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Abstract

This paper presents the results of research whose aim was to investigate the relationship between teachers' epistemological beliefs and their inclination towards either traditional or constructivist learning and teaching paradigm. The study was conducted on a sample of 126 primary school teachers in Croatia. The results show that primary school teachers understand learning as a process in which the connection between students' effort and learning outcomes is expressed and that learning ability is not innate, but on its development student and teacher can affect. Also, a positive correlation was found between teachers inclination towards the traditional paradigm of learning and their beliefs that the ability to learn is genetically innate, and between teachers` inclination towards the constructivist paradigm of learning and their beliefs about the learning process in which students' effort and learning outcomes are interdependent. Research has shown that teachers' epistemological beliefs significantly affect their inclination towards a particular learning paradigm. It has also shown that teachers are significantly more inclined towards the constructivist learning paradigm than the traditional one. Based on these findings, specific implications of such results in primary education and formal education of future teachers are discussed.

Introduction

Different beliefs that teachers hold can directly or indirectly influence their conception of a preferred manner of learning and teaching and their understanding of the roles of teachers and students in the teaching process. Among those are epistemological beliefs, i.e., individuals` attitudes about the nature and process of knowledge acquisition, degree of certainty of knowledge, its criteria and limitations, and how it is shaped in various disciplines (Brownlee, Purdie, & Boulton-Lewis, 2001; Hofer & Pintrich 1997; Ravindran, Grene, & Debacker, 2000).

Previous research into these beliefs brought to the foreground their close connection with teachers‘ conception of teaching (Black & Ammon, 1992; Brousseau & Freeman, 1988; Dweck & Leggett, 1988; Qian & Alvermann, 1995), especially with the behavior and decisions teachers make in the course of the education process (Chan & Elliott, 2004; Fisher & Rush, 2008). That is why the study of those beliefs in the context of the education system

is of great importance. Uslu (2018) claims that the learning and teaching approaches of individuals with sophisticated epistemological beliefs are more constructivist.

When we speak of teachers' inclination towards a particular learning and teaching paradigm, it is essential to differentiate between the constructivist and traditional paradigm. Unlike the traditional approach, which is used by teachers who focus solely on teaching strategies, i.e. according to which the teacher is the source and students are passive recipients of new knowledge (Chan & Elliott, 2004; Cheng, Chan, Tang, & Cheng, 2009), teachers who favour the constructivist approach place students at the centre of attention, guiding them through the learning process and helping them construct new knowledge. According to Warwick and Stephenson (2002), constructivist-oriented teachers believe that learning is an individual, active process and that students come to school with numerous alternative views of the actual knowledge. According to this approach, a teacher plays a vital role in supporting the cognitive activities of students, of creating an atmosphere in which students' previous experiences will be supported and their prior knowledge discovered, as well as potential misconceptions and conceptual misunderstandings (Chen, Burry-Stock & Rovegno, 2000, as cited in Coskun & Grainger, 2014). Depending on whether they are more inclined towards the traditional or the constructivist approach, teachers usually perceive the learning process quantitatively or qualitatively. The quantitative approach means that they are focused on the quantity and reproduction of acquired knowledge and is classified as a surface approach to learning, while the qualitative approach pays attention to the abstract meaning and personal transformation through learning and is classified as a deep approach to the learning process (Biggs & Moore, 1993; Marton, Dall'Alba, & Beaty, 1993; Purdie & Hattie, 2002). Following these classifications, approaches to the learning and teaching process are often viewed hierarchically: the interpretative or constructivist view is seen as the higher-level approach, while the reproductive or traditional approach to learning or teaching is seen as the lower-level approach (Marton, et.al., 1993; Purdie & Hattie, 2002).

Previous Research

Views on epistemological beliefs changed over time. Earlier research characterized them as one-dimensional (Perry, 1968), while later research suggests their multi-dimensional character (Dweck &Leggett, 1988, Schoenfeld, 1985; Schommer, 1990). Nonetheless, both views study the nature of knowledge and the cognitive process.

