None.

Vsebina:

1. Teoretični temelji zasnove kurikula.
2. Spoznavanje kognitivno problematičnih konceptov in metod za njih vpeljavo na področju izobraževanja fizike in naravoslovja.
3. Analiza in primerjava obstoječih domačih in tujih kurikulumov s področja fizike in naravoslovja.

Content (Syllabus outline):

1. Theoretical foundations of projecting curriculum.
2. Conception of cognitively problematic concepts and methods for enrolment in the field of physics and science education.
3. Analysis and comparison of existing home and foreign curricula from the field of physics and life sciences.

4. Simulacije kurikularnih tem, tudi z upoštevanjem časovnih oziroma organizacijskih omejitev.

5. Proces in postopki v razvoju kurikulumu

6. Razvoj kurikula s področja fizike in naravoslovja skozi čas, v Sloveniji in mednarodna primerjava

Analiza in razvoj kurikulumu v povezavi z raziskovalnimi metodami v izobraževanju fizike - vse vsebine se osredotočajo na teorijo in primere s področja izobraževanja fizike.

Temeljne značilnosti kvalitativnega glede na kvantitativno raziskovanje.

Vrste pretežno kvalitativnih pedagoških raziskav (študija primera, akcijska raziskava).

Faze kvalitativne in kvantitativne raziskave.

Pretežno kvalitativni postopki zbiranja podatkov (opazovanje z udeležbo ali brez nje, nestrukturirani ali polstrukturirani intervju) in kvalitativne obdelave podatkov (analize dokumentov).

Pretežno kvantitativni postopki zbiranja podatkov (anketiranje, preizkusi znanja, ocenjevalne lestvice, lestvice stališč, sistematično opazovanje).

Metode analize atributivnih spremenljivk (frekvenčne porazdelitve, t-preizkus hipoteze neodvisnosti in enake verjetnosti, mere kontingence).

Metode analize razlik s parametričnimi preizkusi (t-preizkus, analiza variance, analiza kovariance).

Metode analize razlik z neparametričnimi preizkusi (Mann-Whitneyev preizkus, Wilcoxonov preizkus, Kruskal-Wallisov preizkus, Friedmanov preizkus).

Metode analize povezanosti (bivariatna, multipla korelacija in regresija).

Računalniška obdelava podatkov s statističnim programom SPSS - profesionalni nivo.

Pisanje raziskovalnih poročil, strokovnih in znanstvenih člankov. Raba znanstvenega aparata.

4. Simulations of curricular themes by considering temporal and organisational limitations.

5. The process and procedures in curriculum development

6. Curriculum development in the field of physics and natural science through time, Slovenia and international comparison

Analysis and development of curriculum in connection with research methods in physics education research - the content (theory and examples) is focused on the field of physics education.

Characteristics of qualitative versus quantitative research.

Type of mostly qualitative pedagogical research (study case, action research).

Phases of qualitative and quantitative research.

Mostly qualitative ways of collecting the data (participant or non-participant observation, informal or semistructured interview) and qualitative analyzing the data (content - document analysis).

Mostly quantitative ways of collecting the data (survey, knowledge testing, scaling, attitude measurement, structured observation).

Statistical methods for the analysis of nominal and ordinal variables (frequency distributions, chi-square test hypothesis about independence and hypothesis of equal probability, measures of contingency).

Statistical methods for the analysis of differences with parametric tests (t-test, analysis of variance, analysis of covariance).

Statistical methods for the analysis of differences with non-parametric tests (Mann-Whitney, Wilcoxon, Kruskal-Wallis, Friedman test).

Statistical methods for the analysis of relationships (bivariate, multiple correlation and regression).

Computer analysis of the data by means of SPSS statistical program - professional use.

Writing research reports, technical and scientific papers. Use of scientific sources.

Iskanje in študij primerov raziskav s področja izobraževanja fizike.

Search and study of research examples from the field of physics education.

Temeljni literatura in viri / Readings:

- 1) Gerlič: Metodika in metodologija pouka fizike. Maribor: PEF Maribor, 1984.
- 2) Gerlič: Didaktika pouka fizike v osnovni šoli. PEF MB, 1992
- 3) Potrjeni kurikulumi fizike in naravoslovnih predmetov
- 4) Strokovni in znanstveni članki v revijah / Articles published in professional and scientific journals.
- 5) Spletne strani Oddelka za fiziko ter spletne strani domačih in tujih institucij z objavljenimi dokumenti v zvezi z razvojem kurikulumoma

Cilji in kompetence:

- Poznavanje in razumevanje konceptov pomembnih za konstrukcijo in razvoj kurikulumoma.
- Poznavanje problematičnih vsebin.
- Poznavanje obstoječih kurikulumov.
- Poznavanje poti do kurikularnih sprememb.
- študente usposobiti za samostojno odkrivanje raziskovalnih problemov, njihovo vsebinsko in metodološko opredeljevanje za raziskave s področja izobraževanja fizike
- študente usposobiti za korektno prevzemanje in samostojno izdelovanje strukturiranih in polstrukturiranih inštrumentov zbiranja podatkov za raziskave s področja izobraževanja fizike,
- študente usposobiti za izbiranje in uporabljanje ustreznih postopkov kvantitativne in kvalitativne obdelave podatkov ter interpretiranje (deskriptivno, eksplikativno) izidov analize z vidika njihove statistične in praktične pomembnosti za raziskave s področja izobraževanja fizike,
- študente usposobiti za samostojno pisanje raziskovalnih poročil, strokovnih in znanstvenih člankov.

