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SCIENCE &
TECHNOLOGY**

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EDITORS

Assoc. Prof. Dr. İsmail ŞAHİN
Assist. Prof. Dr. S. Ahmet KIRAY
Res. Asst. Selahattin ALAN



KONYA



NECMETTİN ERBAKAN
UNIVERSITY

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PREFACE

Greetings!

We are congregating scientists, researchers and students who keep on involving their studies on education all over the world via International Conference on Education in Mathematics, Science and Technology which took place on May 16 - 18, 2014, at Necmettin Erbakan University in Konya, Turkey. We are honored to organize this event at Necmettin Erbakan University. By this opportunity, all the participants were able to develop scientific knowledge and scientific exchange through this well organized conference. In addition, they were able to spend a few restful days on the rich historical and cultural ambiance of Konya.

About 400 people from 30 different countries participated in the conference. A total of 359 academic works were presented at this event. We would like to acknowledge by expressing our deepest gratitude to keynote speakers, Prof. Dr. Paul ERNEST from University of Exeter-UK, Prof. Dr. William F. MCCOMAS from University of Arkansas-USA, Prof. Dr. Mack SHELLEY from Iowa State University-USA, Assoc. Prof. Dr. Jacqueline T. MCDONNOUGH from Virginia Commonwealth University-USA, and Prof. Dr. Lynne SCHRUM from West Virginia University-USA, for accepting our invitation to present a keynote speech in our conference. We thank to the panelists, Prof. Dr. Giray BERBEROGLU from Middle East Technical University-Turkey and Assoc. Prof. Dr. Gultekin CAKMAKCI from Hacettepe University-Turkey, for their valuable presentations. We also would like to thank to the members of the organization committee who contribute with their intense efforts for this conference and our sponsors, Private Genclik Schools, Private Basak College, Yargi Academy, Egitim Publication, and TUBITAK for their support.

The Organization Committee

TABLE OF CONTENTS

USING COMPUTER AND ICT EQUIPMENT FOR E-TEACHING AND E-LEARNING: ISSUES AND CHALLENGES FACING TEACHERS	1
CRÈCHE AND SAFETY FACILITIES FOR INFANT DEVELOPMENT	13
PERSPECTIVES OF IRANIAN SECONDARY SCHOOL TEACHERS TOWARDS THE APPLICATION OF INTERACTIVE WHITEBOARDS TECHNOLOGY IN MATH CLASSES.....	17
THE EFFECT OF USING SMART BOARD TECHNOLOGY ON IRANIAN EFL	29
USEFULNESS OF SPSS SUPPORT FOR STUDENTS OF ECONOMICS AND BUSINESS	30
COMPARISON OF DIFFERENTIATED APPROACH DEVELOPED WITH PURDUE MODEL IN TERMS OF ACHIEVEMENT	40
EDUCATION AND THE CHALLENGES OF SUSTAINABLE LIVELIHOOD IN EMERGING ECONOMIES: FOCUS ON RURAL ADULT EDUCATION FOR POVERTY REDUCTION IN NIGERIA	41
ROLE OF HISTORY OF MATHEMATICS ON.....	42
EDUCATION OF MATHEMATICS	42
THE USE OF X-RAY ANALYSIS TO STUDY THE RELATIONSHIP BETWEEN MICROSTRUCTURE AND IONIC CONDUCTIVITY OF $CSAG_{2-x} TL_xI_3$	46
INTERACTION EFFECTS OF TEACHER-PRESENCE AND STUDENTS' ACHIEVEMENT LEVEL OF SCIENCE	54
PHYSICS WITH COMPUTER-AIDED LEARNING.....	54
MADDEYİ TANIYALIM ÜNİTESİNİN ELEŞTİREL DÜŞÜNME YÖNTEMİYLE ÖĞRETİMİNİN ÖĞRENCİLERİN ÜST DÜZEY DÜŞÜNME BECERİLERİNE ETKİSİ	61
8. SINIF ÖĞRENCİLERİNİN RUTİN OLMAYAN PROBLEMLER KARŞISINDA KULLANDIKLARI STRATEJİLER	68
TEACHERS ' VIEW ON EDUCATIONAL RESEARCH.....	73
GEOGEBRA DESTEKLİ ORTAMLARDA ÖĞRENCİLER ARASI ETKİLEŞİMLERİN İNCELENMESİ.....	74
DENEYLE DESTEKLENMİŞ PROBLEME DAYALI ÖĞRENMENİN FEN VE TEKNOLOJİ DERSİNDEKİ BAŞARIYA ETKİSİ.....	75
THE STUDY OF THE EFFECTIVENESS OF APPLYING THE CONSTRUCTIONAL APPROACH IN MATERIALIZING THE GOALS OF THE CURRICULUM OF THE INTELLIGENT SCHOOLS	79
A SURVEY OF INFLUENCE OF ENVIRONMENT AS A MOTIVATOR ON SECONDARY SCHOOL STUDENTS' PERFORMANCE IN MATHEMATICS IN NIGERIA	86
CEBİRSEL MUHAKEME DEĞERLENDİRME ARACI: ARAÇ GELİŞTİRME, GÜVENİRLİK VE GEÇERLİK ÇALIŞMASI	93
TEACHING THE FUTURE TEACHERS: MAKING SCIENCE RELEVANT, USEFUL AND MEANINGFUL FOR NEW ZEALAND PRE-SERVICE TEACHERS.....	99
NO YOUTH LEFT BEHIND: REFLECTIONS FROM UNDERGRADUATE MATHEMATICS ..	110
THE DICHOTOMOUS MARKOV PROCESS WITH NONPARAMETRIC TEST APPLICATION; A DECISION SUPPORT METHOD IN LONG-TERM RIVER BEHAVIOURAL ANALYSIS	115

FACILITATING STUDENTS' GEOMETRIC THINKING THROUGH VAN HIELE'S PHASE-BASED LEARNING USING TANGRAM.....	116
EFFECT OF GENDER, AGE AND MATHEMATICS ANXIETY ON COLLEGE STUDENTS' ACHIEVEMENT IN ALGEBRA.....	117
"I AM UN/SUCCESSFUL IN MATHEMATICS BECAUSE..." : STUDENTS' SELF-PERCEIVED COMPETENCE IN MATHEMATICS	122
BRAID FOLDING AND BURAU REPRESENTATION	123
AN ASSESSMENT TOWARDS THE PUBLICATINONS OF UNESCO ABOUT MATHEMATICS EDUCATION (1989-2013)	137
INTEGRATING MATHEMATICS AND SCIENCE WITH ICT: A PROBLEM-CENTERING STRATEGY IN A GREEK SECONDARY SCHOOL	149
SCIENCE TEACHERS' PERSPECTIVES ON BENEFITS AND PROBLEMS FACED USING TABLET COMPUTERS IN SCIENCE EDUCATION: THE STORY FROM A SECONDARY SCHOOL IN TURKEY	154
ORTAOKUL 6. SINIF ÖĞRENCİLERİN MATEMATİĞE VE MATEMATİKÇİLERE BAKIŞ AÇILARI	155
A NEW METHOD FOR SOLVING BLACK-SCHOLES PARTIAL DIFFERENTIAL EQUATION.....	157
PREDICTING STUDENTS' ACADEMIC PERFORMANCE USING ARTIFICIAL NEURAL NETWORK : A CASE STUDY FROM FACULTY OF ORGANIZATIONAL SCIENCES	158
METHOD OF PROTECTİNG EDUCATİONAL CERTİFİCATES FROM FORGERY	164
INFORMING THE PRACTICE OF MATHEMATICS TEACHING IN THE UPPER PRIMARY CLASSES	168
ASSESSING TEACHER'S PERFORMANCE IN THE LIGHT USING TECHNOLOGICAL TOOLS IN TEACHING AND ITS RELATIONSHIP TO THE STUDENT'S PERFORMANCE AND THEIR ATTITUDES TOWARD MATHEMATICS EDUCATION	173
ŞİFRELEME ETKİNLİĞİNİN MATEMATİK DERSLERİNDE KULLANIMINA BİR ÖRNEK ..	178
EFFECTS OF PARENTAL ROLES IN STUDENTS' MATHEMATICAL LEARNING: HOW DOES THE EDUCATION LEVEL OF PARENTS EFFECT THEIR INVOLVEMENT?.....	183
STUDENTS OPINION ABOUT EXTRA CURRICULAR EXERCISES WHICH PERFORMED WITHIN THE SCOPE OF PROJECT BASED LEARNING	189
FEN BİLGİSİ EĞİTİMİ İÇİN WEB TABANLI ÖĞRENME	190
THE IMPACT OF LESSON STUDY ON PRIMARY MATHEMATICS TEACHERS' INSTRUCTIONS IN BRUNEI DARUSSALAM	197
ORTAOKUL 5. SINIF MATEMATİK DERS KİTABININ ÖĞRETMEN VE ARAŞTIRMACI GÖRÜŞLERİNE GÖRE	202
STUDENTS' ATTITUDES TOWARDS TECHNOLOGY EDUCATION IN FINLAND, ESTONIA AND ICELAND	203
YAN ALANI MATEMATİK ÖĞRETMENLİĞİ OLAN ÖĞRETMENLERİN MATEMATİK ÖĞRETİMİNE YÖNELİK GÖRÜŞLERİ.....	208
THE AWARENESS OF PRE-SERVICE TEACHERS ABOUT LIVING THINGS AS A FUNDAMENTAL CONCEPT ON TEACHING SOCİOSCİENTİFİC ISSUES	209
PERCEPTIONS OF PRE-SERVICE TEACHERS ABOUT INSTRUCTIONAL TECHNOLOGY: THE FINDINGS OF A QUALITATIVE STUDY	210