Perry (1968) believes that epistemological beliefs develop gradually and claims that students develop those beliefs progressively in their study. Similar to Perry's finding, King and Kitchener (1989) and Belenky, Clinchy, Glodberger, and Tarule (1986) also established that epistemological beliefs develop in stages, from more superficial to more complex ones. Contrary to such a view, Schommer (1990) criticizes the one-dimensional and developmental nature of epistemological beliefs represented by Perry, claiming that they do not develop in stages, but an individual can possess several beliefs simultaneously. Moreover, Schommer (1990) emphasizes that the degree of sophistication of those beliefs varies. For example, a person can have sophisticated beliefs regarding the certainty of knowledge, while at the same time, he or she could naively believe that authority is the source of all knowledge. Namely, Schommer (1990) claims that an individual’s belief system consists of

five categories, each of which can range from naive to sophisticated. These are: 1) simplicity of knowledge (the belief that knowledge is simple, consisting of isolated pieces of information, as opposed to the belief that knowledge is complex, i.e., composed of mutually connected mental concepts); 2) certainty of knowledge (the belief that knowledge is either specific or tentative); 3) omniscient authority (the belief that knowledge is drawn from an authority vs. belief that an individual's reflection is crucial for constructing his/her knowledge system); 4) innate ability to learn (the belief that the ability to learn is innate vs. belief that the ability to learn is acquired over time); and 5) quick knowledge (beliefs regarding the speed of knowledge acquisition, i.e., whether the learning process occurs slowly or gradually). Although the hypothesis mentioned above is based on the structure that comprises five beliefs, studies usually examine epistemological beliefs using a structure that comprises four factors or dimensions: simplicity of knowledge, certainty of knowledge, omniscient authority, and innate ability to learn.

Schommer (1993) divides students into two categories based on the classification mentioned above of epistemological beliefs – naive and sophisticated. Naive students believe that knowledge is specific and unchangeable, transferred by an authority and that a person's ability to acquire knowledge is innate and fixed, i.e., that the effort a student invests into learning cannot significantly impact his /her/her academic achievements. On the other hand, sophisticated students believe that knowledge is developed and constructed continuously, that it can be questioned or criticized, and that the ability to learn is not innate and fixed, but instead that the acquisition of knowledge is a process that requires a particular effort which can affect students' achievements (Cheng et al., 2009; Schommer, 1994).

Numerous earlier studies of epistemological beliefs were focused on analyzing the relations between dimensions of epistemological beliefs and meta-cognitive variables such as text comprehension, solving mathematical problems, and persistence in solving complex tasks (Hofer & Pintrich, 1997; Qian & Alvermann, 1995; Schommer, 1990), as well as on researching whether epistemological beliefs depend on scientific disciplines and in which way. According to the results of a study that explored the relationship between students' epistemological beliefs and problem-solving skills (Aksan & Sözer, 2007, as cited in Coskun & Grainiger, 2014), students who believe that learning depends on the effort invested approach the problem-solving process more studiously. Seen that students who believe in the relativity of knowledge tend to have more developed thinking skills, their problem-solving skills are better. Such students tend to think about a problem more flexibly to come up with several solutions, and they invest more time and effort, which affects their academic success. Also, some research studies indicate that those who have sophisticated epistemological beliefs are also more likely to identify several alternative solutions for the given problems (King & Kitchener, 1989). Analogously, research by Schommer-Aikins (2004) has shown that positive beliefs about learning as an innate ability, simplicity of knowledge, and quick learning correlate with poor reflective judgment skills. This is further substantiated by studies that have confirmed that students with naive epistemological beliefs tend to act as passive recipients of knowledge. On the other hand, those with developed and sophisticated epistemological beliefs are more likely to advance to a higher mental level (King & Kitchener, 1989; Schommer-Aikins, 2004).

Some research studies on epistemological beliefs have also analyzed the relationship between these beliefs and

how student teachers and teachers who are already a part of the education system perceive the learning and teaching process (Chan & Elliott, 2002; Richardson & Placier, 2001). The purpose of such research was mainly to determine whether formal education of future teachers can significantly change their perception, thus influencing their behavior in their future work, i.e., the way they organize their classes, and to explore the relationship between teachers' beliefs and the effects of those beliefs on their teaching (Johnson, 1992; Smith, 1996). Such studies generally indicate that teachers' epistemological beliefs can influence their teaching practice, which in turn influences their students' learning process (Johnson, 1992), or they confirm that there is a significant correlation between teachers' epistemological beliefs and the learning and teaching conceptions which they favor and implement in their teaching practice (Chan & Elliott, 2004, King & Kitchener, 1989; Schommer-Aikins, 2004). Kaya's research (2017) showed that participants who attended and successfully completed a scientific research methods course formerly had less traditional scientific epistemological beliefs than those who had not previously attended such a course.

For example, the research by Saeed, Reza, and Momene (2014) focused on determining a correlation between epistemological beliefs of future English language teachers and their conceptions of learning and teaching. The study has shown that they were inclined to implement the traditional approach to teaching and learning with their students and has identified a significant positive correlation between their inclination towards traditional teaching and learning paradigm and the beliefs about the innate ability to learn and certainty of knowledge. Analogously, it has also identified a significant correlation between the teachers' inclination towards the constructivist paradigm and the belief that the learning process is associated with student's efforts, which means that students who advocate the constructivist approach believe in self-construction and interpretation of knowledge, rather than in passive reception of information. In addition, negative correlations have been identified between the constructivist beliefs of respondents and their beliefs about the certainty of knowledge and learning as an innate ability.