Objectives and competences:

- Knowledge and understanding of the concepts that are important for construction and development of curriculum
- Knowledge of problematic topics.
- Knowledge of existing curricula.
- Knowledge of the procedures necessary for enforcement of curricular modifications.
- to enable the students for autonomous finding of research problems and defining their content and methodology for physics educational research
- to enable the students for correct usage and autonomous construction of structured and semistructured instruments for physics educational research,
- to enable the students for selecting and using appropriate ways of qualitative and quantitative analysing and interpretation (descriptive, explicative) of what the results imply in theory and practice (for physics educational research),

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- to enable the students for autonomous writing research reports, professional and scientific papers.

Predvideni študijski rezultati:

<p>Znanje in razumevanje:</p> <ul style="list-style-type: none"> • Usvojiti metode za kvalitativno analizo kurikulumov. • Poznavanje obstoječih kurikulumov in obstoječih medpredmetnih povezav. • Sposobnost formiranja predlogov in obdelave novih vsebin v kurikulumih. <p>Prenesljive/ključne spretnosti in drugi atributi:</p> <ul style="list-style-type: none"> • Sposobnost recenziranja kurikulumov iz sorodnih naravoslovno tehniških področij. • Iskanje in ustvarjanje medpredmetnih povezav v sorodnih naravoslovno-tehničnih kurikulumih.
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Intended learning outcomes:

<p>Knowledge and understanding:</p> <ul style="list-style-type: none"> • To gain the methods for qualitative analysis of curriculum • Knowledge of existing curricula and interdisciplinary connections • The ability to form proposals and handling of novel topics in curricula <p>Transferable/Key Skills and other attributes:</p> <ul style="list-style-type: none"> • The ability to revise the curricula from the related field from natural sciences and technology • Finding and creating interdisciplinary connections in related curricula from natural sciences and technology

Metode poučevanja in učenja:

<ul style="list-style-type: none"> • Predavanja • Seminar

Learning and teaching methods:

<ul style="list-style-type: none"> • Lectures • Seminar

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
• ustni izpit	60%	• Oral exam
• seminarska naloga	40%	• Seminar work

Reference nosilca / Lecturer's references:

<p>1. ÜLEN, Simon, GERLIČ, Ivan, SLAVINEC, Mitja, REPNIK, Robert. Evaluating the effectiveness of physlet-based materials in supporting conceptual learning about electricity. <i>Journal of science</i></p>
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education and technology, ISSN 1059-0145, 2017, vol. 26, iss. 2, str. 151-160, tabele, doi: [10.1007/s10956-016-9661-1](https://doi.org/10.1007/s10956-016-9661-1). [COBISS.SI-ID [22803208](#)]

2. JAGODIČ, Uroš, STAINES, Jacob, KRALJ, Samo, REPNIK, Robert. Teaching complex fields of soft matter, proposal of a new liquid crystal analogy. V: LAMANAUSKAS, Vincentas (ur.). *Philosophy of mind and cognitive modelling in education - 2014*, (Problems of education in the 21st century, ISSN 1822-7864, vol. 61). Siauliai: Scientific Methodological Center Scientia Educologica. 2014, str. 37-45, ilustr. [COBISS.SI-ID [20972552](#)]

3. REPNIK, Robert, RANJKESH SIAHKAL, Amid, ŠIMONKA, Vito, AMBROŽIČ, Milan, BRADAČ, Zlatko, KRALJ, Samo. Symmetry breaking in nematic liquid crystals: analogy with cosmology and magnetism. *Journal of physics, Condensed matter*, ISSN 0953-8984, 2013, vol. 25, no. 40, str. 404201-1-404201-10, doi: [10.1088/0953-8984/25/40/404201](https://doi.org/10.1088/0953-8984/25/40/404201). [COBISS.SI-ID [20050952](#)], [JCR, SNIP, WoS do 23. 10. 2017: št. citatov (TC): 6, čistih citatov (CI): 4, Scopus do 31. 8. 2017: št. citatov (TC): 8, čistih citatov (CI): 6]

4. REPNIK, Robert, GERLIČ, Ivan. Liquid crystals and development of natural science competences. V: *Proceedings od the 11th European Conference on Liquid Crystals, ECLC 2011, 6-11 February 2011, Maribor, Slovenia*, (Molecular crystals and liquid crystals, ISSN 1542-1406, vol. 553, no. 1, 2012). Philadelphia: Taylor and Francis, 2012, vol. 553, no. 1, str. 168-174, doi: [10.1080/15421406.2011.609464](https://doi.org/10.1080/15421406.2011.609464). [COBISS.SI-ID [19420680](#)]

5. MILFELNER, Maja, AMBROŽIČ, Milan, KRAŠNA, Marjan, CVETKO, Matej, ZIDANŠEK, Aleksander, REPNIK, Robert. Visualization of nematic director field with the RGB color system. V: *Proceedings od the 11th European Conference on Liquid Crystals, ECLC 2011, 6-11 February 2011, Maribor, Slovenia*, (Molecular crystals and liquid crystals, ISSN 1542-1406, vol. 553, no. 1, 2012). Philadelphia: Taylor and Francis. 2012, vol. 553, no. 1, str. 50-57, doi: [10.1080/15421406.2011.609370](https://doi.org/10.1080/15421406.2011.609370). [COBISS.SI-ID [18901000](#)]