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Doctoral Dissertaton (PhD) Thesis

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Develop a set of requirements for the online course creation process

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1. Topic choice and research problem

In choosing the research problem, we aimed to develop a method that would be useful for the teaching community, which could facilitate the process of online teaching for teachers, and provide help and guidance for teachers who are not experienced in e-learning environments, both in preparing for online teaching and in the process of teaching.

Based on the experience of online curriculum developers in recent years and of teachers in several teacher training courses, we can see that the majority of teachers would like to know more about the use of digital tools and online platforms, but for various reasons their knowledge is lacking. As a researcher, a review of the literature reveals a number of scientific approaches and statistical studies on the design and effectiveness of online courses (Ehlers and Pawlowski, 2003; Åström, 2008; Kurilovas and Dagiene, 2010; Kristöfl et al, 2006; Muruganantham, 2015; Nexius, 2022; Switch, 2008; Branson et al., 1975), but we are not aware of any research that provides teachers with a practical, brief guide to design their own courses. In order to increase teachers' attitudes towards online education, a wide range of knowledge is needed to inform their work.

During my doctoral research, I developed a tested set of requirements and a pedagogical methodology that teachers can use to independently create online courses on different educational platforms. The system of requirements on which the methodology is based contributes to both the theoretical and practical knowledge of pedagogy, which is timely, but its greatest advantage lies in its usability.

1.2. Objective

For teachers to be effective in their online teaching, they need an up-to-date methodology and tools to effectively navigate the online space and the world of computer software and hardware. By identifying new knowledge and giving precise criteria for the teaching elements in question, they can help in the process of planning and implementation.

There have already been initiatives to standardise e-learning instructional packages (Bryden, 2003; Friesen, 2005; Szepesi, 2020; Papp, 2005; EdApp, 2022), and different models of teaching have been developed, which approach the design of digital learning materials from different perspectives, often with different elements in focus. Trends in education also increasingly reflect the need to meet the needs of a world thirsting for technology. It is also worth investigating the quality of the elements of online courses and the criteria for their content and form. These elements are the basis of the course and, in order to create an effective

online course, the units (learning elements) must be developed to the highest level. Our main research objective is to develop a set of requirements that basically supports, guides and enables teachers to create online courses. It will also provide them with useful information that they can use to develop their digital competences. In addition to our main research objective, I take a theoretical approach, based on deductive logic, to investigate the criteria for the educational content of online courses, based on the following aspects:

- empirical research results

- technical criteria

- formal constraints

- preparation methods

- software to use

- integrability

- responsiveness

- efficiency.

Our vision is to explore the criteria that an online course should meet from three sides, and which can be used as a guideline for an easier and more efficient process of creation. The criteria are summarised in the following three points, based on national and international literature:

1. didactic criteria

2. content criteria

3. specific criteria.

We also aim to test the effectiveness of our research. The developed set of requirements will be tested in two online courses, which will be evaluated by people who will answer a questionnaire.

2. Literature review and research structure

The thesis presents a review of the literature related to online education, from the early forms of e-learning to the most modern technologies of today. It also clarifies basic concepts that are relevant to the topic. Forms of teaching are presented, with a particular focus on online courses, and innovative methodological elements are also included to modernise traditional classroom teaching. The literature on which the requirements are based is also presented. The following models provide the literature base for the requirements model and have been used as a starting point for the development of the requirements:

1. EQO (Europen Quality Observatory) decision-making model (Ehlers and Pawlowski, 2003)
2. ELQ (e-learning quality) model (Åström, 2008)
3. LOR (learning object repository) model (Kurilovas and Dagiene, 2010)
4. Quality criteria for e-learning (Kristöfl el.al., 2006).
5. ADDIE model (Muruganantham, 2015)
6. Nexius model (Nexius, 2022)
7. A model for the design of computer-based learning materials (Kis-Tóth and Forgó, 2011).

The central element of the thesis is the requirements system, which consists of three components: didactic, content and specific requirements. These are analysed in detail in the chapters, but one of the aims of the thesis is to provide practical help for those who wish to create online courses independently. The checklists have been developed with this aim in mind. They list in detail the requirements that should be followed and applied in order to create courses. They also serve as guidelines and checkpoints. By following the first two lists, a stable, well-structured and effective digital courseware can be created. The third list has been included as a supplementary list and should be used only where necessary. The table below shows the list of requirements by category and their respective roles in the research.

Table 1: Tested and untested requirements (source: own table)

Requirements	Tested during research	Not tested during research
Didactic requirements		
Technical requirements	Users have been informed.	
Requirements concerning the prior knowledge of learners	Users have been informed.	
Requirements for courseware developers	Considered	
Time requirements	Tested	
Requirement of the venue	Tested	
Requirements for learning objectives	Considered	
Requirement for the design of instructions	Tested	
Requirements for assessment methods	Considered	
Requirements for tracking and metadata	Considered and tested	
Requirements to support personalisation	Tested	
Requirements for success	Considered	
Content requirements		
Course information requirements	Tested	
Navigation elements requirements	Tested	
Text creation and formatting requirements	Tested	
Requirements for selecting and inserting images	Tested	
Audio requirements	Tested	
Requirements for videos and presentations	Tested	
Animation requirements		Not tested
Interactivity requirements	Tested	
Requirements for the preparation and presentation of questions, exercises, exercises and tests	Considered	
Specific requirements		
Requirements for text content for people with intellectual disabilities		Not tested
Requirements for images and animations for colour-impaired and visually impaired users		Not tested
Requirements for video content for deaf and hard of hearing users		Not tested
Control requirements for courses for users with disabilities		Not tested

2. Research questions and hypotheses

The research questions and hypotheses were structured around the three components of the requirements system development. The three components are based on the stated research objectives:

1. to examine the content elements
2. testing the requirements system
3. to increase teachers' attitudes towards online education.

Q1: Research questions related to the analysis of content elements

Q1$_a$: What content elements should an online course contain?

Q1$_b$: What weighting should be given to each content element in the interface of an online course?

Q1$_c$: What didactic basis should the content elements be based on?

Q1$_d$: What specific content elements can be used to make e-learning environments and digital course materials accessible?

Q2: Research questions on testing the requirements system

Q2$_a$: In which environments can the requirements system be effectively applied?

Q2$_b$: Do users consider the courses created on the basis of the requirements system to be appropriate?

Q3: Research questions on increasing teachers' attitudes towards online education

Q3$_a$: Does the requirements system developed encourage instructors to take the initiative to create online courses?

Q3$_b$: Does the developed requirements system facilitate the process of creating online courses according to the instructors?