Furthermore, research by Coskun and Grainiger (2014) confirmed that the majority of future teachers believe that the knowledge acquisition process and its efficiency depend on the effort a student invests. This study has also shown that the respondents who are more inclined towards the constructivist approach to teaching have expressed stronger beliefs that the knowledge acquisition process is connected with the invested effort. In contrast, constructivist beliefs about learning and teaching are less present among students who believe that knowledge is specific and grows constantly. Also, a higher degree of inclination towards the traditional paradigm of learning has been identified among students who believe in the innate and fixed ability to learn and specific knowledge that constantly grows (Coskun & Grainiger, 2014).

Scientific literature in the past three decades has dealt quite extensively with the issue of the relationship between epistemological beliefs and learning and teaching conceptions. Research has shown that such beliefs are culture-specific, i.e., that there are different dimensions of beliefs in different cultural groups (Chan & Elliott, 2004; Youn, 2000). Also, it has been confirmed that epistemological beliefs are connected with metacognitive variables in learning, such as text comprehension (Kardash & Scholes, 1996; Schommer, 1990), conceptual changes (Mason & Boscolo, 2004; Qian & Alvermann, 1995), motivation, learning strategies, effect

on academic achievements (Cano, 2005; Chan, 2003; Paulsen & Feldman, 1999; Schommer, 1993; Schraw & Olafson, 2002), learning styles and reflective thinking (King & Kitchener, 2002; Phan, 2008; Wood, Kitchener, & Jensen, 2002), as well as approaches to teaching (Chan & Elliott, 2004). The majority of research studies have also shown that different approaches to learning (traditional and constructivist) are associated with teachers' epistemological beliefs (Cano, 2005; Phan, 2008; Phillips, 2001; Rodriguez & Cano, 2007) and that teachers with naive epistemological beliefs tend to implement traditional teaching methods, while teachers with more sophisticated epistemological beliefs are more constructivist-oriented. This supports the theoretical assumptions that approach to learning and epistemological beliefs function as a part of a broader cognitive system, affecting academic achievements (Phan, 2008).

Furthermore, previous research shows a relationship between epistemological beliefs and students' academic achievements (Conley, Pintrich, Vekiri, & Harrison, 2004; Hofer & Pintrich, 1997; Schommer, 1990; Schommer & Walker, 1997; Schommer, Crouse & Rhodes, 1992). Students with naive epistemological beliefs usually have difficulties with text comprehension and achieve poorer academic results, while in terms of the level of knowledge, research results show that the complexity of epistemological beliefs of respondents increases with years of schooling (Brownlee et al., 2001; Schommer, 1993), which proves that epistemological beliefs can be shaped and affected, i.e. that their sophistication can develop gradually. Jena and Chakraborty (2018) determined that there existed no significant relationship among the university students' epistemological beliefs, learning styles, learning approaches, and achievement.

Research conducted by Chan and Elliott (2002, 2004) studied the development of epistemological beliefs of future teachers in Hong Kong. Their study is also based on the multi-dimensional structure of epistemological beliefs, but unlike Schommer, they identify four factors or dimensions: learning as an innate/fixed ability, learning effort/process, authority/expert knowledge, and certainty knowledge. The factor which they call expert knowledge refers to people's belief of whether knowledge is derived from an expert authority or independently constructed by individuals and whether the expert can be questioned, doubted or criticized (Cheng et al., 2009).

Previous research has also shown that epistemological beliefs can be shaped by the cultural context (Palmer & Marra, 2008) and that they differ concerning the respondents' age and education level. Thus, Schommer (1992) research shows that older respondents believe that the ability to learn can improve, while more educated individuals believe that knowledge is complex and constantly developing. Leng et al. (2018), in their study, conclude that it is essential to clarify the relationship further and how each dimension of epistemological beliefs (i.e., innate ability, structure knowledge, certain knowledge, source of knowledge, and quick learning) and Implicit Theories of Intelligence (entity ability and incremental ability) affects teaching practices.