THE ROLE OF BELIFS ON UNIVERSITY MATHEMATICS TEACHERS' PROFESSIONAL KNOWLEDGE DEVELOPMENT.....	211
TURKISH CHEMISTRY TEACHERS' VIEWS ABOUT SECONDARY SCHOOL CHEMISTRY CURRICULUM: A PERSPECTIVE FROM ENVIRONMENTAL EDUCATION.....	217
APPLICATION FOR TRACKING STUDENTS' EFFICIENCY AND PREDICTING EXPECTATIONS BASED ON CURRENT RESULTS	224
SEKİZİNCİ SINIF ÖĞRENCİLERİNİN HİSTOGRAM GRAFİĞİNİ OLUŞTURMA, YORUMLAMA VE ANLAMLANDIRMA SÜRECİNE İLİŞKİN BİR DURUM ÇALIŞMASI.....	229
A REVIEW OF CRITERIA FOR CONTENT SELECTION IN PRIMARY EDUCATION CURRICULUM. (IN IRAN)	230
GENEL LİSE ÖĞRENCİLERİNİN FATİH PROJESİNİN KULLANIM DÜZEYİNE İLİŞKİN GÖRÜŞLERİ.....	235
THE DEVELOPMENT OF AN INQUIRY BASED LEARNING UNIT FOR INTEGRAL CALCULUS: THE CASE OF VOLUMES OF SOLIDS OF REVOLUTION.....	241
WEB TASARIMI VE PROGRAMLAMA DERSİ İÇİN WEB TABANLI EĞİTİMİN ÖĞRENME ÜZERİNE ETKİSİ.....	248
SINIF ÖĞRETMENLİĞİ ÖĞRENCİLERİNİN TEKNOLOJİK PEDAGOJİK ALAN BİLGİSİ ÖZ YETERLİK DURUMLARININ BELİRLENMESİ.....	253
EXAMINATION OF VISUALS IN MIDDLE SCHOOL SCIENCE TEXTBOOKS	259
NON-MATHEMATICS STUDENTS' REASONING IN NON-ROUTINE CALCULUS TASKS ..	260
5. SINIF “VÜCUDUMUZ BİLMECESİNİ ÇÖZELİM” ÜNİTESİ BAŞARI TESTİ: GEÇERLİK VE GÜVENİRLİK.....	271
THE EFFECT OF INTERDISCIPLINARY NATURE EDUCATION PROGRAM ON GIFTED AND TALENTED STUDENTS' PROBLEM SOLVING SKILLS.....	276
SYNTHESIS, SPECTROSCOPIC, AND BIOLOGICAL STUDIES OF CHROMIUM(III), MANGANESE(II), IRON(III), COBALT(II), NICKEL(II), COPPER(II), RUTHENIUM(III), AND ZIRCONYL(II) COMPLEXES OF N1, N2 - BIS (3 - ((3 - HYDROXYNAPHTHALEN - 2 - YL) METHYLENE - AMINO) PROPYL) PHTHALAMIDE.....	277
IDENTIFICATION LOCAL MATTER TYPICAL SOUTH SUMATRA TO DEVELOP MODEL OF LEARNING BASED CONTRUCTIVISM FOR ENVIRONMENT LITERACY ON JUNIOR HIGH SCHOOL STUDENT IN INDONESIA	289
KO TE ARO WHAKAMURĪ KĪA ANGA WHAKAMUA. REFLECT ON THE PAST IN ORDER TO FORGE THE FUTURE.....	296
ASRIN SU PROJESİ: KUZEY KIBRIS ORTAÖĞRETİM ÖĞRENCİLERİNDE SU TÜKETİMİNE VE ÇEVREYE YÖNELİK FARKINDALIK.....	297
INVESTIGATING THE DISTINCTIVE ROLE OF THE INTERACTIVE WHITEBOARDS FOR MATHEMATICS TEACHING.....	306
FATİH PROJESİYLE İLGİLİ AMPİRİK ÇALIŞMALARIN ANALİZİ: BİR LİTERATÜR TARAMASI.....	317
ADAPTATION OF TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (TPACK) AND TECHNOLOGY INTEGRATION SELF-EFFICACY SCALE (TISE) INTO TURKISH	322
THE DERİVATİVE GRAPHAS WITH NUMERİC AND GRAPHİCS APPROACH.....	323
DEVELOPING INNOMATTS TO IMPROVE MATHEMATICS TEACHERS' PEDAGOGICAL AND PROFESSIONAL COMPETENCES: AN INDONESIAN PERSPECTIVE	324

İLKOKUL 4.SINIF MADDEYİ TANIYALIM ÜNİTESİNE YÖNELİK BİR BAŞARI TESTİ GELİŞTİRME ÇALIŞMASI	336
SOME RESULTS ON CYCLIC CODES OVER $F_2 + uF_2 + vF_2 + uvF_2$	341
ZEKÂ OYUNLARI DERSİNE İLİŞKİN.....	342
ÖĞRETMEN VE ÖĞRENCİ GÖRÜŞLERİ.....	342
ORTAOKUL ÖĞRENCİLERİNİN PROBLEM ÇÖZME TUTUMLARININ ÇEŞİTLİ DEĞİŞKENLER AÇISINDAN İNCELENMESİ ÜZERİNE BİR ARAŞTIRMA	343
AN EXAMİNİNG OF MIDDLE SCHOOL STUDENTS' METACOGNİTİVE SKİLLS AND MATHEMATİCS	350
ORTAOKUL ÖĞRENCİLERİNİN BİLİMSSEL YARATICILIKLARININ FEN LABORATUVARI DENEYİMLERİ İLE GELİŞTİRİLMESİ.....	351
BİLİMSSEL SÜREÇ BECERİLERİ ETKİNLİKLERİNİN ORTAOKUL ÖĞRENCİLERİNİN BİLİMSSEL BİLGİYE YÖNELİK GÖRÜŞLERİNE ETKİSİ.....	356
ENHANCİNG STUDENT LEARNİNG THROUGH USE OF ONLİNE TECHNOLOGİES.....	357
AN EXAMİNİNG OF MIDDLE SCHOOL STUDENTS' SELF-EFFICACY TOWARD GEOMETRY AND ATTİTUDES TOWARDS MATHEMATİCS	358
THE EXPERIENCE OF TEACHİNG STATİSTİCS TO NON-SPECIALİST STUDENTS İN SAUDİ UNİVERSİTİES: THE ROLE OF TECHNOLOGY AND LANGUAGE	359
MODERN İCT SOLUTIONS TO BE TAUGHT İN TOURİSM AND HOSPİTALİTY EDUCATION: EVALUATION AND İMPLICATIONS	366
DEVELOPİNG AND EVALUATİNG PHYSİCS TEACHİNG MATERİAL WITH ALGODOO (PHUN) İN VİRTUAL ENVİRONMENT;.....	371
AKADEMİSYENLERİN TABLET PC KULLANIMI HAKKINDAKİ GÖRÜŞLERİ: SÜLEYMAN DEMİREL ÜNİVERSİTESİ ÖRNEĞİ.....	376
VERİ MADENCİLİĞİ TEKNİKLERİ KULLANILARAK ORTAOKUL ÖĞRENCİLERİNİN MATEMATİK ÖĞRENME STİLLERİ İLE MATEMATİK DERSİNE YÖNELİK TUTUMLARININ VE ARALARINDAKİ İLİŞKİLERİN İNCELENMESİ	377
PROJECT MATHS İN İRELAND:.....	384
THE EFFECT ON İNTERNATİONAL STUDENTS.....	384
ÖĞRETMEN ADAYLARININ TEMEL MATEMATİKSEL İFADELERİN DOĞRULUĞUNA YÖNELİK GÖRÜŞLERİ	391
HİZMET ÖNCESİ FEN ÖĞRETMENLERİNİN LİSE ÖĞRENİMLERİNDEKİ LABORATUVAR YAŞANTILARI.....	392
İNVESTİGATİNG PRE-SERVICE MATHEMATİCS TEACHERS' VIEWS ABOUT VECTOR APPROACH TO GEOMETRY AND İNSTRUCTİONAL METHODS DURING GEOMETRY TEACHİNG	398
ORTAOKUL 7.SINIF ÖĞRENCİLERİNİN UZAY ARAŞTIRMALARI KONUSUNDAKİ ALTERNATİF KAVRAMLARININ BELİRLENMESİ.....	399
SAMPLE VİSUAL ARTS ACTİVİTİES İNTEGRATED İNTO PROBLEM BASED LEARNİNG METHOD İN SCİENCE COURSES.....	405
İS PREZİ MORE USEFULNESS EDUCATION TOOL THAN POWERPOINT?.....	406
İÇERİK YÖNETİM SİSTEMİ KULLANILABİLİRLİK DEĞERLENDİRMEİ: JOOMLA 3.....	411

DEVELOPMENT OF LEARNING MANAGEMENT SYSTEM (LMS) AS AN EFFORT IN INCREASING LEARNING EFFECTIVENESS AND LEARNING ACTIVITIES OF STUDENTS IN SRIWIJAYA UNIVERSITY	416
TÜBİTAK WEB SİTESİNİN KULLANILABİLİRLİĞİNİN FARKLI YÖNTEMLER İLE DEĞERLENDİRİLMESİ	421
DEVELOPING GEOMETRICAL THINKING THROUGH MATHEMATIZATION.....	426
EFFECT OF PROSPECTIVE SCIENCE TEACHERS' SCIENCE LABORATORY SELF-EFFICACY AND ATTITUDE SCORES AND PHYSICS, CHEMISTRY AND BIOLOGY LABORATORY ANXIETY SCORES IN TERMS OF SOME VARIABLES	430
ASSESSING AND UPGRADING THE REALITY OF E-LEARNING AT TIKRIT UNIVERSITY	431
ORTAOKUL KADEMLERİNE YÖNELİK FEN VE MATEMATİK PROJE YARIŞMALARININ DEĞERLENDİRİLMESİ: TRABZON ÖRNEĞİ	435
ANALYSIS OF MATHEMATICAL PROBLEM SOLVING PROCESSES OF 6TH GRADE STUDENTS USING THE THINK-ALOUD PROTOCOL	436
FEN VE ETKNOLOJİ DERSİNDE BİLGİSAYAR DESTEKLİ PROJE TABANLI ÖĞRENME MODELİ UYGULAMALARI	437
EXAMINATION OF SCIENCE TEACHER'S PEDAGOGICAL CONTENT KNOWLEDGE IN THE TOPICS RELATED TO ACIDS AND BASES	438
İLKÖĞRETİM MATEMATİK ÖĞRETMENİ ADAYLARININ LİSANSÜSTÜ EĞİTİME YÖNELİK TUTUMLARININ BULANIK MANTIK İLE BELİRLENMESİ	439
LİSELERDEKİ PERFORMANS GÖREVLERİ HAKKINDA ÖĞRETMEN GÖRÜŞLERİ.....	440
LİSE ÖĞRENCİLERİNİN FEN BİLİMLERİNDE KULLANILAN.....	441
ÖLÇÜ BİRİMLERİYLE İLGİLİ BİLGİ DÜZEYLERİ VE DÜŞÜNCELERİ.....	441
PRE-SERVICE SCIENCE TEACHERS' IMAGES OF PHYSICIST AND PHYSICS COURSE ...	446
MATEMATİK ÖĞRETMEN ADAYLARININ ÇİN KALAN TEOREMİ İLE İLGİLİ SOYUTLAMAYI İNDİRGEME EĞİLİMLERİ	451
SEÇMELİ MATEMATİK UYGULAMALARI DERSİNİ ALAN VE ALMAYAN 5. SINIF ÖĞRENCİLERİNİN MATEMATİĞE YÖNELİK TUTUMLARININ KARŞILAŞTIRILMASI	456
A PRELIMINARY STUDY FOR DYSCALCULIA IN SABAH, MALAYSIA.	462
“YEŞİL KUTU” ÇEVRE EĞİTİMİ PROJESİNİN FEN VE TEKNOLOJİ ÖĞRETMEN ADAYLARININ ÇEVRE DOSTU DAVRANIŞLARINA ETKİSİ.....	471
THE EFFECT OF COMPUTER ASSISTED LABORATORY APPLICATIONS ON PRESERVICE TEACHERS' ATTITUDES TOWARDS SCIENCE TEACHING	478
RETHINKING THE MEANING OF INTERNATIONAL LARGE-SCALE ASSESSMENT	479
DEVELOPMENT AND VALIDATION OF A SCALE TO MEASURE CHEMISTRY LABORATORY ANXIETY LEVEL OF UNIVERSITY STUDENTS.....	480
DEVELOPMENT AND VALIDATION OF A SCALE TO MEASURE BIOLOGY LABORATORY ANXIETY LEVEL OF UNIVERSITY STUDENTS.....	481
KNOWLEDGES FOR EFFECTIVE INTEGRATION OF MATHEMATICS AND SCIENCE	482
AN AUTOMATED SCORING APPROACH FOR ESSAY	488
LİSE ÖĞRENCİLERİNİN NÜKLEER ENERJİ HAKKINDAKİ BİLGİ DÜZEYLERİ	493
CEBİR ÖĞRETİMİNDE ÇOKLU TEMSİL TEMELLİ ÖĞRETİMİN YERİ VE ÖNEMİ.....	498