Hypotheses

The hypotheses were formulated using deductive logic along the lines of the literature review listed for reference in chapter two. The hypotheses can be divided into two groups, one group of hypotheses related to the requirements system and the other group of hypotheses related to the attitudes of instructors about online education.

The following hypotheses can be formulated for the requirements system (H1):

H_{1a}: We hypothesise a positive cointegration between course transparency and traceability, between transparency and personalisation, between personalisation and traceability, between overall image and traceability, between overall image and transparency, and between overall image and personalisation.

H_{1b}: Based on international literature, the ideal average length of an instructional video is 4-6 minutes. We assume that videos of 10-15 minutes are appropriate for the learning methods of Hungarian students.

H_{1c}: Using the requirements system will help to exceed the 6.5% compliance rate set by Jordan (2014).

The following hypotheses can be formulated regarding the attitudes of teachers towards online education (H2):

H_{2a}: Most trainers would find it easier to create a stand-alone online course using the requirements system.

H_{2b}: Instructors who have taken more than three online courses are more likely to be open to learning how to create an online course than those who have taken fewer (even zero) online courses.

H_{2c}: Teachers who are present on social media are more likely to be open to learning how to create an online course than those who are not present on social media.

H_{2d}: Teachers who had already created an online course were more open to learning how to create an online course than those who had not yet created an online course.

3. Procedures and methods used in the research

The testing of the requirements system presented in chapter three was carried out using anonline questionnaire, and a Cronbach's Alpha test was performed to assess the reliability of

the questionnaire. Descriptive statistics were used to present the sample and various statistical procedures were used to test the hypotheses. In the following chapter, the topics listed are presented in detail.

3.1. Sampling method

The sample for the research consisted of participants of the course Vállalkozz, Vajdaság! and Web 2.0: Online tools in and out of use, as well as participants of other online courses, teachers of the second course and doctoral students and lecturers of the Doctoral School of Education at Eszterházy Károly Catholic University of Eger. The courses were developed by the Vojvodina e-Regio courseware development team. We were involved in the design and implementation process. These courses contain some of the content elements of the developed requirements system and therefore proved to be suitable for testing the requirements system with the help of users. The online course "Vállalkozz, Vajdaság!" was developed in the Easygenerator framework for the applicants of the Prosperity Foundation. It is an online business development programme that provides support to start-up entrepreneurs in five different topics. The online course Web 2.0: Using online tools and beyond, is an accredited training course for educators in the e-Region's Google Classroom platform. The primary aim of the training is to provide teachers with the basic knowledge to work more effectively during distance learning. And the teachers who participated in the research were the sample of the attitude survey, sharing their experiences and opinions about online teaching.

Sample of users of online courses

During the research, an online questionnaire was filled in with participants of online courses using the tools of "Vállalkozz, Vajdaság!" and Web 2.0: Online and beyond. The condition for completing the questionnaire was the completion of one of these courses. A total of 409 persons completed the course "Vállalkozz, Vajdaság!" and 157 persons (38.39%) completed the questionnaire. The Web 2.0 course was completed by 259 people, of which 75 (28.96%) answered the questions related to the course (Figure 1).

Figure 1: The user sample on their participation in the survey in the context of the courses they have completed (source: own figure)

	Vállalkozz, Vajdaság!	Web 2.0
■ Number of persons having completed the course	409	259
■ Number of people who completed the questionnaire	157	75
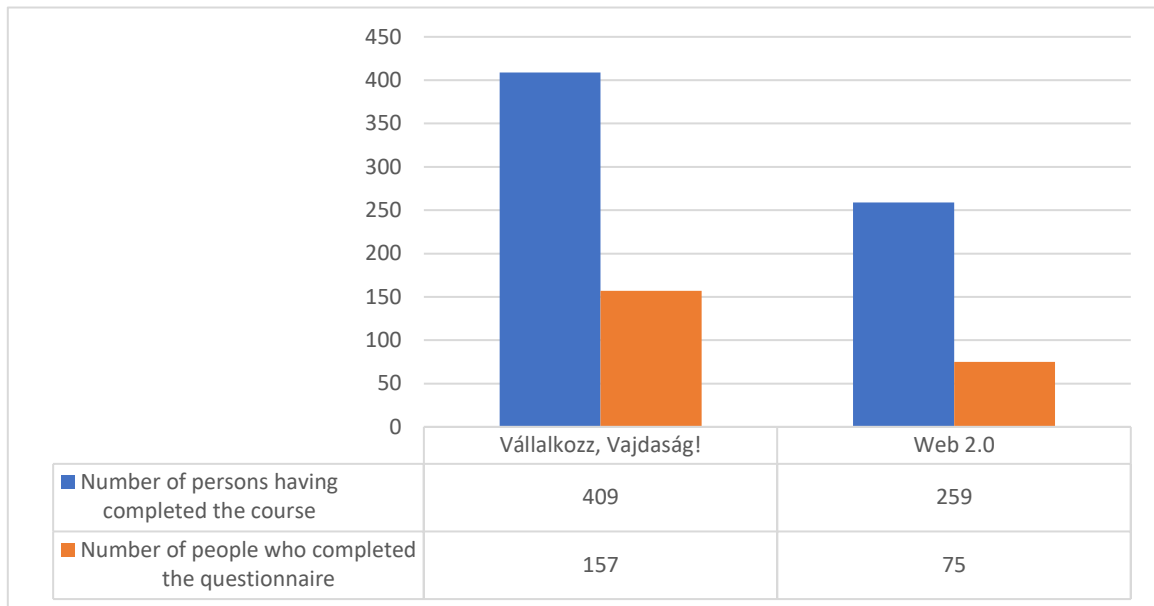
The sample size of users of the online courses surveyed was N = 232. 45% of the sample were male, 55% female and one person did not declare their gender. The mean age of the completers was M = 40.58 and the standard deviation for age was SD = 10.36, with one person not declaring their age. Looking separately at the "Vállalkozz, Vajdaság!" and Web 2.0 courses, the number of items, gender composition, mean age and the associated standard deviation of the sample can be shown (Figure 2).