Various researchers who used the questionnaire created by Schommer obtained controversial results, such as different dimensions of epistemological beliefs identified in different cultures. Also, it has been determined that variations in epistemological beliefs depend on the particularities of the field which is being researched, as well as on the sex and age of respondents (Chan & Elliott, 2000; Hofer, 2000; Schommer & Walker, 1995; Schommer, Duell, & Barker, 2003). All this has led to the criticism of both the instrument and the method used,

after which new, more diverse structures of epistemological beliefs have been proposed (Chan 2006; Chan & Elliott, 2004; Hofer & Pintrich, 1997), as well as different methods and instruments by means of which epistemological beliefs can be examined (Schraw, 2001; Schraw, Bendixin, & Dunkle, 2002; Wood & Kardash, 2002). Nonetheless, Schommer's significant contribution to the research of epistemological beliefs should not be ignored.

Method

Research Aim

This paper presents the results of a research whose aim was to determine epistemological beliefs among general education teachers and their connection with the teachers' inclination towards a particular conception of learning and teaching (either constructivist or traditional). Studies on teachers` epistemological beliefs have not yet been conducted in Croatia, so the results of this research provide insight into the existing teaching practice of teachers and reconsideration of the initial education of future teachers and their preparation for the implementation of constructivist learning. Results of this research can help develop adequate epistemological beliefs in teacher education courses within the development of their competencies for constructivist teaching.

Research Problems

The following research problems have been formulated based on the general research aim:

1. What beliefs do general education teachers hold about the learning process and its relationship with the effort invested, i.e., students' innate ability to learn?
2. What are the beliefs of general education teachers about the credibility of education experts' knowledge and certainty of education-related knowledge reported in the relevant scientific and professional literature?
3. Is there a significant difference in teachers' epistemological beliefs concerning their: a) qualification level, b) years of service, c) age and d) inclination towards innovations?
4. Is there a significant correlation between teachers' epistemological beliefs and their inclination towards a specific learning and teaching paradigm (either constructivist or traditional)?

Hypotheses

H(1): Teachers agree that the learning process is characterized by the relationship between the effort students invest and the academic results and that the ability to learn is not innate, but it is possible to affect its development.

H(2): Teachers believe in the credibility of education experts' knowledge, and they believe in the certainty of knowledge reported in the relevant scientific and professional literature

H(3): There are no significant differences in epistemological beliefs of teachers concerning their (3.1) qualification level, (3.2) years of service, (3.3) age, and (3.4) inclination towards innovations.

H(4): There is a significant correlation between teachers' epistemological beliefs and their inclination towards

specific learning and teaching conception (either constructivist or traditional). Teachers who have a more positive opinion about the effect of the invested effort on the learning process results and who question the credibility of expert knowledge and certainty of knowledge reported in the relevant scientific and professional literature are more likely to favor the constructivist paradigm of learning. Conversely, teachers who believe that learning ability is innate and do not doubt the credibility of expert knowledge and certainty of knowledge reported in the relevant scientific and professional literature are more likely to favor the traditional learning paradigm.

Research Instruments

For the purpose of this research, items from the Epistemological Beliefs Questionnaire (Chan & Elliott, 2004) and the Teaching and Learning Conceptions Questionnaire (Chan, 2006) were used, which have been partially modified and adapted to the particularities of the Croatian education system in order to create a new version of the questionnaire. The questionnaire which was used in this research consisted of four parts. In the first part, demographic information about respondents have been collected, and their inclination towards innovations in teaching has been defined. The second part of the questionnaire, which was borrowed from Chan and Elliott (2004), examined the epistemological beliefs of general education teachers. This part of the questionnaire consisted of a scale comprising 29 items divided into four sub-scales which referred to specific epistemological beliefs (Learning as an innate ability, Learning as an effort-related process, Confidence in the credibility of education experts' knowledge, and Certainty of scientific and professional knowledge reported in the relevant scientific and professional literature).

Teachers expressed their opinions about the statements mentioned above using a five-point Likert scale with values ranging from 1 to 5 (1=I completely disagree, 2=I mostly disagree, 3=I am not sure, 4=I mostly agree, 5=I agree entirely). The third part of the questionnaire, borrowed from Chan (2004), determines teachers' preferences and inclination towards an either constructivist or traditional approach to learning and teaching. This part of the questionnaire consisted of a scale comprising 31 items (statements), 13 of which referred to the characteristics of constructivist teaching, and 18 of which referred to the characteristics of traditional teaching.