METHODICAL AND MULTIMEDIA ENVIRONMENT FOR THE ACQUISITION OF ICT COMPETENCES IN THE FIELD OF LOGO PROGRAMMING OF FUTURE COMPULSORY EDUCATION TEACHERS.....	503
ORTAOKUL FEN VE TEKNOLOJİ DERSLERİNDE LABORATUVAR KULLANIMINA YÖNELİK ÖĞRENCİ GÖRÜŞLERİ.....	508
EXAMINATION OF ATTITUDES OF COMPULSORY EDUCATION TEACHERS IN THE REPUBLIC OF CROATIA TOWARD THE INTEGRATION OF ICT TECHNOLOGY IN DAILY WORK.....	513
BAZI ELEKTRİK KAVRAMLARI ÜZERİNE SEMİYOTİK YAKLAŞIMIN NASIL KULLANILDIĞINA İLİŞKİN BİR DURUM ÇALIŞMASI.....	520
ÖĞRETMEN ADAYLARININ ÖĞRETİM TEKNOLOJİLERİ VE MATERYAL TASARIMI DERSİNE YÖNELİK TUTUMLARI İLE ÖĞRETMEN ÖZ-YETERLİLİKLERİ ARASINDAKİ İLİŞKİNİN ANALİZİ.....	525
ÖĞRETMENLERİN CİNSEL SAĞLIK BİLGİ DÜZEYLERİ.....	526
TÜRKİYE VE ÇİN-TAYVAN 8. SINIF DÜZEYİ MATEMATİK ÖĞRETİM PROGRAMLARININ VE TIMSS SONUÇLARININ KARŞILAŞTIRILMASI.....	527
IMPACTS OF ERGONOMICS ON SUDANESE HIGHER EDUCATION INSTITUTIONS ICT CLASS ROOMS.....	528
FARKLILAŞTIRILMIŞ FEN VE TEKNOLOJİ ÖĞRETİMİNİN ÜSTÜN ZEKALI VE YETENEKLİ ÖĞRENCİLERİN TUTUMLARINA ETKİSİ.....	533
PROSPECTİVE MATHEMATİCS TEACHERS' PREFERENCES FOR INSTRUMENTAL ORCHESTRATION TYPES AND ENDORSED.....	534
BİLİM SÖZDE-BİLİM AYRIMI BAĞLAMINDA PLANLANMIŞ ÖĞRETİM SÜRECİNİN ORTAOKUL ÖĞRENCİLERİNİN AKADEMİK BİLGİ DÜZEYLERİNE ETKİSİ.....	535
YILDIZLAR KONUSUNUN ÖĞRETİMİNE YÖNELİK BİR DERS MATERYALİNİN GELİŞTİRİLMESİ, UYGULANMASI VE ETKİLİLİĞİNİN DEĞERLENDİRİLMESİ.....	536
2005 VE 2013 FEN BİLİMLERİ DERSİ ÖĞRETİM PROGRAMINA GÖRE HAZIRLANMIŞ 5. SINIF DERS KİTAPLARINDA YER ALAN ETKİNLİKLERİN ÇEŞİTLİ YÖNLERDEN İNCELENMESİ.....	541
TURKISH VERSION OF STATISTICAL REASONING ASSESSMENT (SRA).....	542
HOW DO THE PUPİLS' PARENTS TAKE A STAND TO THE STUDYİNG OF THE CRAFTS İN FİNLAND?.....	543
OKUL ÖNCESİ EĞİTİMDE STEM UYGULAMALARINA YÖNELİK ÖĞRETMEN GÖRÜŞLERİ.....	544
5. SINIFLAR İÇİN GELİŞTİRİLEN BİLİMİN DOĞASI ETKİNLİLERİNİN ETKİLİLİĞİ.....	549
ÖĞRETMEN ADAYLARININ BİLİMSEL EPİSTEMOLOJİK İNANÇLARINDAKİ DEĞİŞİM ÜZERİNE KARŞILAŞTIRMALI BİR ÇALIŞMA.....	556
YAŞAM TEMELLİ ÖĞRENME YAKLAŞMIYLA 8. SINIF “SIVILARIN VE GAZLARIN KALDIRMA KUVVETİ” KONUSUNUN ÖĞRETİMİ.....	561
İLKOKUL ÖĞRENCİLERİNE YÖNELİK TEMEL BECERİ ÖLÇEĞİNİN TÜRKÇEYE UYARLAMA ÇALIŞMASI.....	572
ÜNİVERSİTE ÖĞRENCİLERİNİN SOSYAL PAYLAŞIM SİTELERİNE YÖNELİK ALGILARININ İNCELENMESİ.....	573
EXAMİNİNG THE ITEM-WORDİNG EFFECT ON THE SELF-REPORT SCALE.....	597

MATEMATİK KAYGISI VE ENDİŞESİNİN CİNSİYET, SINIF DÜZEYİ VE OKUL TÜRÜ BAKIMINDAN İNCELENMESİ.....	598
ÜNİVERSİTE ÖĞRENCİLERİNİN MATEMATİĞİN TEMELLERİNE İLİŞKİN FELSEFİ GÖRÜŞLERİ.....	599
BİREYSEL GELİŞİM DOSYASI, ÜSTBİLİŞSEL FARKINDALIK ve AKADEMİK BAŞARI ARASINDAKİ İLİŞKİNİN İNCELENMESİ	600
THE INVESTIGATION OF CONTENT KNOWLEDGE OF.....	606
AN EFFECT OF HAVING INTERNET ACCESS ON PROSPECTIVE EARLY CHILDHOOD TEACHERS' INNOVATIVENESS PROFILES.....	613
BİR DURUM ÇALIŞMASI: ORTAOKUL ÖĞRENCİLERİNİN ORANTISAL AKIL YÜRÜTME PROBLEMLERİNİ ÇÖZME SÜREÇLERİNİN, STRATEJİLER VE PROBLEM DEĞİŞKENLERİ AÇISINDAN İNCELENMESİ.....	614
THE USE OF ADOBE CONNECT AND OPENMEETINGS IN DISTANCE EDUCATION	616
AN ANALYSIS OF MATHS LEARNING SUPPORT FOR MATURE STUDENTS IN ENGINEERING: ENGAGEMENT AND EFFECT.....	623
WEB BASED EDUCATIONAL SOFTWARE FOR ARTIFICIAL NEURAL NETWORKS	629
MATEMATİK ÖĞRETMENLİĞİ ALAN BİLGİSİ SINAVLARINDAKİ SORULARIN MATH TAKSONOMİ ÇERÇEVESİNDE ANALİZİ	633
BİÇİMLENDİRİCİ DEĞERLENDİRMENİN MATEMATİK BAŞARISINA VE HATIRLAMAYA ETKİSİ.....	638
THE OPINIONS OF TEACHER CANDIDATES ABOUT THEIR TEACHER TRAINING COURSES	649
ÖZEL ÖĞRETİM YÖNTEMLERİ II DERSİNDE GERÇEKLEŞTİRİLEN UYGULAMALARIN KİMYA ÖĞRETMEN ADAYLARI TARAFINDAN DEĞERLENDİRİLMESİ.....	654
SOLVING A NUMBER PLACEMENT GAME USING RECURSIVE BACKTRACKING ALGORITHM ON THE GRAPH MODEL	656
BİYOLOJİ DERSLERİNDE AKILLI TAHTA KULLANIMINA İLİŞKİN ÖĞRENCİ TUTUMLARI.....	663
KARİKATÜRLERİYLE DESTEKLENEN FEN VE TEKNOLOJİ ÖĞRETİMİNİN ÖĞRENCİLERİN AKADEMİK BAŞARILARINA ETKİSİ.....	664
EXAMINATION OF TEACHER CANDIDATES' METAPHORS RELATED TO TEACHER EDUCATION PROGRAMS	670
DETERMINATION OF STUDENT TEACHERS' VIEWS ABOUT REACT STRATEGY	675
FEN BİLGİSİ ÖĞRETMEN ADAYLARININ GELİŞTİRDİKLERİ BENZEŞİMLER (ANALJİLER) ÜZERİNE BİR ARAŞTIRMA	680
IN-SERVICE SCIENCE TEACHER PROFILES FROM THE EYES OF PRE-SERVICE SCIENCE TEACHERS: WHAT DID THEY OBSERVE?	681
STUDENTS' TALK DURING COLLABORATIVE GROUP DISCUSSION	684
BİYOLOJİ ÖĞRETMEN ADAYLARININ MEMELİLER HAKKINDAKİ GÖRÜŞLERİ	688
ARGUMENTATION IN PEER-GUIDED VERSUS TEACHER-GUIDED GROUP DISCUSSIONS.....	689
BESİN ZİNCİRİ VE BESİN AĞI KONULARINDA YARATICI DRAMA ETKİNLİKLERİ: ÖRNEK BİR DERS İŞLEYİŞİ.....	694
REHBERLİKLİ KEŞFETME VE ETKİLİ ÖĞRENME.....	698
ÇEVRE EĞİTİMİ PROJESİNİN ÖĞRENCİLERİN BİLİŞSEL YAPILARI ÜZERİNE ETKİSİ.....	703

