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The Appeal and Applicability of ICT Study Materials – The Viewpoint of Generation-Z Pre-Service Teachers

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ABSTRACT

Effective contemporary teaching is closely connected to the inclusion of ICT, which comprises technological tools and the preparation and distribution of multimedia learning content. Therefore, one of the objectives of pre-service teacher education is to produce a technologically competent teacher. For this reason, the study programme includes a range of learning content where pre-service teachers engage in practical work in order to learn about the uses of ICT, tools and procedures for the production and distribution of multimedia learning content. Current generations of pre-service teachers are considered as belonging to Generation Z, or digital natives, and we can consequently expect experience, greater interest in studying the material and motivation to use ICT in their work. After the conclusion of the ICT in Education course, a study was prepared focusing on the learning materials that pre-service teachers find interesting, how they assess the applicability and transferability of this material and on the assessment of their own qualification for preparing multimedia learning materials. The results have shown that contemporary generations are familiar with working with ICT; however, they lack the experience and knowledge for using programs and tools. They want more knowledge and practical work in preparing multimedia learning material and in its distribution. The possibility of distributing multimedia learning content has resulted in a notable interest in working with Moodle, which is evident from the comparison of results from this year's generation and those from two years ago. Students believe that the syllabus provided is interesting and useful. The acquired knowledge will be useful in the production of future learning materials and for work in other courses. The findings of the study will be used in the updating and preparation of future syllabi.

Key words: ICT, ICT in education, pre-service teachers, Generation Z, study materials, digital competences

Zanimivost in uporabnost študijskih vsebin IKT – vidik bodočih učiteljev generacije Z

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POVZETEK

Sodoben in učinkovit pouk je tesno povezan z vključevanjem IKT, ki obsega tako tehnološke pripomočke kot pripravo in distribucijo multimedijskih učnih vsebin. Zato je med cilji izobraževanja bodočih učiteljev tudi tehnološko kompetenten učitelj. Študijski program v ta namen vključuje nabor učnih vsebin, pri katerih se bodoči učitelj skozi praktično delo seznani z možnostmi uporabe IKT, orodji in postopki za pripravo in distribucijo multimedijskih učnih vsebin. Generacije bodočih učiteljev sodijo v generacijo Z oziroma v t. i. digitalno generacijo (angl. digital natives), zato je pričakovati izkušnje, več zanimanja za učne vsebine in motiviranost za uporabo IKT pri svojem delu. Po končani izvedbi študijskega predmeta IKT v izobraževanju smo pripravili raziskavo, v kateri nas je zanimalo, katere študijske vsebine so bodočim učiteljem zanimive, kako ocenjujejo uporabnost in prenosljivost vsebin ter kako ocenjujejo lastno usposobljenost za pripravo

multimedijskih učnih gradiv. Rezultati so pokazali, da sodobne generacije sicer poznajo delo z IKT, manj pa imajo izkušenj in znanja pri uporabi namenskih programov in orodij. Želijo si še več znanja in praktičnega dela pri pripravi multimedijskih učnih vsebin in njihovi distribuciji. Zaradi možnosti distribucije multimedijskih učnih vsebin opažamo porast zanimanja za delo z Moodlom, kar kaže primerjava rezultatov med generacijama tekočega leta in izpred dveh let. Študenti menijo, da so ponujene vsebine zanimive in uporabne. Pridobljena znanja jim bodo koristila pri pripravi učnih vsebin in pri delu pri drugih študijskih predmetih. Spoznanja iz raziskave bodo uporabljena pri posodobitvi in pripravi bodočih študijskih vsebin.

Ključne besede: IKT, IKT v izobraževanju, bodoči učitelji, generacija Z, študijske vsebine, digitalne kompetence

Introduction

Nowadays, we can no longer imagine classroom support without the use of ICT. Using ICT in the classroom enables us to achieve greater illustrative value for and simpler management of topics on the syllabus. This has benefits for both the teacher and the student. Study topic management can mean the storage of learning materials as well as faster and more continuous updating and distribution. The use of ICT in teaching also includes the preparation of multimedia elements, their inclusion in multimedia learning materials and the distribution of materials. Multimedia elements comprise text, image, audio and video. Multimedia learning materials are study materials comprised of multimedia elements that are connected into a coherent whole. The contemporary teacher must be able to cope with these challenges, a requirement which can be fulfilled through the provision of appropriate syllabus content in the primary part of teacher education and later with continuous in-service training. An important objective of pre-service teacher education is the shaping of a technologically competent teacher. From the viewpoint of ICT use in teaching, the technological competence of a teacher is understood as digital competence, which can be classified into two aspects.