Teacapproachesin expressed their opinions about the offered statements by using a five-point Likert scale with values ranging from 1 to 5 (1=I completely disagree, 2=I mostly disagree, 3=I am not sure, 4=I mostly agree, 5=I completely agree). The fourth part of the questionnaire consisted of a scale comprising 26 items which described various constructivist approaches used in the Science and Social Studies class. Science and Social Studies is an interdisciplinary school subject in Croatian education that connects science and social studies topics on the first level of elementary school. The scale was created for the purpose of this research. Teachers were asked to assess how frequently they implement constructivist approaches in their teaching on a scale from 1 to 5 (1=almost never (1x a year), 2=rarely (1-2x in a semester), 3=occasionally (1-2x a month), 4=frequently (at leasnd 5=almost always (in almost every class)). During the analysis of the collected data, respondents' answers to specific parts of the questionnaire were mutually correlated to determine whether there is a statistically significant correlation between them. The reliability of the questionnaire was tested by calculating

the reliability coefficient (Cronbach's alpha), and the resulting value for the first scale was 0.94, the resulting value for the second scale was 0.89, while the resulting values for the third and fourth scale were 0.92, which is a very high degree of reliability.

Respondents and Research Implementation

The research was conducted by means of a survey among general education teachers (N=126). The majority of the sample consisted of female respondents (96%), while in terms of qualification level, respondents with a university qualification (58%) and those with two-year post-secondary school qualifications (42%) were approximately equally represented. With regard to the years of service, teachers were grouped into two categories: those with up to 20 years of service (44%) and those with more than 20 years of service (56%), while in terms of age, they were grouped into those under 45 years of age (54%) and those over 45 years of age (46%). Concerning their inclination towards innovations, the respondents were divided into those who are inclined to implement innovations in teaching (76%) and those who are not inclined to implement innovations in teaching (24%). The analysis concerning the inclination towards innovations was only informative, and its results should be taken with reservations due to the unequal representation of respondents within sub-samples.

Results

Epistemological beliefs of teachers about the learning process and their confidence in the credibility of expert knowledge and certainty of knowledge reported in the relevant scientific and professional literature have been examined by means of teachers' self-assessment of a series of statements. The obtained results (see Table 1) show that teachers mostly agree with a strong connection between the learning process and the effort that students invest in learning (M=41.91, SD=6.35). The effort usually refers to whether a student tries hard, asks for help, and/or participates in class. Stipek (2002) highlights that students are engaged, and learning occurs when teachers promote effort in the classroom by emphasizing participation, setting high expectations, and encouraging students to support each other as learners, so we can say that these results are expected. In line with these findings, teachers have also expressed a primarily negative opinion about statements that claim that students' predisposition for learning is innate and cannot be significantly influenced in the education process (M=27.91, SD=8.49). This finding confirms the first hypothesis.

Table 1. Epistemological Beliefs of General Education Teachers

Epistemological Beliefs	***N***	***M***	***SD***
Learning as an innate ability	126	27.91	8.49
Learning as an effort-related process	126	41.91	6.35
Confidence in credibility of knowledge of education experts	126	31.03	8.62
Certainty of scientific and professional knowledge about education	126	27.90	7.18

Further analysis has shown that the surveyed respondents have only partial confidence in the credibility of education experts' knowledge (M=31.03, SD=8.62) and partial confidence in the certainty of knowledge

reported in the relevant education-related scientific and professional literature (M=27.90, SD=7.18). Based on such findings, the second hypothesis has been dismissed. This skepticism towards experts and their expertise shows the discrepancy between teaching practice and educational theory and calls into question the possibility of implementation of innovations that experts point out into the teaching practice.

By examining the statistical significance of differences between various groups of respondents concerning their demographic characteristics, it has been determined that respondents with baccalaureate-level qualifications have significantly more positive beliefs about certainty of scientific and professional knowledge reported in the relevant education-related scientific and professional literature than respondents with master-level qualifications, who are more skeptical about scientific knowledge (t=2.09; df=124; p=0.04) (see Table 2). The higher degree of skepticism among teachers with university-level qualifications might be attributed to more developed critical thinking resulting from their formal higher education.

Table 2. Epistemological Beliefs of General Education Teachers concerning their Qualification Level

Epistemological Beliefs	**Qualification Level**	***N***	***M***	***SD***	***t-test***	***df***	***p***
Learning as an innate ability	B.A. degree	53	27.10	6.76	-0.91	124	0.37
	M.A. degree	73	28.49	9.56			
Learning as an effort-related	B.A. degree	53	40.75	4.07	1.76	124	0.08
process	M.A. degree	73	42.75	7.51			
Confidence in credibility of	B.A. degree	53	31.32	4.89	0.32	124	0.75
knowledge of education experts	M.A. degree	73	30.82	10.57			
Certainty of scientific and	B.A. degree	53	29.47	7.43	2.12	124	**0.04**
professional knowledge about	M.A. degree	73	26.77	6.81			
education							

Research has not identified any differences in other epistemological beliefs of general education teachers with regard to their qualification level (see Table 2), which is why a part of the third hypothesis (3.1), which assumes that there are no significant differences in epistemological beliefs of teachers with regard to their qualification level, is partially accepted, as well as partially dismissed due to the fact that a statistically significant difference has been observed in teachers' confidence in certainty of knowledge reported in the relevant scientific and professional literature.