ANALYSIS OF PRESERVICE ELEMENTARY TEACHERS VISUAL MATHEMATICS LITERACY	704
TEKNOLOJİ DESTEKLİ ÇOKLU TEMSİL TEMELLİ ÖĞRETİME ÖRNEK BİR UYGULAMA	705
TEKNOLOJİ DESTEKLİ ÇOKLU TEMSİL TEMELLİ ÖĞRETİMİN ÖĞRENCİLERİN LİNEER CEBİR BAŞARISINA ETKİSİ	710
ORTAOKUL 4. SINIF ÖĞRENCİLERİNİN EŞİTSİZLİK KONUSUNDAKİ SOYUTLAMA SÜREÇLERİNİN RBC MODELİ BAĞLAMINDA İNCELENMESİ	715
STUDENTS PERCEPTIONS ABOUT EFFECTS OF TEACHERS' CHARACTERISTICS ON STUDENTS MATH ACHIEVEMENT	720
HAZIRLIK SINIFI ÖĞRENCİLERİNİN YABANCI DİL DERSLERİNDE BİLGİ VE İLETİŞİM TEKNOLOJİLERİ KULLANILMASINA YÖNELİK TUTUMLARI.....	721
ARAŞTIRMAYA DAYALI FEN LABORATUARI UYGULAMALARININ ÖĞRETMEN ADAYLARININ YARATICI DÜŞÜNME DÜZEYLERİNE ETKİSİ.....	722
PROSPECTIVE ELEMENTARY TEACHERS' PERCEPTIONS OF USING TECHNOLOGY IN THE TEACHING OF MATHEMATICS	728
USING SLOWMATION AS A TEACHING APPROACH AND ITS EFFECT ON BIOLOGY ACHIEVEMENTS OF PRE-SERVICE SCIENCE TEACHERS	729
ÇOCUKLARIN TEMİZ VE KİRLİ ÇEVRE ALGILARI	735
ERADICATING MATHEMATICS ANXIETY AMONG SECONDARY SCHOOL STUDENTS USING COGNITIVE BEHAVIOURS THERAPY (CBT)	736
EFFECTS CONSTRUCTIVIST BASED INSTRUCTIONAL STRATECY ON STUDENTS' LEARNING OUTCOME IN MATHEMATICS	740
ARAŞTIRMAYA DAYALI FEN LABORATUARI UYGULAMALARININ ÖĞRETMEN ADAYLARININ YARATICI DÜŞÜNME DÜZEYLERİNE ETKİSİ.....	745
ELEKTRİK AKIMI VE İLGİLİ KONULARA AİT ÖĞRETME DURUMLARININ PRAKSEOLOJİK ANALİZİ	746
CONCEPT CARTOON SAMPLES INTEGRATED INTO PROBLEM BASED LEARNING IN SCIENCE COURSES*	748
EFFECTS OF PROBLEM BASED LEARNING ON PROSPECTIVE SCIENCE TEACHERS' ATTITUDES TOWARDS BIOLOGY LABORATORY	749
GÜNEY KORE VE TÜRKİYE'DEKİ ÖĞRENCİLERİN MATEMATİK BAŞARILARI İLE AİLE İŞLEVSELLİĞİ ALGILARININ İLİŞKİSİ	750
10. SINIF ÖĞRENCİLERİNİN ÖTELEME VE DÖNME DÖNÜŞÜMLERİYLE İLGİLİ MATEMATİKSEL ANLAMALARININ GELİŞİMİNDE SANAL MANİPÜLATİFLERİN ROLÜ	755
FEN BİLİMLERİ ÖĞRETMENLERİNİN ALTERNATİF ÖLÇME DEĞERLENDİRME ARAÇLARINI KULLANMA DURUMLARI	756
GRAFİK HESAP MAKİNESİ İLE TRİGONOMETRİ ÖĞRETİMİ: BİR EYLEM ARAŞTIRMASI	758
MATEMATİK DERSİNE YÖNELİK TUTUM GELİŞTİRME İLE İLGİLİ YAPILMIŞ ARAŞTIRMALARA BİR BAKIŞ.....	760
ÖĞRETMEN ADAYLARININ, TAMSAYI TARİFİNDE ÇOCUKLARIN NEREDE VE NEDEN KARIŞIKLIK YAŞADIKLARINA DAİR DÜŞÜNCELERİ	765
BİLİŞİM TEKNOLOJİLERİ VE YAZILIM DERSİ PROGRAMININ ÖĞRETMEN GÖRÜŞLERİNE GÖRE DEĞERLENDİRİLMESİ (KONYA-EREĞLİ ÖRNEĞİ)	766

HOW WELL PREPARED MATHEMATICALLY ARE OUR ENGINEERING STUDENTS WHO TRANSFER FROM AN ORDINARY DEGREE INTO AN HONOURS DEGREE	767
AN EVALUATION ABOUT TEACHER TRAINING PROGRAMS: FROM THE PERSPECTIVE OF PRESERVICE TEACHERS.....	771
EVALUATION OF ALGORITHM IMPLEMENTATION ASSESSMENT METHODS BASED ON A DATA STRUCTURE COURSE.....	777
DİĞİTAL BOŞLUK: KIRSAL ALANLARDA GÖREV YAPAN SINIF ÖĞRETMENLERİNİN BİLGİ İLETİŞİM TEKNOLOJİLERİNİN KULLANIMINA İLİŞKİN GÖRÜŞLERİ	782
LİSE ÖĞRENCİLERİNİN “AKILLI TAHTA” KAVRAMINA İLİŞKİN METAFORLARI.....	784
CORRELATIONS AMONG ASSESSMENT TECHNIQUES USED IN AN INTRODUCTORY PROGRAMMING COURSE	794
PRESERVICE PRIMARY MATHEMATICS TEACHERS’ VIEWS.....	799
FARKLI ÖĞRENME STİLLERİNİN FEN BİLGİSİ ÖĞRETMEN ADAYLARINDA PROJE PERFORMANSI VE AKADEMİK BAŞARIYA ETKİSİNİN İNCELENMESİ.....	804
THE EXPLORATION OF QUICK POLLS QUESTIONS’ LEVELS WITH THE BLOOM’S TAXONOMY: A CASE STUDY.....	810
CONTINUING TEACHER EDUCATION COURSES OF COMPUTATIONAL RESOURCES IN THE TEACHING OF MATHEMATICS AND PHYSICS: CREATION, APPLICATION AND STUDY	811
A PROBLEM GENERATOR SYSTEM TO LEARN FIRST-DEGREE EQUATIONS.....	815
MATHEMATICS TEACHERS' VIEWS ABOUT TEACHING GENERALIZATION OF NUMBER PATTERNS	820
OTOMOTİV SEKTÖRÜNDE YENİ TEKNOLOJİLER İÇİN.....	825
ÇOK BOYUTLU EĞİTİM-ÖĞRETİM PLATFORMU	825
ÜNİVERSİTELER İLE EĞİTİME İLİŞKİN SÜRDÜRÜLEN İŞBİRLİKLERİNİN FİRMALARIN ÖZÜMSEME KAPASİTESİNE ETKİSİ	833
THE LIFE AND SCIENTIFIC METHODS OF MEHMED TAHİR FROM BURSA	843
ÖĞRENME STİLLERİ, MATEMATİK KAYGISI, MATEMATİK ÇALIŞMA SÜRESİ VE MATEMATİK BAŞARISI ARASINDAKİ AÇIKLAYICI VE YORDAYICI İLİŞKİLER	847
CENTRAL HOSPITAL APPOINTMENT SYSTEM (CHAS-MHRS).....	848
ON COMPLETION IN PSEUDO-QUASI-N-NORMED SPACE.....	849
RATES ASSOCIATED PROBLEM-SOLVING ABILITY WITH PROGRAMMING IN COMPUTER STUDENTS	854
PROJE TABANLI ÖĞRENME YAKLAŞIMININ ÜSTBİLİŞSEL FARKINDALIĞA ETKİSİ İLE İLGİLİ ÖĞRENCİ GÖRÜŞLERİ.....	859
CONTEXTUALIZED LEARNING SETTINGS FOR MEANINGFUL NATURE OF SCIENCE UNDERSTANDING	864
THE INFLUENCE OF INITIAL TEACHER TRAINING IN FUTURE TEACHERS' PERCEPTIONS ABOUT MATHEMATICS TEACHING AND LEARNING.....	865
SINIF ÖĞRETMENİ ADAYLARININ UZUNLUK ÖLÇME KONUSUNDA ÖĞRENCİLERİN KAVRAM YANILGISILARINI TESPİT ETME DURUMLARI	870
EXAMINING THE CONCEPT CARTOONS BY PRE-SERVICE PRIMARY SCHOOL TEACHERS.....	875

THE EFFECT OF INFORMATION TECHNOLOGY IN TEACHING PHYSICS COURSES	880
MADDENİN PARÇACIKLI YAPISI İLE İLGİLİ KAVRAM YANILGILARININ GİDERİLMESİNDE MODELE DAYALI AKTİVİTELERİN ETKİSİ	885
BECERİ TEMELLİ ELEŞTİREL DÜŞÜNME EĞİTİMİNİN İLKOKUL 3. VE 4. SINIF ÖĞRENCİLERİNİN ELEŞTİREL DÜŞÜNME BECERİLERİNİ GELİŞTİRME DÜZEYİNE ETKİSİ	886
ÜNİVERSİTE ÖĞRENCİLERİNİN MEDYA OKURYAZARLIK DÜZEYLERİ	895
ÖĞRETMENLERİN RUTİN OLMAYAN MATEMATİKSEL PROBLEMLERİ ÇÖZMEDE KULLANDIKLARI STRATEJİLER	896
EXPLORING THE RESULT OF THALES THEOREM AND ITS RELATIONSHIP TO OTHER SHAPES AMONG IRANIAN MATHEMATIC HIGH SCHOOL STUDENTS	903
SOLVING A GEOMETRICAL EXERCISE FROM FOUR PERSPECTIVE.....	908
A SOFTWARE SIMULATION FOR MULTI-CHANNELS WDM BY HYBRID EDFA/RA SYSTEM.....	912
İLKÖĞRETİM MATEMATİK ÖĞRETMEN ADAYLARININ MATEMATİK TARİHİNİN MATEMATİK EĞİTİMİNDE KULLANILMASINA YÖNELİK TUTUM VE İNANÇLARI.....	919
MESLEK YÜKSEKOKULLARINDA ÖĞRENCİLERİN MATEMATİK BAŞARI SIRASI İLE GENEL BAŞARI SIRALAMASININ İNCELENMESİ.....	926
MATHEMATICS ACTIVITIES OF PEOPLE AT DIFFERENT LEVEL	931
ORTAOKUL 5.SINIF FEN BİLİMLERİ DERSİ ETKİNLİKLERİNİN LABORATUVAR KULLANIM TEKNİKLERİ VE KAZANIMLARA UYGUNLUĞU AÇISINDAN İNCELENMESİ.....	932
ABOUT 8 th GRADE STUDENTS' SKILLS IN TRANSLATING AMONG MULTIPLE REPRESENTATIONS	942
AŞKIN SAYILAR ŞADIRVANI	943
MOODLE ÖĞRENME YÖNETİM SİSTEMİNİN KULLANILABİLİRLİĞİNİN İNCELENMESİ.....	944
2005 VE 2013 FEN BİLGİSİ ÖĞRETİM PROGRAMLARININ 4. VE 5. SINIF DÜZEYLERİNİN BİLİMSSEL SÜREÇ BECERİLERİ AÇISINDAN KARŞILAŞTIRILMASI.....	950
LİSANSÜSTÜ ÖĞRENCİLERİNİN YENİ FEN BİLİMLERİ ÖĞRETİM PROGRAMINA İLİŞKİN GÖRÜŞLERİ	951
İLKÖĞRETİM 5. SINIF FEN BİLİMLERİ DERS KİTABI İÇERİĞİNE ELEŞTİREL BAKIŞ.....	956
8. SINIF ÖĞRENCİLERİNİN GEOMETRİK CİSİM İLE İLGİLİ KAVRAM İMGELERİ.....	957
TEACHER VIEWS ON STUDENTS' MISTAKES AND MISCONCEPTIONS: EQUATION EXAMPLE.....	958
ON DAILY MATHEMATICS: MATHEMATICS COMİNG FROM MINUS INFINITE.....	959
DYSLEXİA AND DIFFİCULTİES İN MATHEMATİCS	960
6. SINIF MATEMATİK DERSİNDE PROBLEME DAYALI ÖĞRENME YAKLAŞIMININ MATEMATİĞE İLİŞKİN TUTUMA ETKİSİ.....	961
8. SINIF ÖĞRENCİLERİNİN PERSPEKTİF ÇİZİMLER KONUSUNU ÖĞRENMELERİNE WEBQUEST UYGULAMASININ ETKİSİ	965
SOCIAL WORK AND ICT-SOME ETHICAL ISSUES	966
SEVERAL VIEWS OF TEACHING PHYSICS	970