The first is the ability to effectively use ICT and multimedia learning materials in teaching. The second aspect is the ability to recognise the strengths and weaknesses of ICT and to observe the specific rules and ethics of its use (Duh, Bratina and Krašna, 2012).

In terms of concept, the available literature distinguishes between several different aspects of the term digital competence with reference to an individual. One concept presents digital competence as literacy and includes computer literacy, ICT literacy, e-literacy, information literacy and the attitude towards ICT. There is also a concept that joins all aspects of ICT use under the unified term *digital literacy*.

In the publication of the American Library Association on information literacy standards and indicators in higher education, the term digital literacy is replaced by the term information literacy. The term is discussed from the standpoint of the information literacy level of students, which is assessed on the basis of individual standards. The criteria cover five standards that determine what to assess with regard to students' information literacy. A student is information literate when they are able to do the following: (1) determine the nature and extent of the information needed; (2) access needed information effectively and efficiently; (3) evaluate information and its sources critically and make sensible use of them; (4) use information to accomplish a specific purpose, and (5) recognise the economic, legal and social issues surrounding the use of information, so as to access and use information ethically and legally. Success in achieving these standards is assessed by means of performance indicators for each individual standard (Information Literacy Competency Standards for Higher Education, 2010).

Another interesting concept presents digital competence as e-skills. In 2006 the European Parliament joined these concepts into the term *digital competence* as one of the eight key competences (Ala-Mutka, Punie and Redecker, 2008). In simpler terms, digital competence can be understood as the ability to use different types of ICT equipment. From the perspective of its use in education, the term digital competence comprises a range of knowledge and experience: i.e., advanced text editing, work with tables and charts, image, video and audio processing, presentation techniques and the use of the Internet, as well as all forms of electronic communication. (Krašna, 2010). According to the European Qualifications Framework (EQF), there are three competence components: knowledge, skills and attitudes. Knowledge can be theoretical or practical and is acquired through learning. Skills are the ability to apply knowledge on our way to achieving a goal, which can be a product or an activity. Attitudes represent the responsibility for but also the desire or motivation to achieve a goal (Ala-Mutka, 2011). We estimate that the term digital competence is crucial from the viewpoint of teacher education, as it represents the teacher's ability to effectively use ICT and multimedia study materials in everyday teaching. Attaining the objective of shaping a technologically competent teacher is possible by using appropriate syllabus topics and by fostering an appropriate attitude among pre-service teachers towards the use of ICT. The requests and proposals of students with regard to the syllabus topics of the course and their experience must also be considered.

The process of acquiring digital competence

Purpose and assumptions

These students, pre-service teachers, have encountered the use of ICT in teaching throughout their previous years of schooling. Their experience with ICT in the classroom has been mostly limited to their experience as learners, or those receiving instruction. As pre-service teachers, they will soon find themselves in the role of the one providing the instruction. In order to effectively provide instruction and to support the learning process, pre-service teachers will exploit the potential of ICT. They will encounter learning through technology (Mayer, 2010). According to Mayer, learning but also teaching with technology can be classified into two different approaches with regard to their purpose: the technology-centred and the learner-centred approach. The technology-centred approach uses ICT to support teaching. The learner-centred approach uses ICT to assist (support) learning. Both approaches will be vital to the professional work of pre-service teachers.

The development of ICT brings revolutionary changes to teaching strategies and requires teachers to continuously adapt. The rapid development of the use of ICT in education is evident from the fact that at the beginning of the century, the possibility of personalised learning services was an upcoming trend (Dryden, Vos, 2001) that soon became something that can be implicitly assumed. Today, awakening students' interest in the study topics is often referred to as the greatest challenge in teaching, and ICT appears to be an appropriate tool. Strategies increasingly include gaming, which, if applied correctly, can result in a substantial increase of interest in the syllabus material and a higher level of acquired knowledge (Caligiuri and Ominelli, 2014). Interest in the study material also means motivation, which is a key factor for successful learning.