Also, no statistically significant difference has been observed in the respondents' epistemological beliefs concerning their years of service (see Table 3). Regardless of their years of service, both groups of respondents expressed similar epistemological beliefs, which is why it can be concluded that the number of years of service does not significantly affect those beliefs. Therefore, a part of the third hypothesis (3.2), which assumes that there are no significant differences in teachers' epistemological beliefs concerning their years of service, has been accepted.

Table 3. Epistemological Beliefs of Teachers concerning their Years of Service

	Years of service	***N***	***M***	***SD***	***t-test***	***df***	***p***
Learning as an innate ability	0-20 years	56	29.40	10.31	1.78	124	0.08
	20 years or more	70	26.71	6.53			
Learning as an effort-related process	0-20 years	56	42.80	7.99	1.41	124	0.16
	20 years or more	70	41.20	4.59			
Confidence in the credibility of knowledge of education experts	0-20 years	56	31.31	11.54	0.32	124	0.75
	20 years or more	70	30.81	5.32			
Certainty of scientific and professional knowledge about education	0-20 years	56	28.39	6.69	0.68	124	0.50
	20 years or more	70	27.51	7.57			

Data analysis has shown that younger respondents have, to a statistically significant degree, more positive beliefs about the learning process being influenced by genetic factors and that they also tend to believe that it cannot be significantly influenced during the education process in comparison with older respondents (t=2.47; df=124; p=0.02) (see Table 4). This finding indicates that experienced teachers during their years of service in the school have gained a clearer insight into the relationship between the effort a student invests in the learning process and his/her achievements and that their epistemological beliefs have become more sophisticated.

Table 4. Epistemological Beliefs of Teachers concerning their Age

	Age	***N***	***M***	***SD***	***t-test***	***df***	***p***
Learning as an innate ability	Under 45	67	29.63	9.70	2.47	124	**0.02**
	Over 45	59	25.95	6.40			
Learning as an effort-related process	Under 45	67	42.34	7.63	0.81	124	0.42
	Over 45	59	41.42	4.50			
Confidence in credibility of knowledge of education experts	Under 45	67	31.49	10.54	0.64	124	0.53
	Over 45	59	30.51	5.77			
Certainty of scientific and professional knowledge about education	Under 45	67	28.99	5.85	1.82	124	0.07
	Over 45	59	26.68	8.32			

However, the further analysis did not establish a significant difference in other epistemological beliefs concerning years of age; rather, the analysis indicates that both categories of respondents have expressed similar opinions about other epistemological components examined by the questionnaire (see Table 4). Therefore, a part of the third hypothesis (3.3) is partially accepted and partially dismissed because a statistically significant difference has been observed in teachers' opinions about the innate ability to learn.

Data shown in Table 5 demonstrate that respondents who are inclined towards innovations in teaching have, to a statistically significant degree, more positive beliefs in the certainty of scientific and professional knowledge reported in professional and scientific literature, unlike the respondents who are not inclined towards

innovations in teaching (t=2.41; df=124; p=0.02), which is expected result. Also, the table above shows no statistically significant differences in teachers' beliefs about other epistemological components between respondents who are inclined to innovations and those who are not. Hence, a part of the third hypothesis (3.4) is partially accepted and partially dismissed because a statistically significant difference has been observed in teachers' beliefs about the certainty of scientific and professional knowledge reported in the professional literature.

Table 5. Epistemological Beliefs of Teachers concerning their Inclination towards Innovations

	Inclination towards innovation	***N***	***M***	***SD***	***t-test***	***df***	***p***
Learning as an innate ability	Positive	96	27.12	6.48	1.87	124	0.06
	Negative	30	30.42	12.83			
Learning as an effort-related process	Positive	96	42.09	6.81	0.57	124	0.57
	Negative	30	41.33	4.62			
Confidence in credibility of knowledge of education experts	Positive	96	30.90	9.39	-0.30	124	0.77
	Negative	30	31.45	5.57			
Certainty of scientific and professional knowledge about education	Positive	96	28.75	6.92	2.41	124	**0.02**
	Negative	30	25.20	7.44			

Furthermore, using a part of the questionnaire borrowed from Chan (2003), teachers' preferences and inclination towards either constructivist or traditional learning paradigms have been identified. The data from Table 6 show that teachers are to a statistically significant degree more inclined towards the constructivist learning and teaching paradigm than towards the traditional learning and teaching paradigm.