THE PHENOMENON OF CYBER BULLYING IN ALBANIAN CONTEXT: AN EXPLORATIVE STUDY OF STUDENTS' PERCEPTIONS.....	977
CATEGORIZING MATHEMATICS KNOWLEDGE TO USE ICT IN MATHEMATICS EDUCATION	981
MATHEMATICS TEACHER CANDİDATES'	990
FATİH PROJESİ İL KOORDİNATÖRLERİ VE EĞİTMENLERİNİN, FATİH PROJESİ KAPSAMINDA VERİLEN EĞİTMEN EĞİTİMLERİNE İLİŞKİN GÖRÜŞLERİ	1000
SELF-CONCEPT AND SELF-EVALUATION IN THE TRANSITION FROM PRIMARY TO LOWER SECONDARY EDUCATION.....	1008
ASSESSING THE CLIMATE FOR CREATIVITY IN MATHEMATIC'S LESSONS.....	1015
SINIF ÖĞRETMENİ ADAYLARININ ÇOKLU TEMSİLERİ KULLANIM SÜREÇLERİ.....	1022
MÜHENDİSLİK ÖĞRENCİLERİNİN İRRASYONEL SAYI BİLGİLERİ	1028
ORTAOKUL ÖĞRENCİLERİNİN MATEMATİK TERİMLERİNİ SÖZEL VE MATEMATİKSEL TEMSİL BECERİLERİ.....	1029
FEN BİLGİSİ VE SINIF ÖĞRETMENLERİNİN FEN KAVRAM ÖĞRETİMLERİ, KAVRAM YANILGILARINI SAPTAMA VE GİDERME ÇALIŞMALARININ DEĞERLENDİRİLMESİ ..	1038
ÖĞRETMEN ADAYLARININ YAŞAM BOYU ÖĞRENME EĞİLİMLERİNİN ÇEŞİTLİ DEĞİŞKENLER AÇISINDAN İNCELENMESİ	1039
IMPACT OF EXPLİCİT-REFLECTİVE AND HİSTORY BASED INSTRUCTION ON PRESERVİCE SCİENCE TEACHERS' UNDERSTANDİNG OF NATURE OF SCİENCE.....	1041
BİR PROBLEMİ BEŞ FARKLI YOLDAN ÇÖZMEK, BEŞ PROBLEMİ BİR YOLDAN ÇÖZMEKTEN DAHA MI İYİDİR?	1042
<i>f</i> -CEBİRLERİNDE SIRALI İDEALLER.....	1047
THE PERCEPTIONS OF THE PRE-SERVICE SCIENCE TEACHERS' PROBLEM-SOLVING SKILLS	1051
7. SINIF “İNSAN VE ÇEVRE” ÜNİTESİNE YÖNELİK BİR EĞİTSEL OYUN GELİŞTİRİLMESİ ve UYGULANABİLİRLİĞİNİN ARAŞTIRILMASI.....	1052
ÖĞRETMEN ADAYLARININ KAVRAM KARİKATÜRLERİNE İLİŞKİN GÖRÜŞLERİ	1057
İLKÖĞRETİM MATEMATİK ÖĞRETMENLİĞİ ÖĞRENCİLERİNİN SİLİNDİR KAVRAMINA DAİR KAVRAM İMAJLARININ İNCELENMESİ.....	1062
BİR KAMPÜS AĞINDA EN KISA UZUNLUKLU HAMILTON ÇEVRELERİN BULUNMASI	1068
PSEUDOSCIENTIFIC BELIEFS OF UNIVERSITY SCIENCE EDUCATION STUDENTS.....	1073
THE EFFECTS OF MODEL BASED TEACHING ON 8 th GRADERS' METACOGNITIVE AWARENESS AND ATTITUDES TOWARDS SCIENCE AND TECHNOLOGY COURSE: EXAMPLE OF SOUND UNIT	1074
STUDENTS' INTERNET AND WEB 2.0 USE: A CASE OF BURDUR'S MIDDLE SCHOOLS	1075
FEN VE MATEMATİK ÖĞRETMEN ADAYLARININ “EŞİTLİK, EŞİTSİZLİK, DENKLİK, DENKLEM, ÖZDEŞLİK” KAVRAMLARINA İLİŞKİN ALGILARI.....	1080
THE INVESTİGATION OF PRESERVİCE TEACHERS' MEDİA AND TECHNOLOGY USAGE AND ATTİTİDES	1081
KEŞİRLER KONUSUNDAKİ KAVRAM YANILGILARI İLE İLGİLİ ÖĞRETMEN VE ÖĞRENCİLERDEN YANSIMALAR	1082

VERİ MADENCİLİĞİ İLE 7.SINIF ÖĞRENCİLERİNİN SAYILAR ÖĞRENME ALANINDAKİ PROBLEM ÇÖZME STRATEJİLERİNİN İNCELENMESİ	1087
ORTAÖĞRETİM ÖĞRENCİLERİNİN KUVVET VE HAREKET KONUSUNDAKİ KAVRAM İMAJLARI	1088
MATEMATİK ÖĞRETMEN ADAYLARININ MATEMATİKSEL KANIT YAPMAYA YÖNELİK GÖRÜŞLERİ	1089
PRESERVICE SCIENCE TEACHERS' PERCEPTIONS OF GENETICALLY MODIFIED ORGANISMS: A METAPHOR ANALYSIS	1090
INTERACTIVE E-LEARNING MATERIALS PRODUCTION AND SAMPLE APPLICATIONS IN THE FIELD OF MATHEMATICS	1091
SINIF ÖĞRETMENLERİNİN MATEMATİK KAYGISI.....	1092
PRESERVICE SCIENCE TEACHERS' PERCEPTIONS OF GENETICALLY MODIFIED ORGANISMS: A METAPHOR ANALYSIS	1093
İKİ AŞAMALI ÇOKTAN SEÇMELİ TEST KULLANILARAK ÖĞRENCİLERİN “MADDENİN TANECİKLİ YAPISI” ÜNİTESİ İLE İLGİLİ ALTERNATİF KAVRAMALARININ BELİRLENMESİ.....	1094
MADDENİN TANECİKLİ YAPISI İLE İLGİLİ ANLAMALARIN BELİRLENMESİNDE TAHMİN-GÖZLEM-AÇIKLAMA YÖNTEMİNİN VE ÇALIŞMA YAPRAKLARININ KULLANIMI.....	1100
ÖĞRENCİLERİN FONKSİYON KAVRAMINA İLİŞKİN KAVRAM YANILGILARINA YÖNELİK ÖĞRETMEN YAKLAŞIMLARI	1106
İLKOKUL 1. SINIF ÖĞRENCİLERİNİN DRAMA TEMELLİ ÖĞRETİM İLE TOPLAMA İŞLEMİ İLE İLGİLİ ÖĞRENME SÜREÇLERİNİN İNCELENMESİ	1108
MATEMATİKTE ÜSTÜN ZEKÂ VE ÜSTÜN YETENEK KAVRAMLARI ÜZERİNE ALAN YAZIN İNCELEMESİ	1110
7. SINIF ÖĞRENCİLERİNİN KESİRLERDE SIRALAMA KONUSUNDAKİ KAVRAM YANILGILARI.....	1111
THE IMPORTANCE OF LIFELONG LEARNING FOR TURKEY AND EU RELATIONSHIP IN THE GLOBAL AND CHANGING WORLD	1113
9-12. SINIF BİYOLOJİ DERSLERİNDE BİLİM İNSANLARINDAN YARARLANMA	1118
UYARLANMIŞ BİRİNCİL LİTERATÜRE DAYALI YÖNTEMİN BİYOLOJİ ÖĞRETMEN ADAYLARININ BİLİM İNSANI İMAJLARI ÜZERİNE ETKİSİ.....	1119
STUDENTS' OPINIONS ABOUT THE ACTIVITIES BASED ON CONCEPTUAL CHANGE STRATEGIES.....	1120
BİYOLOJİ ÖĞRETMEN ADAYLARININ ORGAN NAKLİ VE BAĞIŞI KONUSUNA BAKIŞ AÇILARININ BELİRLENMESİ VE DEĞERLENDİRİLMESİ	1121
AKILLI TAHTA KULLANIMININ ÖĞRENCİLERİNİN MATEMATİK VE GEOMETRİ ÖZ-YETERLİLİK DÜZEYLERİNE ETKİSİ.....	1122
GELECEĞİN SINIF ÖĞRETMENLERİ VE FENİN GÜNLÜK HAYATLARINDAKİ YERİ.....	1124
MATEMATİK ETKİNLİKLERİ OLUŞTURMAK İÇİN ÖĞRENME YÖNETİM SİSTEMİ KULLANIMINA YÖNELİK ÖNERİLER.....	1125
ÖĞRETMEN ADAYLARININ SABİT FONKSİYONLARIN.....	1126
KHALİFA UNIVERSITY OF SCIENCE, TECHNOLOGY AND RESEARCH (KUSTAR) STUDENTS' ATTITUDES TOWARDS MATHEMATICS IN THE LIGHT OF VARIABLES SUCH	