*Figure 2: User per sample course (source: own graph)*

	Vállalkozz, Vajdaság!	Web 2.0
■ Item number	157	75
■ Female	65	62
■ Male	92	13
■ Average age	36,96	48,26
■ Standard deviation by age	9,3	8,08
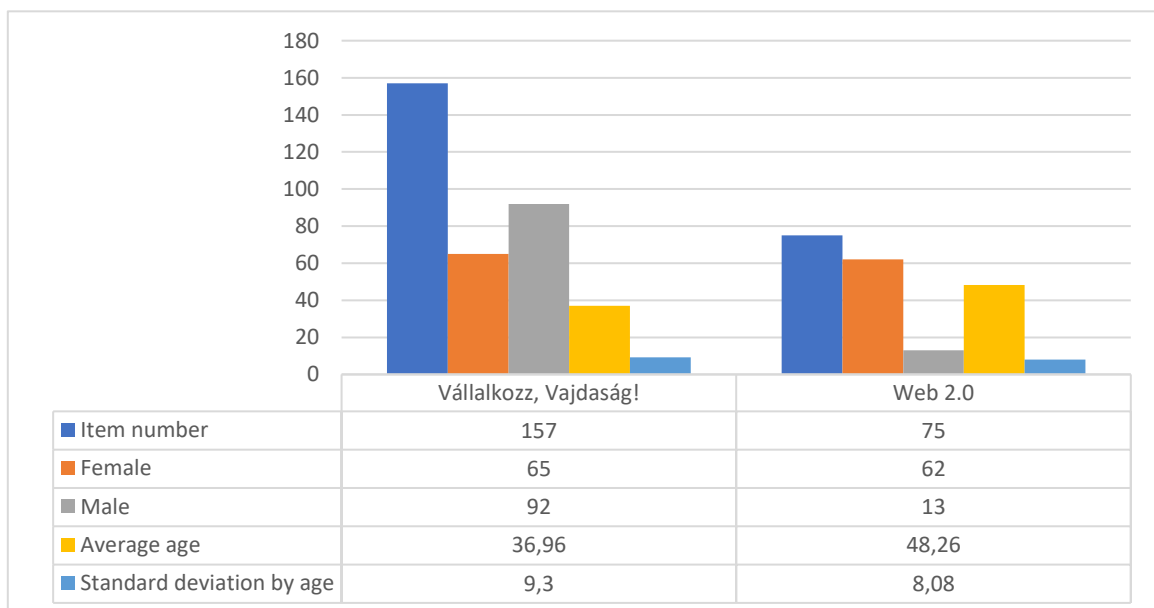
Sample of teachers

The sample of trainers participating in the study has a total number of N = 105. 18.1% of the sample are male, 81.9% are female. The mean age of the respondents was M = 46.68 and the standard deviation for age was SD = 10.44, with three respondents not reporting their age. The number of questionnaires sent out and returned by the e-Region and the Eszterházy Károly Catholic University of Eger Doctoral School of Education is shown in the graph below (Figure 3).

Figure 3: Proportion of questionnaires sent out and returned (source: own graph)

	e-Régió	EKKE
■ number of questionnaires sent out	259	114
■ number of questionnaires received	96	9
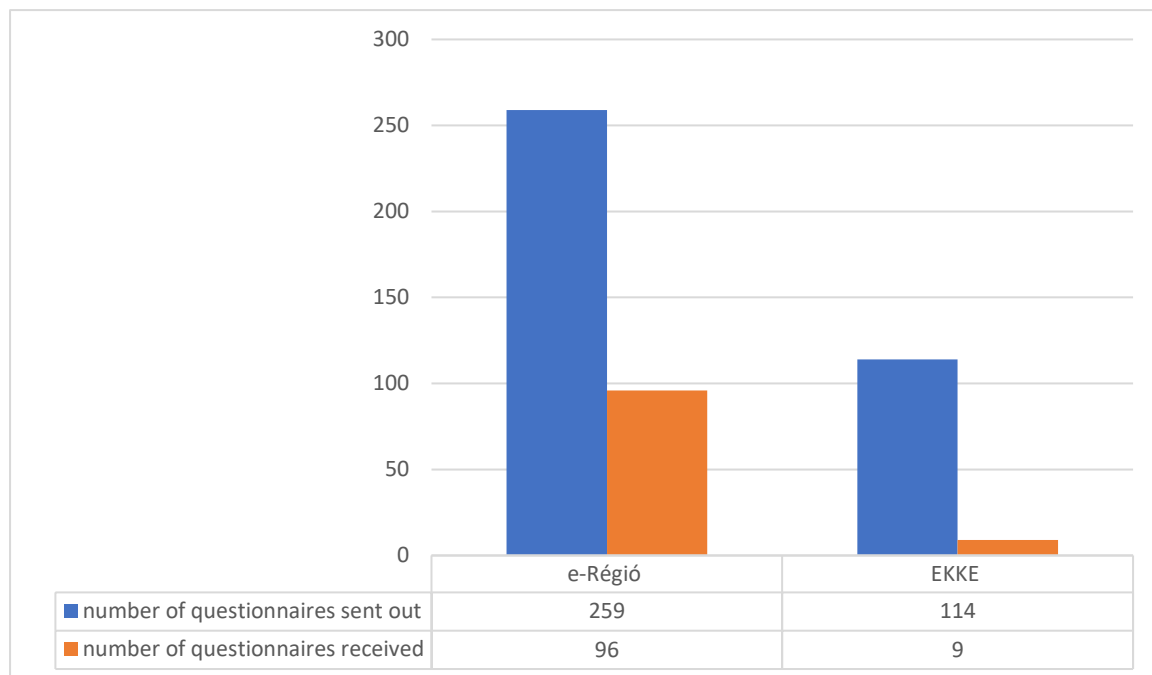
3.2. Methods of data collection

The research is educationally oriented and applicable to the field of digital pedagogy. It investigates the courses used in online education and the attitudes of teachers towards online education. The research used a quantitative method to analyse the questionnaires. The questionnaires were designed according to the following literature criteria: simple and clear wording, logical arrangement and order of questions, avoiding suggestiveness (Nádas, 2011). Two online questionnaires were sent out, one containing questions related to the requirements system and the other one related to online teaching and learning. The questionnaire on the requirements system took 15-20 minutes to complete, while the one on online learning took 10-15 minutes to complete. The questionnaires were sent out via e-mail by the Posperitati

Foundation, the e-Region and the secretariat of the Doctoral School of Education of the Eszterházy Károly Catholic University.

3.3. Statistical methods

The data collected were processed using the statistical analysis software SPSS Statistics, and descriptive statistics were used in the analyses, and independent and one-sample Chi-square tests, Spearman's correlation test and Wilcoxon's test were used to test the hypotheses. The program was used to calculate basic statistical indicators such as mean, standard deviation and median.

4. A summary of the results

Two questionnaires were used in the research. The first one examines some elements of the developed requirements system in two courses, in two different frameworks, the results of which are presented in eleven subsections below. Names of the courses and frameworks studied:

1. Vállalkozz, Vajdaság! in the Easygenerator framework
2. 2. Web 2.0 in the Google Classroom framework.

The second questionnaire explores teachers' online learning and teaching habits and media use.