Table 6. Teachers' Opinions about the Constructivist and Traditional Approach to Teaching

	N	***M***	***SD***	***t-test***	***df***	***p***
The constructivist paradigm of the Science and Social Studies class	126	78.13	6.44	16.22	125	**0.00**
The traditional paradigm of Science and Social Studies class	126	59.31	11.32			

Analogously to the teachers' self-assessment of their inclination towards either constructivist or traditional learning paradigm, the surveyed respondents were also asked to conduct a self-assessment of their teaching practice to determine the frequency of use of the constructivist practices in their classes. Descriptive indicators of their assessments are shown in Table 7, and they indicate that teachers implement such practices relatively often, i.e., at least once a week (M=99.59; SD=11.66), which is why their approach to teaching can be defined as constructivist-oriented, because in Croatian educational system this school subject students have two times a week.

Table 7. Frequency of Use of Constructivist Practices in Science and Social Studies Class

	N	***Min.***	***Max.***	***M***	***SD***
Frequency of use of constructivist practices in Science and Social Studies class	126	71.00	122.00	99.59	11.66

The primary purpose of this research was to verify whether there is a relationship between teachers' epistemological beliefs, their inclination towards either constructivist or traditional teaching paradigm, and the frequency of use of constructivist practices in teaching. The results of the conducted analysis are shown in Table 8.

Table 8. Intercorrelation between Teachers' Epistemological Beliefs, Opinions, and Frequency of Use of Constructivist Practices in Science and Social Studies Class

	1	**2**	**3**	**4**	**5**	**6**	**7**
Constructivist teaching paradigm (1)	-	-.002	**.445****	.006	**.355****	**.185***	.152
Traditional teaching paradigm (2)		-	.155	**.327****	-.071	.007	**.407****
Frequency of use of constructivist practices in teaching (3)			-	.127	.142	.093	**.208***
Learning as an innate ability (4)				-	.163	**.303****	**.412****
Learning as an effort-related process (5)					-	**.548****	.066
Confidence in the credibility of knowledge of education experts (6)						-	**.290****
Certainty of scientific and professional knowledge about education (7)							-

**p<0,01; *p<0,05

The findings shown in Table 8 demonstrate that the respondents who are more inclined towards the constructivist teaching paradigm tend to use constructivist practices in classes more frequently and have more positive beliefs about learning as a knowledge acquisition process that is associated with students' effort. The research has also established a weaker positive correlation between a strong inclination towards the constructivist teaching paradigm and confidence in credibility of knowledge of education experts. On the other hand, teachers who are more inclined towards the traditional teaching paradigm have more positive beliefs about learning as a genetic predisposition which cannot be considerably influenced in the course of the education process. However, they also have more positive beliefs about the certainty of scientific and professional knowledge reported in professional and scientific literature.

A weaker positive correlation has been observed between the frequency of constructivist practices in Science and Social Studies class and the confidence in the certainty of professional and scientific knowledge reported in the relevant education-related literature. Furthermore, respondents who believe that learning is a process governed by genetic predispositions also have more confidence in the expert knowledge and certainty of scientific knowledge reported in the relevant literature. In comparison, teachers who perceive learning as a

process that depends on the effort invested by students have more confidence in expert knowledge. It is also possible to observe an expected positive correlation between the expressed confidence in the education experts' knowledge and belief in the certainty of scientific and professional knowledge reported in the relevant literature.

Based on the conducted analysis, the fourth hypothesis, which assumed that there is a significant correlation between teachers' epistemological beliefs and their inclination towards a particular conception of learning and teaching (either constructivist or traditional), is partially accepted. Namely, the analysis has shown that teachers who have a more positive opinion about the influence of the invested effort on the learning process results tend to favor the constructivist learning paradigm. Analogously to this finding, teachers who believe that the ability to learn is innate and genetically conditioned tend to favor the traditional learning paradigm. A part of the hypothesis which assumed that teachers who are more inclined towards the constructivist teaching paradigm are also more skeptical towards expert knowledge has proved to be incorrect. However, the research has established a positive correlation between teachers' inclination towards the traditional learning paradigm and confidence in the certainty of knowledge reported in the relevant scientific and professional literature. However, it is evident that despite their expressed confidence, teachers, unfortunately, do not implement the most recent scientific discoveries in their teaching practice, nor do those discoveries significantly impact the teachers' deeply rooted inclination towards traditional teaching.