The use of ICT will not be limited to providing knowledge only during the lesson, since content will also be available to students later on. Given the possibilities offered by the use of ICT and its availability, parts of the learning process can also be transferred outside the classroom.

Syllabus topics in the ICT course

The development of digital competence among pre-service teachers is a process that requires the preparation of selective learning material related to the use of ICT in education. The ICT course taught at the Faculty of Education at the University of Maribor includes a selection of topics that allows pre-service teachers to engage in practical work to become familiar with the currently available ICT, learn about the possibilities and methods of using ICT in the classroom, test the tools and procedures for preparing multimedia elements and multimedia learning materials, become familiar with the operation of Moodle and use it as teachers and learn about Internet safety (Bratina and Dinevski, 2016). In terms of structure, the study syllabus corresponds to the proposed selection of knowledge and experience of a digitally competent teacher.

Content and Generation Z

The syllabus is continuously being modified and adapted to the development of ICT and to the fact that future generations of pre-service teachers are people who have been in contact with ICT from birth and throughout their previous years of schooling. The literature designates them as representatives of Generation Z or as digital natives.

Generation Z includes people born between 1995 and 2012, who enter the study process with a certain level of ICT knowledge and prior knowledge of the use of ICT. Furthermore, when completing their education, Generation Z pre-service teachers will teach children who are also part of this generation. This represents an additional challenge in preparing pre-service teachers for their job (Fernandez-Cruz and Fernandez-Dias, 2016).

The term digital natives was coined slightly earlier and also describes people who have been in contact with ICT from the start. The authors (Palfrey and Gasser, 2008) classify people born after 1980 into this group. They describe them as people who frenetically type messages into their mobile phones, tablets and similar devices in public places, who know what to do when emails crash, who are friends with people they have never met and who easily beat you at any video game.

The fact is that Generation Z has already developed the skills in and knowledge for using ICT, owing to their being in contact with ICT practically from birth. Consequently, they are not plagued by reservations or fear, which are evident in pre-1980 generations. Regardless of the skills and knowledge of Generation Z, as regards working with students, we see that this is mostly evident in using ICT as a tool for electronic communication, accessing information and/or study materials and for exchanging files, while less so in applied use.

The skills in and knowledge of using ICT which are brought to the study process by the students greatly facilitate the transition to the applied use of ICT in various fields. From the viewpoint of teachers, this relates to the use of ICT in education. The syllabus in the ICT in Education course is therefore intended to channel existing knowledge

and experience into professional use of ICT. Professional use of ICT encompasses a broad spectrum of activities, from theory to practical experience of using ICT in mock and actual situations. The final objective is a digitally competent teacher, who will be able to correctly and effectively use ICT in their work.

The anticipated use of ICT in teaching is nevertheless based on the assumption that pre-service teachers must already have expressed a certain interest in and desire to learn about the possibilities offered by the use of ICT during their education. At the same time, they also need to recognise the purpose and applicability of the syllabus topics. The opinions of students on the content of the ICT course were investigated in a study,the results of which are presented below.

Methods

Purpose

When preparing for the study, it was anticipated that our students (Generation Z, digital natives) would display a certain level of experience with the use of ICT and prior knowledge of some ICT work processes. It was assumed that, because of the content revision that is required in order to bring all students to the same level on which to build, certain syllabus items from the field of ICT would be less interesting to some students. We were further interested in whether students' opinions on syllabus topics change with new generations. The following research questions were posed:

- What topics on the syllabus are the most popular?
- How do students assess the applicability of individual study materials?
- How do students assess the transferability of knowledge?
- How do students assess their own skill in preparing multimedia learning materials?

The answers were compared for two generations of students at an interval of two years.

Sample

The sample includes 169 students from the 2016/17 and 2014/15 academic years attending the ICT in Education course at the Faculty of Education, Maribor. The structure of the sample is shown in Table 1.