4.1. Interpreting the hypotheses on the requirements system

The hypotheses regarding the content of the requirements developed in the research were based on the research questions posed at the beginning of the thesis. These were built around two main components of the requirements framework. The groups covering the two dimensions, based on the research objectives formulated, are as follows:

1. examination of content elements

2. testing the requirements system.

On the basis of deductive logic and in the light of the literature cited, we set out to answer three hypotheses. In the following, we will discuss the literature, test the hypotheses and present the results.

The content elements and the testing of the requirements framework have been used to answer the hypotheses formulated (H1). The hypotheses were formulated with the aim of gaining new insights, exploring the underlying causal relationships and gaining a more complete picture of the effectiveness of the requirements system. These are set out in detail below.

H₁ₐ: Positive correlations can be assumed between course transparency and traceability, between transparency and personalisation, between personalisation and traceability, between overall image and traceability, between overall image and transparency, and between overall image and personalisation.

Knowing the concepts mentioned in the hypotheses is essential to fully understand the hypothesis.

- By transparency, we mean navigability on the course interface. That is, whether it was clear to the user, for example, how to watch the videos, complete the exercises or download the course material. The navigation elements, which are described in more detail in chapter 3.2.2, are a great help in improving transparency.

- Traceability refers to the process of completing the course, i.e. whether the user can keep track of where they are, how many tasks they have completed and how many they have left to complete. Either by chapter or for the whole course.

- Personalisation can be divided into three parts. Firstly, the technical customisation of the course, i.e. the choice of font size and colour, the choice of background colour or image. On the other hand, the control and customisation of the learning process in the course. Thirdly, the personalisation of the specific profile: uploading a profile picture, adding a nickname, creating an avatar, writing an introduction (more on this in chapter 3.1.11).

- The overall impression is given by the combination of colour, layout and transparency. These three components complement each other. A suitable overall image according to the requirements is achieved if the visual elements on the platform are designed in the way described in Sections 3.2.3 and 3.2.4, with as many and as simple navigation elements as possible.

The research tested the impact of the elements defined in the requirements framework and examined the variables in relation to them.

- In the first part of the hypothesis, it is assumed that the more transparent the participants perceive the learning material to be, the more they perceive it to be followable.

If the course is transparent, it is easier to follow where you are in the learning process and what will happen next. A transparent course will allow the user to navigate more easily, so the whole process will be easier to follow. Conversely, if a course is difficult to see, users can get lost in the course as a whole, which can have a negative impact on learning outcomes. Wanner and

Palmer (2015) present a study that shows the positive aspects of the flipped classroom model. They made the method more attractive for learners by using a predefined learning sequence and flexible assessment methods. In addition to personalised learning, students also stressed the importance of transparency and traceability. They felt comfortable with a system that offered more flexibility but was nevertheless well structured and transparent. The importance of transparency and traceability is also emphasised by Gray and Dalgarno (2014) and Fink (2013), who see the potential for positive changes in learning outcomes in the enhancement and improvement of both. In his book, Conole (2013) mentions the importance of traceability already in the planning process, as planning can also make this phase smoother. A course developed and designed segment by segment will enable developers and teachers to effectively use different technologies and innovative pedagogical approaches. This idea is supported by the flowcharts of the models presented in chapter 2.7 and the literature behind them.

- In the second part of the hypothesis, it is assumed that the more transparent the participants perceive the learning material to be, the more personalisable they will perceive it to be.
- In the third part of the hypothesis, it is assumed that the more personalised the learning material is perceived to be, the more followable it is perceived to be.

The link between customisation and traceability and transparency is that customised courses tend to offer learners more options and they can work through each task and material at their own pace. This allows each user to progress at his or her own level. Zimmerman (2012) discusses the control, personalisation and monitoring of the learning process in courses in his study. He mentions the motivational properties of the objectives and the factors that influence their effectiveness (section 3.1.6). According to the author, this can help students to assess their own performance and to design more effective learning processes. Personalisation is based on the principle of self-regulated learning. "Personalisation, in turn, stems from the recognition that there are multiple, different pathways (and potentially endpoints) to suit all needs for users with different learning analytics" (Wise and Vytasek, 2017). Personalisation is user-centred, allowing for different uses for different individuals. Individual learning pathways can sometimes be overwhelming and difficult. There is a risk that users may overload themselves in this way. Therefore, for learning to work effectively, learner management and active support must be taken into account in the design. Tracking the progress of users thus becomes essential (Wise and Vytasek, 2017). Dabbagh and Kitsantas (2012) also include social media in the process of self-regulated learning. In their study, they point out that education mainly relies on

traditional platforms such as learning management systems (LMS) and does not exploit the pedagogical potential of social media, which could enable the creation of learning spaces that facilitate users' learning activities and strengthen their relationships with peers and learners. For developers, it opens up new ways of aggregating learning processes, sharing learning outcomes, facilitating traceability and providing a secondary structure to learning materials.

- The fourth part of the hypothesis assumes that the better the overall picture, the more tractable the course is perceived to be.

The correlation between the overall picture and traceability is that if all the elements in the course fit together well, it is easier to monitor the progress of the learners and to identify any gaps in the course structure. The overall picture can also help learners to better understand the objectives of the course. Personalised and self-regulated learning focuses on the core concepts of the course material and structure helps to achieve the objectives. Even if users are sometimes faced with complex and challenging tasks, the path chosen offers individualised opportunities that developers would not always have built in for all learners. Nevertheless, it is important to get the big picture, whichever path the user takes. They need to see what they have to look forward to and what their options are, and identifying any gaps can help in bug-fixing (Boekaerts and Corno, 2005). Follow-up is best captured through feedback. Hattie and Timperley's (2007) study presents a model of feedback for learning (more in Section 3.1.9). The model describes effective feedback by answering three questions, which are:

1. Where am I going?   **Feed up**

2. How am I doing?   **Feed back**

3. Where to next?   **Feed forward**

Each of these feedback questions operates at four levels: task, process, self-regulation and self levels. The question will only lead to an effective response if the user is reached at the right level. According to the authors, good quality feedback helps learners to better understand the overall course and to more easily monitor their own progress and development. A large body of research evidence supports the view that effective feedback leads to improved learning. Paul Black and Dylan Wiliam collected 250 studies on feedback up to 1998 in their study Assessment and classroom learning, assessment in education. According to Sadler (1989), three questions must be answered by the student for feedback to be predictive:

1. What is good performance?

2. How does your current performance compare to good performance?

3. What do you need to do to make your current performance good?

Nicol and Macfarlane-Dick (2006) describe seven principles of feedback practice to promote self-regulated learning. "Good feedback practice is defined as anything that promotes learners' ability to self-regulate. Good feedback practice is based on the following seven principles:

1. It helps to clarify what good performance is (objectives, requirements, expected standards);

2. promotes the development of self-evaluation (reflection) in learning;

3. provides learners with high quality information about their learning;

4. encourages dialogue between teacher and peers about learning;

5. encourages positive motivational beliefs and self-esteem;

6. provides opportunities to close the gap between current and desired performance;

7. provides teachers with information that can help shape instruction." (Nicol and Macfarlane-Dick, 2006)

The above studies point out that course comprehension and traceability facilitate the development of effective feedback-based learning processes for learners and also promote self-regulated learning.