AS GENDER, NATIONALITY, MATHEMATICS SCORES AND THE COURSE THEY ARE ATTENDING	1127
FACTORS AFFECTING THE FREQUENCY OF ICT USAGE IN PRIMARY SCHOOLS TEACHING	1146
ÖĞRENCİLERİN PROBLEME DAYALI ÖĞRENME YÖNTEMİNİN UYGULANMASI HAKKINDAKİ DEĞERLENDİRMELERİ	1154
GOLF SPORU YAPAN BİREYLERİN DİKKAT DÜZEYLERİNİN İNCELENMESİ.....	1156
THE ANALYSIS OF THE ATTENTION LEVELS OF INDIVIDUALS PLAYING GOLF	1157
FUTBOL BRANŞINA KATILAN 9-14 YAŞ GRUBU ERKEK ÇOCUKLARIN IŞIK REAKSİYON ZAMANLARININ BELİRLENMESİ.....	1158
DETERMINING THE TIME OF LIGHT REACTION OF THE MALE CHILDREN BETWEEN 9 AND 14 YEARS OLD WHO ATTENDED THE FOOTBALL BRANCH.....	1159
THE EFFECT OF PRACTICES IN THE LABORATORY COURSE ON THE DEVELOPMENT OF SCIENTIFIC PROCESS SKILLS OF TEACHER CANDIDATES.....	1160
INQUIRY-BASED LEARNING IN CHINA : LESSON LEARNED FOR SCHOOL SCIENCE PRACTICES	1161
APPLICATION OF MATHEMATICS TO TRANSPORT PHENOMENA	1162
A NEW E-LEARNING PARADİGM: TOOLS AND TECHNIQUES.....	1163
POTENTIAL USE OF DIGITAL TECHNOLOGIES IN MATHEMATICAL MODELING THE FIRST STEPS OF RESEARCH	1170
EFFECT OF GENDER-RELATED DIFFERENCES IN ACADEMIC ACHIEVEMENT AND RETENTION OF SENIOR SECONDARY SCHOOL STUDENTS TAUGHT GEOMETRY USING PROBLEM SOLVING APPROACH.....	1176
FAILURE IN MATHEMATICS	1181
SINIF ÖĞRETMENLERİNİN FEN VE TEKNOLOJİ ÖĞRETİMİNE YÖNELİK TUTUMLARI	1182
PEDAGOJİK ALAN BİLGİSİ BİLEŞENLERİNDEN ÖĞRENCİ DÜŞÜNCESİ BİLGİSİNE YÖNELİK BİR LİTERATÜR TARAMASI	1183
SERVICE LEARNING IN SCIENCE TEACHER PREPARATION PROGRAM: CONCEPTS AND PRACTICES	1185
ORTAÖĞRETİM MATEMATİK ÖĞRETMEN ADAYLARININ ÖĞRENCİLERİNİN HATALI ÇÖZÜMLERİNİ ÖNGÖRME BECERİLERİ.....	1194
BAYES RISK FOR SELECTION THE MEDIAN CATEGORY FROM EVEN SAMPLE SIZE .	1205
THE IMPACT OF SOCIOCULTURAL DİALECTICAL METHOD ON STUDENTS' BEHAVİORAL, COGNİTİVE AND EMOTİONAL ENGAGEMENT.....	1215
EXPECTATIONS TOWARDS ADEQUACIES OF NEW IT GRADUATES BASED ON SECTOR AND EXPERIENCE OF THE EMPLOYERS	1216
THE USAGE OF SOCIAL MEDIA FOR LEARNING AND TEACHING PURPOSES: AN IMPLEMENTATION OF EXTENDED THEORY OF REASONED ACTION MODEL.....	1221
FEN BİLİMLERİ ÖĞRETMEN ADAYLARININ GİRİŞİMCİ ÖZELLİKLERİNİN BAZI DEĞİŞKENLER AÇISINDAN İNCELENMESİ	1227
ÖĞRENCİLERİN ÖĞRENME YAKLAŞIMLARI İLE DÜŞÜNME STİLLERİ ARASINDAKİ İLİŞKİNİN İNCELENMESİ	1228

EXPLORING PRESERVICE EARLY CHILDHOOD TEACHERS' MATHEMATICS-RELATED EMOTIONS.....	1234
COMPLETENESS IN DISLOCATED QUASI-METRIC SPACE	1235
ORTAOKUL ÖĞRENCİLERİNİN ÇEVRESEL TUTUM, DAVRANIŞ VE DÜŞÜNCELERİNİN DOĞA EĞİTİMİ PROJESİNE BAĞLI DEĞİŞİMİ.....	1239
FİZİK ÖĞRETMEN ADAYLARININ ÖĞRETMENİN VE ÖĞRENCİNİN ROLÜ AÇISINDAN EĞİTİM SÜRECİNE İLİŞKİN FELSEFİ GÖRÜŞLERİNİN İNCELENMESİ	1244
FİZİK ÖĞRETMEN ADAYLARININ ÖĞRENME STİLLERİNİN ÇEŞİTLİ DEĞİŞKENLER AÇISINDAN İNCELENMESİ.....	1245
iOS PLATFORMU İÇİN TIBBİ ETKİNLİK VE KONGRE UYGULAMASI	1246
BİLİM İÇİN BİR BULUŞMA NOKTASI:	1250
FEN BİLGİSİ ÖĞRETMEN ADAYLARININ ORGANİK BİLEŞİKLERİ IUPAC SİSTEMİNE GÖRE ADLANDIRMADA KARŞILAŞTIĞI ZORLUKLAR.....	1251
TEACHING AND LEARNING IN HIGHER EDUCATION.....	1252
DİNAMİK GEOMETRİ YAZILIMI GEOGEBRA'NIN KULLANIMININ ÖĞRENCİ BAŞARISI VE KALICILIK ÜZERİNDEKİ ETKİSİ ¹	1258
KAVRAMSAL DEĞİŞİM METİNLERİNİN MADDENİN AYIRT EDİCİ ÖZELLİKLERİNİ ANLAMAYA ETKİSİ.....	1259
MAKİNE ÖĞRENMESİ ALGORİTMALARI KULLANILARAK KALP HASTALIĞI TESPİTİ	1260
LİSE ÖĞRENCİLERİNİN MATEMATİK DERSİNİ NİYE SEVMEDİKLERİ ÜZERİNE BİR ARAŞTIRMA.....	1265
KNOWLEDGE OF CURRÍCULUM OBJECTİVES AND POSSESSİON OF THE SUBJECT – NECESSİTY FOR ALBANİAN LANGUAGE ACQUISİTION FROM STUDENTS.....	1272
6-7-8. SINIF MATEMATİK DERSİ ÖĞRETİM PROGRAMINDA YER ALAN ARA DİSİPLİNLERE YÖNELİK ÖĞRETMEN GÖRÜŞLERİ.....	1273
HARMANLANMIŞ ÖĞRENME ALANINDA TÜRKİYE'DE YAPILMIŞ YÜKSEK LİSANS VE DOKTORA TEZLERİNİN İNCELENMESİ	1278
PROSPECTIVE MIDDLE SCHOOL MATHEMATICS TEACHERS' COMPUTATIONAL ESTIMATION STRATEGIES FOR ADDITION.....	1284
INVESTIGATING MASTER THESIS AND DOCTORAL DISSERTATIONS ABOUT NATURE OF SCIENCE: TURKEY SAMPLE.....	1285
ÖĞRENCİLERİN MOBİL TEKNOLOJİLERE İLİŞKİN ÖN BİLGİ DÜZEYLERİNİN FARKLI DEĞİŞKENLER AÇISINDAN İNCELENMESİ	1286
EVALUATING EFFECTS OF AN EXHIBITION VISIT ON PRE-SERVICE ELEMENTARY TEACHERS' UNDERSTANDINGS ON CLIMATE CHANGE	1292
UZAKTAN EĞİTİMDE ÇEVİRİMİÇİ DERS İÇİN BİR YOKLAMA SİSTEMİNİN TASARIMI.	1300
ÖĞRETMEN ADAYLARININ MATEMATİK ÖĞRETİMİNDE KENDİLERİNE REHBER EDİNDİKLERİ ÖĞRETİM MODELLERİ.....	1304
ASSESSING STUDENT LEARNING OUTCOMES THROUGH TECHNOLOGY	1305
ÖĞRETMENLERİN TEKNOLOJİK PEDAGOJİK ALAN BİLGİLERİNİN İNCELENMESİ.....	1306
AZERBAYCAN VE TÜRKİYE'DE OKUTULAN 1.SINIF MATEMATİK DERS KİTAPLARININ İÇERİK AÇISINDAN KARŞILAŞTIRILMASI.....	1312