Table 1: The sample structure by academic year

Generation (academic year)	f	f%
2016/17	90	53.3
2014/15	79	46.7

Data collection

Data were collected in the 2014/15 and the 2016/17 academic years. Data were collected using the online surveying tool, which was used to provide each generation of students with the questionnaire. Students received the questionnaires after completing the course and before taking the exam. This excluded the eventual effect of the course grade on the assessment of elements of the syllabus. Data were processed using SPSS statistical software. The statistical methods of descriptive

statistics and chi-squared test were used, while chosen non-parametric tests were also employed to process rating scales.

Results

Appeal of the study material

Students estimate the appeal of the syllabus topics by selecting the levels between Do not Like at All (value 1) and Like Very Much (value 5) at the five level on the Likert scale. Table 2 shows the perceived attractiveness of each particular topic on the syllabus. Table 3 shows the appeal of the topics by generation (study year).

Table 2: Appeal of Individual Syllabus Topics

Syllabus topics	M	SD	$\overline{R}$	Friedman	
				χ^2	P
Advanced text editing techniques	4.32	0.630	5.76	151.316	0.000
Picture editing	4.03	0.713	4.95		
ICT in the classroom	3.97	0.762	4.88		
Working with Moodle	3.80	0.930	4.46		
Video editing	3.78	0.815	4.28		
Digital presentations	3.77	0.831	4.26		
Audio editing	3.77	0.909	4.26		
Authoring tools	3.33	0.963	3.14		

The most attractive topic is the advanced text editing techniques. Although very similar content was presented in their previous elementary and secondary education, student's current knowledge of advanced text editing techniques is insufficient. Since advanced editing is required for thesis writing and beyond, this result is predictable. Picture editing is the second most attractive study topic. We assume that the reason lies in the simple acquiring of the images using smartphones or digital cameras and extended usage of images in electronic communication, presentations and social networks. Closely following is the material dealing with ICT in the classroom. This is another predictable outcome, since all students acquired some experience with ICT in the classroom during their earlier education, and they are keen to gain more knowledge and skills. Both will soon be required during their teaching practice and microteaching sessions. The students are familiar with some techniques for using Moodle but only in the learner's role. During the lessons, students have the opportunity to act as teachers and explore many functions within Moodle to which they have not previously had access. Therefore, the attraction of this material is understandable. The explanation for the slightly lower appeal of the topic concerning video and audio editing may lie in the more demanding software functions. When it comes to the production of multimedia learning materials, students have less experience and skill. The authoring tools are more complex to use; therefore, the lesser appeal of this topic is understandable and quite predictable.

The differences between estimations of the topics' appeal are statistically significant (P=0,000), which also indicates the varying level of complexity in given ICT items used in education.

Table 3: Appeal of the Syllabus Topics by generation

Syllabus topics	Academic year	$\overline{R}$	U	*P*
Advanced text editing techniques	2014/15	86.71	3341.000	0.533
	2016/17	82.54		
Picture editing	2014/15	90.44	3046.500	0.103
	2016/17	79.23		
Audio editing	2014/15	79.73	3139.000	0.192
	2016/17	88.73		
Video editing	2014/15	76.82	2909.000	0.037
	2016/17	91.31		
Digital presentations	2014/15	80.80	3223.000	0.313
	2016/17	87.79		
Authoring tools	2014/15	79.78	3142.500	0.211
	2016/17	88.69		
Working with Moodle	2014/15	64.13	1906.500	0.000
	2016/17	102.58		
ICT in the classroom	2014/15	72.77	2588.00	0.001
	2016/17	94.92		

The comparison of the perceived attractiveness of the study materials between the two generations shows the increasing appeal of some topics. The attraction of video editing procedures has increased to a statistically significant degree (P=0.037). The result is explainable by the existing simpler technical ways of acquiring and publishing videos and necessary modification demands prior to publishing. It does not matter whether publishing occurs on social media or as part of multimedia learning materials. The topic with the highest shift toward student appeal is working with Moodle. The difference between estimates of the two generations (R=64.13 and R=102.58) is statistically significant (P=0.000). The estimate by generation 2016/17 is much higher. The reason for the increased appeal is a consequence of the latest upgrade of Moodle from version 1.9 to the latest version 3.2. The latest version is more user-friendly. Students using version 3.2 were able to produce their own courses on Moodle much sooner than earlier generations. The topic concerning ICT in the classroom is more attractive among students of the 2016/17 generation. The difference in estimates between the generations is statistically significant and clearly shows the increasing interest of pre-service teachers in implementing ICT in the teaching process.