- The fifth part of the hypothesis assumes that the better they perceive the overall picture, the more transparent they perceive the course to be.
- In the sixth part of the hypothesis, it is assumed that the better the overall picture, the more personalised the course is perceived to be.

The correlation between the overall picture and transparency and personalisability is due to the fact that a well-structured course that is easy to understand and personalise helps learners to better understand the overall picture. Transparent and customisable courses allow learners to select the elements that are most relevant to their needs and interests. Learning analytics programmes can be used to monitor users' performance and predict success or failure. These systems can help students stand out from the crowd and send signals ('alerts') when something is not right. This makes it much more likely that the user will change their learning style in

time and the outcome of the course will be positive. Learning analytics dashboards allow students to get individual feedback, giving them a better overview of the system and a holistic view. Personalised learning thus follows individual pathways that can be tracked (Park and Jo, 2015). In their study, Kirschner, Sweller and Clark (2006) stress the importance of transparency and the big picture, and point out that unmanaged, unstructured education is not only less effective, but can also lead to negative outcomes. The authors analyse the effectiveness of constructivist, discovery-based, problem-based, experiential and inquiry-based teaching methods in a range of disciplines. And they see the systematic and transparent nature of teaching materials as one of the ways in which learners can successfully develop.

The hypothesis can be broken down into six points, which are supported by the literature above. The variables were tested by means of questionnaire responses. Participants in the survey were asked to express their opinion on a five-point Likert scale (1 - Unacceptable, 5 - Fully satisfactory) on the transparency, traceability, personalisation and overall image of the course. Descriptive statistics were used to show the median, mode, mean and standard deviation of the items assessed, the results of which are shown in the table below.

Table 2: Median, mode, mean and standard deviation of hypothesised items (source: own table)

	Median (Mdn)	Mode (Mo)	Mean (M)	Standard deviation (SD)
Transparency	5	5	4,67	0,59
Traceability	5	5	4,69	0,57
Personalisation	5	5	4,28	0,92
Overall image (colour, layout, transparency)	5	5	4,03	0,94

The hypothesis was tested by correlation analysis. After performing Spearman correlation, the following results were obtained:

Table 3: Correlation matrix (source: own table)

Correlations

			osszkep	velem_nyomon kovethetoseg	velem_atlathato sag	velem_szemres zabottsag
Spearman's rho	osszkep	Correlation Coefficient	1,000	,227**	,205**	,103
		Sig. (2-tailed)	.	,001	,002	,122
		N	228	226	225	225
	velem_nyomonkovethetose g	Correlation Coefficient	,227**	1,000	,612**	,452**
		Sig. (2-tailed)	,001	.	,000	,000
		N	226	229	227	227
	velem_atlathatosag	Correlation Coefficient	,205**	,612**	1,000	,422**
		Sig. (2-tailed)	,002	,000	.	,000
		N	225	227	228	226
	velem_szemreszabottsag	Correlation Coefficient	,103	,452**	,422**	1,000
		Sig. (2-tailed)	,122	,000	,000	.
		N	225	227	226	228

**. Correlation is significant at the 0.01 level (2-tailed).

Interpreting the table above, we can say that:

1. There is a strong positive relationship (r = 0.612) between transparency and traceability, and the result is significant (p < 0.001).
2. Transparency is positively and strongly correlated (r = 0.422) with traceability and the result is significant (p < 0.001).
3. There is a positive, medium (r = 0.452) correlation between personalizability and traceability, and the result is significant (p < 0.001).
4. We found a weak positive correlation (r = 0.227) between overall image and traceability, but the result is still significant (p = 0.001).
5. A positive but weak correlation (r = 0.205) between the overall picture and transparency and the result is significant (p = 0.002).
6. No significant relationship between overall image and personalisation.

The results of the hypothesis testing are as follows:

1. The hypothesis on transparency and traceability is confirmed.
2. The hypothesis on transparency and personalisation is confirmed.
3. The hypothesis on personalisation and traceability is confirmed.
4. The hypothesis on the big picture and traceability is confirmed.
5. The hypothesis on the overall picture and transparency is confirmed.
6. The hypothesis on the overall picture and personalisation was not confirmed.

Thus, the hypothesis was partially confirmed, as a significant relationship was found between the first five points, but not for the sixth point. It can be concluded that the courses created using the requirements system are transparent and traceable, providing users with an overall adequate and traceable picture.

Two hypotheses can be derived from hypothesis **H1$_a$**:

Thesis 1: There is a positive correlation between the transparency of a learning course and its traceability and personalisation, as well as between its personalisation, its overall image and its traceability, and between its overall image and its transparency. As a result, transparent courses are easier to follow and personalise. The easier a course is to follow, the better its overall picture and the easier it is to personalise. And transparent courses give a coherent overall picture, making them more effective in terms of the opinions of course participants.

Thesis 2: We did not find a positive correlation between the overall picture of the learning course and its personalisation. This suggests that a good overall image does not necessarily imply good personalisation. Personalisation may depend on a number of other factors, the chain of correlations of which I described in thesis 1.

Studies have been conducted internationally on the quality and length of instructional videos (Guo et al., 2014; Hansch et al., 2015; Fisherman, 2016; Bengochea and Budia 2012). The presentations in videos have also been studied (Thomson et al, 2014; Kapterev, 2007), as well as the instructors (Kristöfl et al., 2006; Rollins, 2018; Tongori, 2012; Urbán, 2019; Kim and Bonk, 2006). The research has sought to develop each element to the highest possible level and to produce the best possible instructional videos. Taking all these into account, we aimed to develop the most suitable tutorial videos for the learning habits of Hungarian users and formulated the second hypothesis in this context.