EĞİTSEL OYUNLARLA MATEMATİK ÖĞRETİMİ DERSİNDE TASARLANAN OYUNLARIN ANALİZİ	1313
SPATIAL SKILLS AS PREDICTORS OF SUCCESS IN MATHEMATICS	1314
GÖRÜNTÜ PARAMETRELERİNİN PARÇACIK SÜRÜ OPTİMİZASYONU YÖNTEMİ İLE ENİYİLEMESİ	1315
TURKISH AND ISLAMIC SCIENTISTS IN TURKISH SCIENCE TEXTBOOKS	1320
BİLGİSAYAR DESTEKLİ ÖĞRETİMİN LİNEER BAĞIMSIZLIK KONUSUNDA AKADEMİK BAŞARI ÜZERİNE ETKİSİ	1321
LİSE ÖĞRENCİLERİNİN MATEMATİK DERSİNDE ÖĞRENME STİLLERİNE GÖRE UYGULANAN ETKİNLİK TÜRLERİNE YÖNELİK TERCİHLERİ	1322
AN ANALYSIS OF NUMBER SENSE OF THE HIGH-ACHIEVING HIGH SCHOOL STUDENTS	1328
ODAK GRUP GÖRÜŞMESİ İLE KÜTLE VE AĞIRLIK KAVRAMLARININ ÖĞRETİMİ.....	1329
FEN VE TEKNOLOJİ ÖĞRETMENLERİN TEKNOLOJİ DOĞASI HAKKINDAKİ DÜŞÜNCELERİ.....	1330
BİLGİSAYAR MÜHENDİSLİĞİNE GİRİŞ DERSİNE İLİŞKİN ÖĞRENCİ GÖRÜŞLERİNİN DEĞERLENDİRİLMESİ	1331
ÖĞRETMENLİK UYGULAMASINDA GÖREV ALAN UYGULAMA ÖĞRETMENLERİNİN FEN VE TEKNOLOJİ ÖĞRETMEN ADAYLARININ YAPISALCI ÖĞRENME KURAMINA KARŞI TUTUMLARI ÜZERİNE ETKİSİ	1337
IŞIK KİRLİLİĞİNE İLİŞKİN BİLGİSAYAR DESTEKLİ KAVRAM KARİKATÜRLERİNİN GELİŞTİRİLMESİ	1345
CONCEPTUALIZATION OF PEDAGOGICAL CONTENT KNOWLEDGE (PCK) FOR TEACHING MATHEMATICS IN UNIVERSITY LEVEL	1346
ORTAOKUL 7. SINIF ÖĞRENCİLERİNİN ATOM KAVRAMI HAKKINDAKİ KAVRAM YANILGILARI.....	1351
ORTAOKUL 7. VE 8. SINIF ÖĞRENCİLERİNİN RASYONEL SAYILAR KONUSUNDAKİ YANLIŞ ANLAMALARI VE KAVRAM YANILGILARI	1352
SELF-CONCEPT AND SELF-EVALUATION IN THE TRANSITION FROM PRIMARY TO LOWER SECONDARY EDUCATION.....	1353
ÇEVİRİMİÇİ ÖĞRENME ORTAMLARINDA KULLANILABİLİRLİK: BİR LİTERATÜR TARAMA ÇALIŞMASI.....	1354
PERFORMANS ÖLÇÜMÜNDE KULLANILABİLECEK PROBLEM ÖRNEKLEMELERİ VE ÖĞRENCİLERİN BU PROBLEMLERİ ÇÖZÜM SÜREÇLERİNİN İNCELENMESİ.....	1363
AÇILARI VE KENARLARI DİZİ OLUŞTURAN ÜÇGENLER İLE $x^2 + 3y^2 = z^2$ DİOPHANTİNE DENKLEMİ ARASINDAKİ İLİŞKİ ÜZERİNE ¹	1377
HERON ÜÇGENLERİNİN TEĞETLER ÇEMBERLERİNİN YARIÇAPLARI İLE $x^2 + 2y^2 = z^2$ DİOPHANTİNE DENKLEMİ ARASINDAKİ İLİŞKİLER ÜZERİNE ¹	1391
ORTAOKUL BEŞİNCİ SINIF ÖĞRENCİLERİNİN	1401
TEACHING THE SCIENTIFIC EXPLAINING CONCEPT THROUGH “SOCIO-CULTURAL DIALECTIC METHOD” IN SCIENCE COURSES.....	1406
ÜÇ AŞAMALI YÜZME-BATMA TANI TESTİNİN GELİŞTİRİLMESİ	1407
BAYES RISK FOR SELECTION THE MEDIAN CATEGORY FROM EVEN SAMPLE SIZE IN K-NOMIAL DISTRIBUTION	1408

LITERATURE ON META-ANALYSIS METHOD.....	1409
ÖZEL GEREKSİNİMLİ BİREYLERİN EĞİTİMİNDE BİLGİ İLETİŞİM TEKNOLOJİLERİNİN KULLANIMI.....	1410
OTİZMLİ BİREYLERİN EĞİTİMİNDE KULLANILAN TABLET UYGULAMALARI	1411
DESIGNING OF A CNC TRAINING SET	1412

FACTORS AFFECTING THE FREQUENCY OF ICT USAGE IN PRIMARY SCHOOLS TEACHING

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ABSTRACT: Intensive and rapid development of ICT lead to popularization and necessity of its use, and changes in all spheres including education as a process.

A research was conducted in order to ensure valid and reliable assessment of the extent and nature of ICT knowledge and skills of teachers in primary schools, to identify the factors that affect the frequency of use of ICT in teaching and to identify strategies for enhancing development effectiveness future.

The research surveyed 214 teachers from 10 primary schools in the Southeast region of Macedonia. Technique Modeling of Structural Equations was used to determine the relative strength of the factors affecting the frequency of use of ICT in teaching. The results show that the highest percentage of 58.4 % of the teachers often use ICT in teaching, 33.6 % rarely use ICT, 7 % of respondents use ICT at all times, and only 0.9 % do not use ICT for teaching purposes. ICT competencies of teachers, number of training, years of computer use, possession of personal computer and having Internet at home proved as influential factors for ICT usage frequency in teaching.

The survey results were analyzed using SPSS 19, Excel and Amos Graphics 18.

Keywords: ICT knowledge and skills, ICT in teaching, modeling with structural equations.

1. INTRODUCTION

Information and communication technologies (ICT) play a proven critical role in enhancing the quality of education. They are particularly important in helping teachers and students to perform more effectively. To make the best use of ICT, teachers must be equipped with adequate ICT competencies. In the process of integrating ICT into education, both teacher's ICT competencies and how they perceive the role of ICT in their teaching/learning processes play key roles. Analysis, design, development, implementation, evaluation, and management of ICT in education require diversified competencies and knowledge (Kozma 2002, pp.1-6).

ICTs have become within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy (Daniels, 2002).

Today, improved communication technology has made time and space less complex. It could be observed that this modern age is the age of information explosion in which an average individual wants to explore the information system. Thus, the ability for timely acquisition, utilization, communication and retrieval of relevant

and accurate information has become an important attribute for better teaching-learning process (Adebayo, 2008).

The new technologies have the potential to support education across curriculum and provide opportunities for effective communication between teacher and students in ways that have not been possible before. ICT in education has the potential to be influential in bringing about changes in ways of teaching (Dawes, 2001).

The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research (Yusuf, 2005). A great deal of research has proven the benefits to the quality of education (Al-Ansari, 2006). ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005). As Jhurree (2005) states, much has been said and reported about the impact of technology, especially computers, in education. The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning and research (Yusuf, 2005). ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005).

Teachers contribute toward the base of the education innovation, therefore ICT competencies of teachers in primary schools should be seen as an invaluable prerequisite to facilitate teaching and learning in this modern era of information and technology. [9]

ICT is not only a means of realizing the educational goals but important factor in a complete restructuring of the educational system, introducing new interactive and participatory models of education, new educational pedagogy, continuous and lifelong learning.

Macedonian context of computerization and digitization of education intensively developed after 2002 when the country received the first Chinese donation, which allowed a certain degree of popularization of ICT in the education. Starting in 2003 through the e-school project teacher training the use of ICT were conducted in two phases. With changes in education that occurred with the intensive introduction in education, resulted in a need to develop national educational policies and strategies that will contribute to the social and educational development. In 2005 was created the draft program for the development of ICT in education (2005-2015) which covered the process of computerization and digitization of education.

Macedonia entered the world of ICT innovation with the introduction of the program "Computer for Every Child" initiative and investment by the Government of the Republic of Macedonia to modernize Macedonian education. This project provides a computer for each child, software solutions and tools for each subject, advanced ICT skills among teachers and students, a national system of testing students and the interactive online teaching.

In the academic year 2009/2010, primary schools were equipped with portable Classmate PCs for every student from first to third grade. In 2010 teacher trainings were conducted for Edubuntu operating system, the programs for integration of mathematics and sciences, ToolKid program and SSTC of using "thin clients". Furthermore, despite the software electronic grades were introduced. Also attached is training for class teachers for the program and Green G Compris suite-junior. [5,6,8]

Starting from the academic year 2013/14, all teachers were required to integrate at least 30% of ICT in the curriculum.

2. METHODOLOGY

In the survey every teacher had to report their ICT knowledge and skills, the ways in which they use ICT in teaching, ICT training they have attended, frequency of ICT use in teaching and to evaluate motivational attitudes of the ICT use in teaching, and the attitudes of the school towards ICT. The main parts of the survey are shown in Table 1.

This research is done in order to ensure a valid and reliable assessment of the extent and nature of ICT knowledge and skills of teachers in primary schools, and to identify factors that affect the frequency ICT usage in teaching.

The survey was conducted in the academic year 2012/13, in 10 primary schools in the Southeast region of the Republic of Macedonia in the municipalities of Strumica, Vasilevo, Bosilevo and Novo Selo. The survey was

conducted on 214 teachers, a representative sample in given that 610 is the total number of teachers in those municipalities.

Table 1. Structure Of The ICT Survey In Teaching For Teachers In Primary Schools.

part	Title of section	Information	Number of issues
I	General information	environment, age, experience, sex, teacher	5
II	Using the computer for personal needs	personal computer, type of computer, Internet at home, years of experience with computer	4
III	Personal and professional development	training classes at school, additional training, self-improvement	3
IV	Using computers at school	implementation of ICT programs, type of computer, hardware, use of computer	6
V	Motivation for using ICT in teaching	motivational view with scale assessment	21
VI	ICT knowledge and skills	navigation in the operating system, email, Internet, text editor, multimedia presentations, spreadsheet calculations, blogs, databases	8
VII	ICT in school	assessment scale for the application of ICT in school	3
Total Questions			33

3. RESULTS AND DISCUSSION

The survey results were analyzed using SPSS 19 programs, Excel and Amos Graphics 18. The tables below present the demographic characteristics of the surveyed teachers.

Table 2. The location of the school.

		Location			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rural	105	49,1	49,1	49,1
	Urban	109	50,9	50,9	100,0
	Total	214	100,0	100,0	

Table 2 Shows That Almost Equal Number Of Teachers Are From Urban And Rural Areas.

Table 3. Age Structure Of The Surveyed Teachers.

		Age			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=25	5	2,3	2,3	2,3
	>=56	24	11,2	11,2	13,6
	26-35	59	27,6	27,6	41,1

36-45	55	25,7	25,7	66,8
46-55	71	33,2	33,2	100,0
Total	214	100,0	100,0	

Table 4. Work experience as a teacher.

Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid <=5	46	21,5	21,5	21,5
>=26	51	23,8	23,8	45,3
11-15	29	13,6	13,6	58,9
16-20	22	10,3	10,3	69,2
21-25	19	8,9	8,9	78,0
6-10	47	22,0	22,0	100,0
Total	214	100,0	100,0	

Table 5. Gender of surveyed teachers.

Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Female	177	82,7	82,7	82,7
Male	37	17,3	17,3	100,0
Total	214	100,0	100,0	

Table 6. Teachers from primary education.

Teacher

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Primary education teacher	85	39,7	39,7	39,7
Subject teacher	129	60,3	60,3	100,0
Total	214	100,0	100,0	

Figure 1 is a graphical representation of a given application of ICT in teaching. The question: Do you use ICT in teaching, teachers had to answer whether they do it all the time, rarely, never, or don't know what it is. The largest percentage of 58.4% reported that they use ICT often, 33.6% rarely use ICT, 7% of the respondents use ICT at all times, and only 0.9% do not use ICT for teaching purposes.