The applicability of the study materials

The attractiveness of the study material does not necessarily mean its applicability. How appealing the particular study topic is, depends on a range of factors, from the current attitude among users, every day extension of use, to ease of use etc. More important than the attractiveness of the study material is how its applicability is recognized. Applicability in this case means that students expect to see the application of the acquired knowledge and skills during their study period and later in the learning and teaching process.

Estimates of the applicability of the syllabus topics was acquired using the five-level Likert scale by selecting the levels between Not Applicable (value 1) to Very

Applicable (value 5). Table 4 shows the estimated applicability of the particular topic, and Table 5 shows the applicability of the topics by generation (study year).

Table 4: Applicability of syllabus topics

Syllabus topics	M	SD	$\overline{R}$	Friedman	
				χ^2	P
Advanced text editing techniques	4.79	0.464	6.13	286.187	0.000
ICT in the classroom	4.49	0.657	5.15		
Digital presentations	4.46	0.647	5.06		
Working with Moodle	4.38	0.797	4.88		
Picture editing	4.15	0.655	4.01		
Authoring tools	4.04	0.921	3.85		
Video editing	3.99	0.699	3.49		
Audio editing	3.96	0.747	3.43		

Estimates of the future applicability of the particular syllabus topics are rather high (from M=4.79 to M=3.96), which is considered a satisfying result. Students find the contents of the syllabus to be applicable, thus confirming the staff's efforts in selecting the study materials. The results for perceived applicability are in correlation with the estimated level of appeal. Those topics rated most applicable are all among the most appealing ones. Despite this correlation, there is a statistically significant difference between estimates (P=0.000) obviously, in the case of high estimates for the advanced text editing topic and the topic about ICT in the classroom. In general, the average estimates for all topics range between applicable and very applicable and are higher among the younger generations.

Table 5: Applicability of syllabus topics by generation

Syllabus topics	Academic year	$\overline{R}$	U	*P*
Advanced text editing techniques	2014/15	79.75	3140.000	0.115
	2016/17	87.81		
Picture editing	2014/15	81.83	3304.500	0.527
	2016/17	85.95		
Audio editing	2014/15	77.61	2971.000	0.071
	2016/17	89.73		
Video editing	2014/15	78.97	3079.000	0.136
	2016/17	88.51		
Digital presentation	2014/15	79.82	3146.000	0.231
	2016/17	87.75		
Authoring tools	2014/15	87.53	3197.000	0.339
	2016/17	80.83		
Working with Moodle	2014/15	76.99	2922.000	0.048
	2016/17	90.30		
ICT in the classroom	2014/15	71.67	2502.000	0.000
	2016/17	95.07		

There are no statistically significant differences in estimates between generations for most of the syllabus topics (P>0.05), except in some cases. The estimate of applicability of the topic about ICT in the classroom is significantly higher (P=0.000) among the students of the 2016/17 generation. We can perceive an increasing awareness of an effective teacher performance as being one supported by implementation of ICT. Additional confirmation of this increasingly positive attitude is the higher applicability estimate for the topic about Moodle expressed by the younger generation of 2016/17. The difference in estimates for the Moodle topic between the generations is statistically significant (P=0.048). Analysis of the differences in applicability estimates for the audio editing topic by generations shows the tendency (P=0.071) toward increasing estimates of the applicability of audio editing techniques by the younger generation.

According to the results of these applicability estimates, we can expect increasing future interest in the study topics concerning ICT items like the interactive board, mobile devices and Moodle.

Transferability of knowledge

The study subject ICT in Education and its syllabus are not oriented to any specific technology item but oriented toward the implementation of ICT in any area of education. The study program of pre-service teachers includes a range of study materials where the implementation of acquired knowledge of and skills in ICT is useful and advantageous. Table 6 shows the analysis of opinions about the transferability of acquired ICT knowledge and skills to other study subjects.