> **H1$_b$:** According to international literature (Guo, 2014, Thomson, 2014), the appropriate length of instructional videos is 4-6 minutes, and I assume that 10-15 minutes is appropriate for the learning methods of Hungarian students.

Guo et al. (2014) examined videos of four edX courses combined with six interviews. They analysed 6.9 million video views. In addition to engagement, they also looked at which types of videos engaged users' attention more. The research shows that the videos that were more effective were those that:

- alternating image: the instructor's image alternated with the presentation slides

- were recorded sitting at a desk rather than in a TV studio

- illustrated on tablet drawings (e.g. Khan Academy style) instead of Power Point slides

- were newly made instructional videos, as opposed to re-edited versions of old videos

- were made at a faster speaking pace

- were lecture rather than "tutorial" videos.

Also several times:

- re-watched the tutorial videos as lectures

- paused for tutorial videos more than for lectures

- paused on the Power Point slides, as they did on the videos with the tablet drawings.

Taking these factors into account, user engagement was examined and the authors identified three to nine minutes as an appropriate length for the length of the videos (see section 2.5.3 for more details).

Thomson et al. (2014) summarised the making of an effective and successful instructional video in four points:

1. exploring the context and defining the objectives.
2. Telling and presenting the story.
3. presenting the story in a credible way.
4. keep the video short and to the point.

Because of declining engagement, authors recommend presenting key concepts and content first, or suggesting several shorter videos rather than one long one. The study does not set strict rules for video length, but notes that the average YouTube video is 4 minutes 12 seconds, so it would be wise to stay within this timeframe.

Hansch et al. (2015) see the most appropriate structure for MOOC videos as short content segments separated by assessment questions. The segments are then defined in lengths of 2-3 minutes.

Two models for video production style are proposed:

1. the talking head style, in which the instructor talks into the camera
2. the tablet recording with voice-over (for example Khan Academy style)

The above two models are recommended primarily for lecture-style videos. According to Koumi (2006), the added value of videos for education is realised on three levels. The first type of value is cognitive value, which includes visual strategies. The second is the experiential value, which provides a vicarious experience and gives the user insight into things that he or she might not otherwise have experienced. The third is the nurturing value, which refers to the motivational power of video and creates an emotional connection.

According to the international literature, the appropriate length of an instructional video is 5 minutes, which represents an average of 6 minutes as defined by Guo (2014) and 4 minutes as defined by Thomson (2014). The mean, $M = 12.11$ minutes and standard deviation, $SD = 15.58$ minutes for the length of the tutorial videos used in the course tested in this research.

The hypothesis was tested using a one-sample t-test (parametric test) to begin testing. The variable has a high level of measurement but does not follow a normal distribution (Shapiro-Wilk test result: $p < 0.001$), so I did not use a parametric test but a one-sample Wilcoxon test, which resulted in $Z = 352.5$, $p = 0.014$, so the result is significant. The videos shown in the course are significantly longer than the corresponding video lengths defined in the international literature.

However, descriptive statistics confirm that the participants in the study, who were asked to express their opinion on the length of the videos using a five-point Likert scale (1 - Not at all, 5 - Absolutely), also considered the length of the videos in the course to be appropriate. Based on the users' responses, the median $Mdn = 3$ (Appropriate length).

The hypothesis was confirmed.

Our thesis on hypothesis **H1$_b$** is as follows:

Thesis 3: The longer tutorial videos (12 minutes) used in the online courses were also considered appropriate by users. The correlation between the length and appropriateness of the videos used in the course is probably due to the fact that learners are used to 45-minute lessons in school, and 12 minutes is still significantly shorter compared to this. Online learners therefore spend less time listening to lectures than in the traditional school system. The appropriate video length discussed in the research is sufficient to allow the material to be presented and explained, and to break the longer material into sections of consistent length. According to Kapterev's (2007) research, the key is to have a memorable beginning, then develop the message along three arguments, and finally conclude with a memorable

conclusion. This is the amount of information that the listener can still remember, and bullet-pointing can facilitate comprehension. If you build your presentation around this triad within the timeframe indicated, you can create effective training videos.

The completion rate of online courses is extremely low, and several studies have been conducted on this issue on leading course collection sites around the world, using various methods (e.g. gamification) to try to improve it (Nesterowicz et al., 2022; Jordan, 2014; Jordan,2015). Our aim was to reduce dropout and thus increase the completion rate by applying the requirements framework developed in this thesis.

The hypothesis for this is as follows:

> **H$_{1c}$:** Using the requirements system will help to exceed the 6.5% compliance rate set by Jordan (2014).

The requirements set out a number of criteria along which a course can be designed. These criteria included both theoretical and practical aspects. As discussed in the dissertation, not all requirements can be applied simultaneously or fully across the different learning platforms. Therefore, it is important for the research that the courses were created on two different platforms, so we tried to incorporate as many requirements as possible and also tested each of the incorporated elements by means of questionnaire responses. The theoretical requirements were taken into account when designing the courses and the requirements for the learners were communicated to the users. The detailed list of requirements for use can be found in Table 1.

In practice, the hypothesis investigates that if some of the elements formulated in the requirements framework are incorporated into online courses, more students will complete the course than without them, i.e. the completion rate will be higher. The comparative basis for the study was the international literature. In her research, Katy Jordan (2014) found a completion rate of 6.5% on the most popular course collection sites. In 2015, Jordan's extended research found a completion rate of between 0.7% and 52.1%, with a median of 12.6%. The research group of Krzysztof Nesterowicz (2022) managed to increase this rate to 13.7% by using gamification.

In the hypothesis testing, I tested the completion rate of the total number of participants (N = 668) of the online courses Vállalkozz, Vajdaság! and Web 2.0. The testing was based on a variable related to completion (530 persons (79.34%) completed the course or 138 persons (20.66%) did not complete the course). The result of the one-sample Chi-square test was $\chi2(1)$

= 5831.86 p < 0.001 The result showed that the completion rate using the requirements system was significantly higher than 6.5%, thus the hypothesis was confirmed.

Thesis related to hypothesis **H1c**:

Thesis 4: Incorporating some of the elements of the requirements framework into online courses will result in more students completing the course than without it, thus resulting in a higher completion rate than 6.5% (Jordan, 2014). The requirements framework has defined several aspects that can be used to design a course and the results of the testing show that they contributed to the success of the course and increased the completion rate.