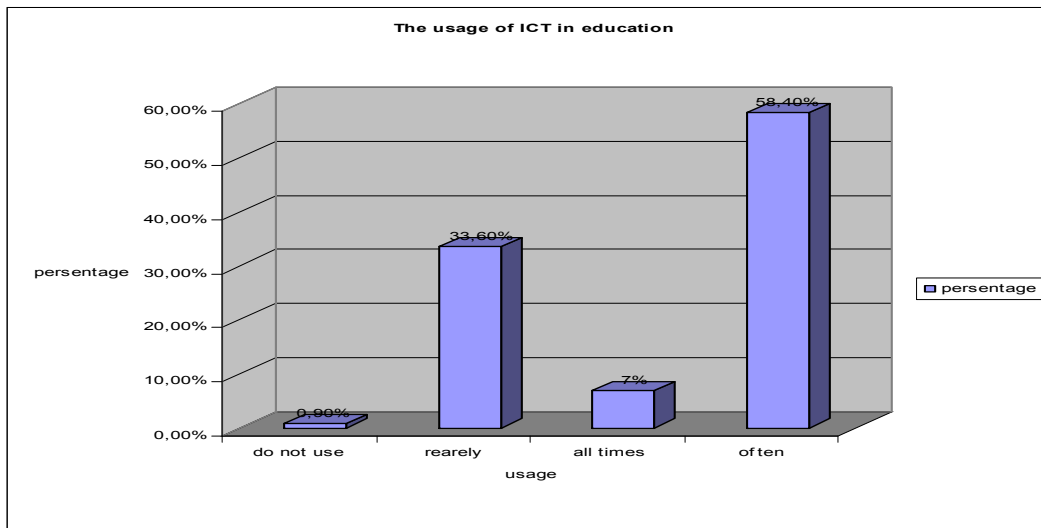


Figure 1. The usage of ICT in education.

The survey asked teachers who use ICT in teaching to also assess the frequency, i.e. if they apply it daily, weekly, monthly, or a few times a year. Figure 2 shows the frequency of ICT usage. The largest percentage of 49.10 % applied ICT weekly, 20.60 % applied ICT monthly, 17.80 % a few times a year, and the smallest percentage of 11,70 % use ICT every day. The frequency of ICT usage in teaching depends on the nature of the subject that the teacher teaches and the requirements for the application of ICT in the teacher's curriculum.

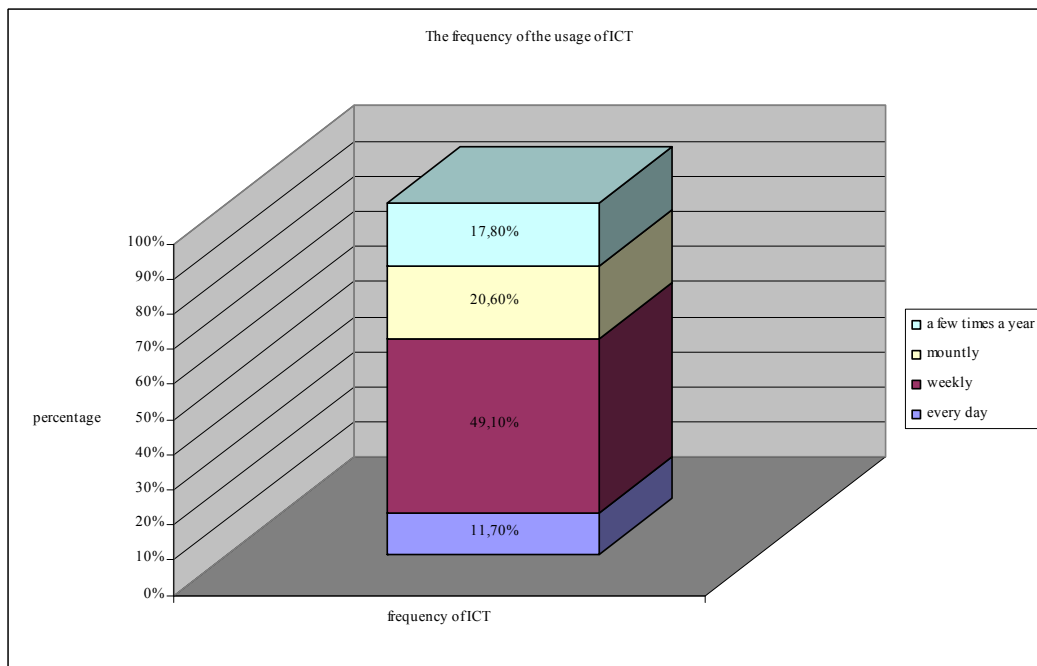


Figure 2. The frequency of the usage of ICT.

According to the frequency of ICT usage, the teachers can be classified into three categories: low, medium and high. The low category, 34.1% of the surveyed teachers, includes teachers who rarely or never use ICT and if they do use it, it is a few times a year or month. The medium category, involved the highest percentage of respondents 52.3%, includes teachers who often use ICT in teaching. The high category, involved the lowest percentage of 13.5 % respondents, includes teachers who use ICT at all times, or every day.

By analyzing all demographic factors such as gender, environment, age, seniority, years of experience, and the kind of teacher we cannot single out any demographic factor that shows statistically significant correlation with the frequency of ICT usage in teaching.

The technique of structural equation modeling was used again to analyze the relationship between the frequency of ICT usage and the other factors.

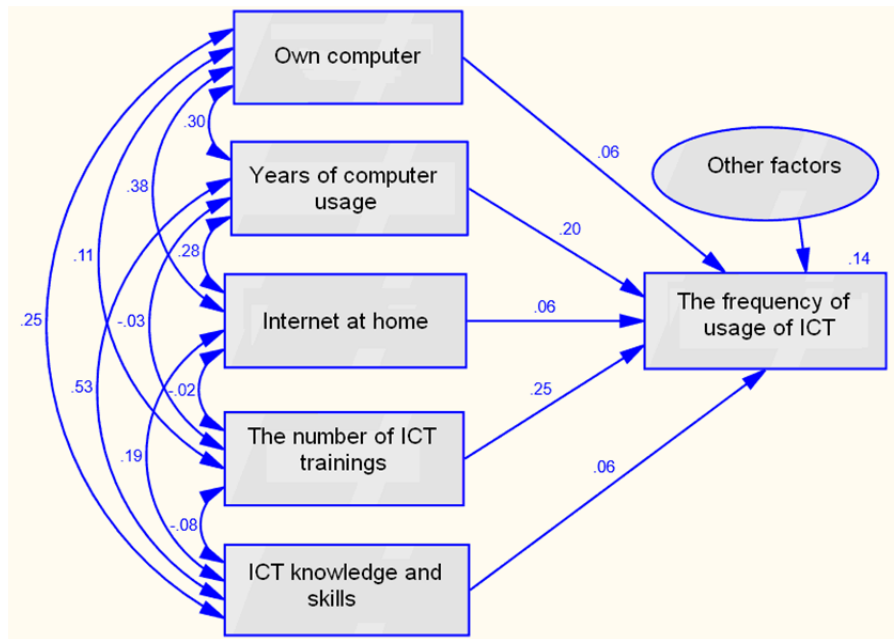


Figure 3. The relative strenght of influence on the factors on the frequency of usage of ICT.

From Figure 3 we can conclude that the number of ICT trainings is a factor with the strongest influence on the frequency of ICT usage - measured 0.25, then comes years of computer usage - measured 0.20, and the remaining three factors: own computer, have Internet at home, and have ICT knowledge and skills - measured 0.06. The impact of other factors on ICT knowledge and skills is 0.14.

When we add the results of all five factors that influence the frequency usage of ICT, we obtain value 0.63 (0 to 1). This means that all these factors are 63% of the variance in frequency of ICT usage, suggesting that these factors describe the impact on frequency of ICT usage well.

Table 7. The regressional weight of the factors for the frequency if the usage of ICT.

Regression Weights: (Group number 1 – Default model)

		Estimate	S.E.	C.R.	P	Label
The frequency of ICT usage	←-Own computer	.266	.325	.818	.414	
The frequency of ICT usage	←-Years of computer usage	.289	.110	2.636	.008	
The frequency of ICT usage	←-Internet at home	.373	.464	.804	.421	
The frequency of ICT usage	←-Number of ICT training	.238	.060	3.964	***	
The frequency of ICT usage	←-ICT knowledge and skills	.002	.003	.758	.449	

Table 7 is a textual display of the results using AMOS Graphics. As we can see only the factor *Number of ICT training* has a significant positive effect on the frequency of ICT usage, with value of $p < 0.001$. Years of computer usage have a positive significant effect on the frequency of ICT usage, with value of $p < 0.05$. The rest of the factors have a positive insignificant effect on the frequency of ICT usage, with a value of p greater than 0.05.

Table 8. Overview of the model in SPSS.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,380 ^a	,144	,124	1,376

a. Predictors: (Constant), ICT knowledge and skills, Number of ICT training, Internet at home, Own computer, Years of computer usage

Table 8 gives us a summary of the model in SPSS, where we can see that the value of R Square is 0.144, indicating a good model.

Table 9. ANOVA table for the cumulative effect on SPSS.

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66,457	5	13,291	7,018	,000 ^a
	Residual	393,917	208	1,894		
	Total	460,374	213			

a. Predictors: (Constant), ICT knowledge and skills, Number of ICT training, Internet at home, Own computer, Years of computer usage

b. Dependent Variable: The frequency of usage of ICT

As we can see from the ANOVA table, the cumulative effect is significant.

Table 10. Table of coefficients in SPSS.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,060	,479		2,213	,028
	Own computer	,266	,329	,058	,808	,420
	Years of computer usage	,289	,111	,204	2,605	,010
	Internet at home	,373	,470	,056	,795	,428
	Number of ICT training	,238	,061	,255	3,917	,000
	ICT knowledge and skills	,002	,003	,057	,749	,455

a. Dependent Variable: The frequency of usage of ICT

From Table 10 we see that the the Beta coefficients of all predictors are positive, but only Number of ICT training and years of computer use are significant, the rest of the factors are insignificant.

4. CONCLUSION

Since the ultimate goal is to achieve higher frequency of the ICT usage in teaching, then according to the factors that contribute to it, are moving a step forward.

- o Increased ICT competencies of teachers positively influence the increase of frequency ICT usage in teaching.
- o Certainly the experience of working with computer positively affects the increase of ICT competencies of teachers, and thus the frequency of ICT usage in teaching.
- o Increased number of training courses and similar improvements increase the frequency of ICT usage in teaching.
- o The use of Internet at home does not limit a teacher to work in preparation for teaching and contributes to increase of the frequency of ICT usage in teaching.
- o Having computer certainly has a positive influence on the frequency of ICT usage in teaching.

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