Discussion

This research has confirmed the findings of previous research studies on the relationship between teachers' epistemological beliefs and their inclination towards a particular learning paradigm. It has also shown public school teachers` beliefs about teaching in the context of the Croatian first educational cycle. Research has shown that teachers' epistemological beliefs significantly affect their inclination towards a particular learning paradigm which means it is necessary to develop adequate epistemological beliefs among teachers during formal education or professional development. One way to accomplish this is to assess the teachers` epistemological beliefs and facilitate their epistemological development above their current levels during their professional development (Hofer, 2001; Lee, Zhang, Song & Huang, 2013). Teacher educators in the formal education of future teachers may promote more effective learning by requiring student teachers to reflect on the nature of their beliefs about knowing (Stacey, Brownlee, Thorpe, & Reeves, 2005).

Furthermore, the research findings on teachers' epistemological beliefs show that teachers tend to believe that the knowledge acquisition process plays a vital role in learning and that it is associated with the effort students invest. On the other hand they have expressed little confidence in the certainty of knowledge and they believe that experts' knowledge should be questioned. Constructivist beliefs tend to prevail among those who believe that comprehension is essential in learning and that expert knowledge should be questioned.

On the other hand, traditional beliefs about learning and teaching are more pronounced among those who believe that the ability to learn is innate and fixed. This study also shows that teachers in the Croatian educational system are significantly more inclined towards the constructivist learning paradigm than the

traditional learning paradigm, which is a reasonable basis for further development and fostering student-centered instruction in educational practice. This background provides a reasonable basis for the transformation of traditional teaching practice, which is still present among some teachers. Since the Croatian National Curriculum Framework was promulgated in 2011, students are no longer viewed as knowledge receivers but as knowledge constructors, which show that the implementation of the new curriculum framework, in which Croatian educational policy has made a turn from the acquisition of factual knowledge to the development of student competencies, had a positive effect on teachers' practice. As a result of the implementation of the new curriculum framework, teachers progressively changed their beliefs from traditional to constructivist conceptions, and began to view knowledge as constructed outcomes arising from students` interactions (Lee, Zhang, Song & Huang, 2013).

Conclusion

Based on the obtained results, it can be concluded that developing sophisticated epistemological beliefs is a critical function of formal education of future teachers (Bencivenga & Elias, 2003; Cano & Cardelle-Elawar, 2004), because some day they will become a part of the education system and will have a significant influence on shaping their students' epistemological beliefs, as numerous studies have shown that teachers' epistemological beliefs affect their teaching practice, their behaviour in class, the use of various teaching strategies and on learning outcomes (Beers, 1988; Hashweh, 1996, Kang & Wallace, 2005; Schommer, 1993). Also, previous research studies have shown that incorporating critical thinking about epistemological beliefs in the education of future teachers leads to more complex thinking and more complex beliefs about knowledge, which is then followed by proactive and postmodern pedagogical approaches to teaching and early childhood (Brownlee et al., 2001; Gill, Ashton, & Algina, 2004).

As a part of their research, Brownlee et al. (2001) implemented a particular curriculum for students who have engaged in postgraduate studies, where students were required to think intensively about their epistemological beliefs during their one-year training in the area of psychology. Compared with a control group composed of students who did not engage in the said curriculum, those who did engage in it have developed more sophisticated epistemological beliefs and have continued to maintain them. Hence, due to this positive practice, the authors propose that similar solutions should also be implemented in the formal education of future teachers in teacher training faculties in the Republic of Croatia.

Based on the results of the conducted research, it can be concluded that teachers have positive beliefs about the constructivist teaching paradigm and perceive it as a holistic approach to students which allows the construction of high-quality knowledge, development of valuable skills, and shaping of personal attitudes and values, i.e., comprehensive development of students. The fact that this approach is perceived more positively than the traditional approach to teaching indicates that teachers are more likely to implement the constructivist approach in teaching. Such beliefs can be considered a reasonable basis for a successful and more frequent implementation of the constructivist paradigm in teachers' daily teaching practice.

Recommendations

Hence, we have concluded that the formal education of teachers is an essential predictor in shaping teachers' attitudes towards a particular approach to teaching. It is necessary to implement lifelong learning and professional development programs for teachers that will deal with this topic. Regardless of the numerous previously conducted research studies on epistemological beliefs, further research into the relationships between different pairs of epistemological beliefs, perception of learning, and learning strategies are necessary and advisable in order to gain a more comprehensive insight into and a better understanding of the relationships between the variables through their structural modeling and analysis. Such research would help teachers better understand the nature and relationships between the cognitive, metacognitive, and affective variables in learning, but it can also indicate implications of using the established relationships to promote effective learning.

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