Table 6: Knowledge transferability

Academic year	**2014/15**		**2016/17**		**Total**	
Do you find the acquired knowledge, useful for other study subjects?	f	f %	f	f %	f	f %
Yes	58	73.4	83	95.4	141	84.9
Partially	21	26.6	4	4.6	25	15.1
Total	70	100.0	109	100.0	166	100.0

The previous results about the applicability of study materials are additionally confirmed by the opinions about the transferability of the acquired knowledge and skills. Both generations share the opinion that acquired knowledge of and skills in ICT will also be useful in other study subjects. However, analysis shows a statistically significant difference in opinions between the two generations of students (χ^2=15.643, P=0.000). The usefulness of the acquired knowledge and skills is confirmed by about 73.4% of the older students and by about 95.4% of younger students. Considering all positive opinions, the acquired knowledge and skill are estimated as useful by about 84.9% of students from both generations. According to the results, the knowledge of and skills in ICT in education that were acquired through the course content are transferable to other areas in education.

Pre-service teachers production of multimedia learning materials

The acquired knowledge about ICT should enhance skills in the production of multimedia elements and multimedia learning materials. We expect that, after

completing the course, students should have acquired the knowledge, skills and motivation suitable for producing their own less complex multimedia learning materials. The estimates of pre-service teacher's current knowledge of and skills in production of their own multimedia learning materials is shown in Table 7.

Table 7: Production of multimedia learning materials

Academic year	**2014/15**		**2016/17**		**Total**	
Can you produce your own multimedia learning materials after completion of the course?	f	f %	f	f %	f	f %
Yes	32	40.5	56	66.7	88	54.0
Partially	38	48.1	27	32.1	65	39.9
Only very simple forms	9	11.4	1	1.2	10	6.1
Total	79	100.0	84	100.0	163	100.0

Approximately about two-thirds (66.7%) of the younger students are sufficiently experienced to produce their own multimedia learning materials, and about 40.5% of older students share the same level of confidence. This result is encouraging but requires more staff effort during the course in the following study year. The increasing level of current experience is visible form the portion of students who are less (partially) experienced in the production of multimedia learning materials. The percentage of less experienced students has decreased from 48.1% of older students (generation 2014/15), to less than one-third (32.1%) of students from the 2016/17 generation. The difference in estimates of experience according to generation is statistically significant (χ^2=14.667, P=0.001). The younger students are more experienced than the older student in creating multimedia learning materials. According to the result, the future generation of teachers will be increasingly better prepared for the production of multimedia elements and multimedia learning materials. We also expect an increase in the quality and very likely, the complexity of these teacher-produced multimedia learning materials.

CONCLUSION

The preparation of a study syllabus for educating digitally competent teachers is directed towards the objective of didactically appropriate, reasonable and effective use of ICT in teaching. Generation Z pre-service teachers have no problem with using ICT; however, they need to be led in the right direction in order to achieve the intended objectives. The syllabus content plays an important role in this respect; however, it needs to be prepared following specific assumptions. We need to consider the previously acquired knowledge and experience of students and consequently adapt the complexity of the material, while the study topics must also be useful and interesting. A study was performed to investigate the popularity, interest and utility of the syllabus in the ICT in Education course among Generation Z students.

Regardless of the existing knowledge and skills of students, the results of the study show what additional knowledge Generation Z students desire in order to engage in more professional and complex use of ICT. Students classify complex and professional use of ICT among the most popular study topics. These are tools for advanced text

editing, the production of multimedia elements and multimedia learning materials and the communication of study materials via Moodle. These topics receive equally high rankings in terms of applicability. The comparison between two generations over a span of two years shows an equal level of interest in and assessment of applicability for text editing and the preparation of multimedia elements. There was an increase in interest in and assessment of applicability of knowledge for production and distribution of multimedia learning materials using Moodle and the use of ICT in the implementation of lessons.

An important aspect of the use of ICT in education includes its transferability to other fields of applied education, where its use contributes to easier work and greater effectiveness. The results show that students can usefully apply the skills acquired in the use of ICT to other courses. The assessment of transferability of knowledge to other fields of education is highest among the younger generation of students. More of the younger students see themselves as able to independently produce multimedia learning materials.

It is to be expected that with the generations to come, learning materials will become more extensive in terms of information and more complex in terms of the multimedia elements in use. A growing interest on the part of pre-service teachers in including ICT in their work is also anticipated. Owing to the continuous development of new technologies, the study syllabus in the ICT in Education course will need to be continuously updated, by including both new ICT and software tools.

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