In most cases, the tasks of curriculum developer and instructor are separated. In this thesis we try to combine these two roles. The training and support of instructors has been the subject of several research studies (Conrad and Donaldson, 2011; Greenhow and Gleason, 2014). Training and supporting instructors is very important to enable them to start creating online courses efficiently and successfully. There are several types of assistance available in the literature, but we could not find any research that supports instructors by creating a set of requirements that guides instructors through the design, implementation, and testing processes.

4.2. Interpreting the hypotheses on online tutors and teachers

The research questions posed at the beginning of the paper regarding teachers' attitudes towards online education were examined and answered in the light of the results. The research used a questionnaire method to ask instructors about their different online learning and teaching habits and their use of media. Our primary aim was to explore the attitudes of the research participants towards online learning. We formulated the following hypotheses (H2) regarding the instructors' attitudes towards online learning:

> **H2a:** Most trainers would find it easier to create a stand-alone online course using the requirements system.

The hypothesis was tested with descriptive statistics. 89.3% of the users would find it easier to create an online course on their own if a set of requirements were available and only 10.7% of the respondents do not consider this parameter important. This suggests that more people would find it easier to start creating an online course with the help of a set of requirements than not. The hypothesis is therefore confirmed. The requirements system does not in itself make an instructor capable of creating an online course, but it can be seen from the hypothesis that it

certainly has a motivating effect among instructors. The course design process is complex, both from a technical and theoretical point of view. However, if instructors are confident and motivated, they are more likely to be able to create an online course efficiently and effectively. If trainers have little experience of online teaching or are not comfortable with creating online courses, they may need additional support and training. There is a large literature (Kis-Tóth and Forgó, 2011; Kim and Bonk, 2006; Phan and Dang,2017; Greenhow and Gleason, 2014; Conrad and Donaldson, 2011) on the requirements for online instructors, which are described in more detail in section 3.1.3 of this thesis.

Thesis on hypothesis **H2$_a$**:

Thesis 5: If teachers have a set of requirements with a checklist that they can follow, they will be more confident and motivated to start creating an online course and more likely to be able to develop it efficiently and effectively.

Creating online courses is a complex process. Experience in an online environment can help the instructor. If they have participated in any course as a learner or as an instructor, they will have a better understanding of how the course material should be structured and of the points that may make it difficult for learners to progress. By incorporating the knowledge gained from their experience in the online space, they can make their own courses more effective. We found several studies (Conrad and Donaldson, 2011; Greenhow and Gleason, 2014) that discussed the importance of instructor experience and prior knowledge. And Vaughan et al. (2016) found that experience has a strong influence on the willingness and effectiveness of online course creation. Instructors who had prior experience with online teaching showed higher rates of interest in engaging in online teaching. We investigated whether previous experience in online courses influences the willingness to create online courses.

H2$_b$: Instructors who have taken more than three online courses are more likely to be open to learning how to create an online course than those who have taken fewer (or even zero) online courses.

Vaughan, Cleveland-Innes, and Garrison (2013) write in their book about the importance of instructors' experience and prior learning, which they argue has a major impact on the willingness and effectiveness of online course design. In their research, they investigated the potential of blended learning among undergraduate students. Instructors who had prior

experience with online education were more likely to be willing to participate in online course creation and were more successful.

The hypothesis, based on the literature cited, claims that those with more or less experience of online courses are more open to learning how to create online courses than those without any experience of online courses.

In hypothesis testing, I used two equally weighted variables:

- number of courses taken (two or less/ more than three)
- whether you would like to learn to create an online course (yes/no)

The correlation between the two nominal variables was tested using an independent samples Chi-square test with $\chi2(1) = 2.595$, $p = 0.107$

The result shows that there is no significant correlation between the two variables. 54.5% of those who have taken few (two or less) online courses do not want to learn how to create an online course, while 45.5% want to. 30.3% of those who have taken more than three online courses do not want to learn how to create an online course, while 69.7% (62 people) would like to. The hypothesis was not confirmed, but there is only a tendency to say that a higher proportion of those who have taken more than three online courses would like to learn how to create one.

The thesis for hypothesis **H2$_b$** is as follows:

Thesis 6: Experience in online courses does not affect the willingness of instructors to learn how to create an online course. Thus, it is not necessary for an instructor who wants to develop a course to have previously taken any form of online course. Those who are more experienced are just as motivated to start as those who are not.

Kirschner and Karpinski (2010) report in their research that instructors who are social media users are more open to blended learning and ICT-enhanced instruction. In the present study, we investigated the extent to which the willingness to learn the process of creating online courses is facilitated by the use of social media.

H2$_c$: Teachers who are present on social media are more likely to be open to learning how to create an online course than those who are not present on social media.

Kirschner and Karpinski (2010) investigated the relationship between Facebook (social media) use and academic performance. The study included 209 college students, 141 Facebook users and 68 non-Facebook users. The authors found that extracurricular activities were more popular among FB users, which the social profile could help them organise. Conversely, students who did not have a profile were more likely to do various student activities. In the light of the study results, being active social media users did not have a negative impact on students' performance. In fact, 75% of the students said that Facebook use had a positive impact on their studies and at this point they highlighted the usefulness of the various FB groups. According to the research, the use of social media in education helps to improve learning outcomes and the efficiency of the teaching process, which in turn attracts the involvement of teachers in online education. These results suggest that the presence of instructors on social media and the development of their digital competences may be related to their willingness to create online courses.

The research also examined the popularity of instructors' use of social media platforms, a diagram of which is presented in Section 6.12. And in testing the hypothesis, I used two equally weighted variables:

- presence on social media (yes/no)
- would like to learn to create online courses (yes/no)

I tested the correlation between the two nominal variables using an independent samples Chi-square test, which resulted in $\chi^2(1) = 1.416$, $p = 0.234$

The result shows that there is no significant correlation between the two variables. 32.6% of social media users do not want to learn how to create online courses, while 67.4% want to. 50% of those who are not on social media do not want to learn to create online courses and 50% want to. So the hypothesis is not confirmed and the following thesis can be formulated: The result shows that there is no significant correlation between the two variables. 32.6% of social media users do not want to learn how to create online courses, while 67.4% want to. 50% of those who are not on social media do not want to learn to create online courses and 50% want to. So the hypothesis is not confirmed and the following thesis can be formulated:

Thesis 7: The use of social media does not affect the willingness to learn and use online courseware. Instructors who are active on social media will not necessarily be more proactive

in mastering the process of online course creation than instructors who are not present on social media.

The experience, motivation and training of teachers has been the subject of a number of studies (Kim and Bonk, 2006; Conrad and Donaldson, 2011; Greenhow and Gleason, 2014; Kirschner and Karpinski, 2010). The research on this topic shows that it is an area of great importance. The studies cited provide a variety of perspectives and angles. However, we have narrowed the scope and made it more concrete. We investigated the extent to which the experience gained from previous online course production has influenced the development needs of instructors in the field of course production.

> **H2d:** Teachers who have already created an online course are more open to self-development in creating online courses than those who have not yet created an online course.

Online education develops critical and creative thinking. The number of "hands-on" lectures, interactive labs, scientific simulations is increasing, which has a positive impact on the online teaching experience of the instructors. Kim and Bonk (2006) conducted a survey of more than 12,000 college teachers, instructional designers and administrators, of which 2,000 participants had actual online course design experience. The survey was conducted using online questionnaire responses and the questions covered various educational trends, the current state and future of online learning. The respondents' experience of online teaching ranged from zero to more than 10 years. The results of the research confirm the hypothesis that teachers who have already produced an online course are more open to self-development, more confident and less worried about the difficulties of producing an online course than teachers who have never produced such a course. Two equally weighted variables were used for hypothesis testing:

– whether has ever created an online course (yes/no)
– would like to learn to create an online course (yes/no)

We have two nominal variables and their correlation was tested using an independent samples Chi-square test, which resulted in $\chi2(1) = 11.15$, $p < 0.001$. The result shows that there is a significant correlation between the two variables. Among those who have already created an online course, only 10% do not want to learn how to create an online course, while another 90% do. Of those in the sample who have not yet created an online course, 44% do not want to learn the process of creating a course, but 56% are open and want to learn how to create a

course. The hypothesis is confirmed and the following thesis can be formulated in relation to it:

Thesis 8: The experience gained from previous online course production will help trainers to be open to further training to improve their skills and knowledge of online course production processes.

The theses identified in the light of the hypotheses represent a new scientific achievement in the field of education. And the set of requirements developed in relation to the research questions and objectives that form the guiding principles of the thesis provides the basis for a new approach to the design and delivery of online courses.

5. Scientific publications related to the thesis

5.1. Peer-reviewed paper published in a national scientific journal in hungarian

1. Urbán, D.; Lengyelné, Molnár, T,. (2023) A tanulási terek transzformációja: a hagyományos módszerektől az online tanulásig (to be published)

2. Urbán, D. (2022). Az online kurzusok elméleti háttere. Létünk (Újvidék) 2022/3-4 pp. (p. 81–90. , 10)

3. Major, L.; Kovács, C.; Urbán, D.; Boros, O.; Námesztovszki, Zs. (2022). Fejleszthetők-e a pedagógusok online oktatással kapcsolatos kompetenciái online tanulási környezetben? Információs Társadalom: Társadalomtudományi Folyóirat 22: 1 (pp. 49–66., 18 p.)

3. Urbán, D., (2020). Tanítás és tanulás a digitális pedagógia korában In: Horák, Rita; Kovács, Cintia; Námesztovszki, Zsolt; Takács, Márta (szerk.) Új nemzedékek értékrendje: A Magyar Tannyelvű Tanítóképző Kar Tudományos Konferenciáinak tanulmánygyűjteménye, Subotica, Szerbia, Szabadka, Szerbia: Újvidéki Egyetem Magyar Tannyelvű Tanítóképző Kar (581 pp. 559–567., 9 p.)

4. Urbán, D.; Chira, Cs. (2019). Virtuális osztálytermi keretrendszerek összehasonlítása OXIPO: Interdiszciplináris E-Folyóirat 1: 2 (pp. 77–88., 12 p.)

5. Urbán, D. (2018) Elektronikus postafiókok hatása a teljesítési arányra online környezetben In: Bodáné, Kendrovics Rita (szerk.) Hazai és külföldi modellek a projektoktatásban: Nemzetközi Tudományos Konferencia tanulmánykötete, Budapest, Magyarország: Óbudai Egyetem Rejtő Sándor Könnyűipari és Környezetmérnöki Kar (pp. 334–343., 10 p.)

6. Balázs, Piri, D. (2017). Hagyományos tartalmak innovatív környezetben In: Éva, Borsos; Zsolt, Námesztovszki; Ferenc, Németh (szerk.) A Magyar Tannyelvű Tanítóképző Kar 2017-es tudományos konferenciáinak tanulmánygyűjteménye. XI. nemzetközi tudományos konferencia, VI. módszertani konferencia, IV. IKT az oktatásban konferencia Szabadka, Szerbia: Újvidéki Egyetem Magyar Tannyelvű Tanítóképző Kar (122 p. pp. 803–813., 10 p.)

7. Námesztovszki, Zs.; Kovács, C.; Balázs, Piri, D. (2017). Magyar nyelvű online kurzusok Vajdaságban. Létünk (Újvidék) 47. (3 pp. 91–100., 10 p.)

5.2. Presented at national and international conferences, pre-refereed, in hungarian

1. Urbán, D. (2021) A pedagógia kihívásai: a minőség biztosítása az online oktatás során. Pedagógia 2.0 Digitális innováció az oktatásban. Eger, Magyarország

2. Urbán, D. (2019). Az online oktatási környezet sajátosságai. 18. VMTDK. Újvidék, Szerbia

3. Urbán, D.; Kovács, C. (2019). Online platformok többszempontú elemzése. I. Szakképzés és Oktatás: Ma–Holnap konferencia. Budapest, Magyarország (2019)

4. Urbán Dorottya. Virtuális osztálytermi keretrendszerek – miért? hogyan? kinek? 6. IKT az oktatásban konferencia Szabadka, Szerbia

5. Urbán, D. (2018) Az online tanulást befolyásoló tényezők. 17. VMTDK Újvidék, Szerbia

6. Kovács, C.; Balázs, Piri, D. (2017) Három online kurzus többszempontú vizsgálata Tudományos távlatok: Vajdasági Magyar Tudóstalálkozó. Újvidék, Szerbia

7. Kovács, C.; Balázs, Piri, D. (2017). Tanulói aktivitásvizsgálat online környezetben II. Oktatástervezési és Oktatás-informatikai Konferencia. Eger, Magyarország

8. Urbán, D. (2017). Online kurzusok – az elmélettől a gyakorlatig. 16. VMTDK Újvidék, Szerbia

9. Balázs, Piri, D. (2016). Az ember és a mooc. 15. VMTDK Újvidék, Szerbia

5.3. Pre-refereed presentation in foreign languages at national and international conferences

1. Urbán, D. (2021). Presentation of Vállalkozz, Vajdaság! online course 8th ICT in Education Conference, november 4–6, 2021, Subotica, Szerbia: University of Novi Sad Hungarian Language Teacher Training Faculty, Subotica