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Slovenian Primary School Teachers' Opinion on Interdisciplinary Approach Between Fine Art and Science Education

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Abstract: In this article we present research on Slovenian primary school teachers' opinion about the interdisciplinary approach between fine art and science education. With the help of questionnaires, interviews, and analysis of lesson plans, we determined how primary school teachers use this type of interdisciplinary approach, how often and what their views are. We included 138 primary school teachers from every region in Slovenia. It turned out that primary school teachers in Slovenia use an interdisciplinary approach between fine art and science teaching quite often and consider it useful to achieve different aspects of pupils' development. The study revealed that most teachers find it difficult to consider the educational goals of both fields (fine art, science). They often use the connection between the subjects only on an associative level - they only mention the teaching content of one subject quickly and carelessly, without making meaningful connections and without achieving the goals of both subjects. Content taught in this way cannot be considered a cross-curricular approach in the subject sense.

Keywords: *Fine art, interdisciplinary approach, teacher' opinion, science, wholesome teaching of concepts.*

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Introduction

To plan lessons that bring subjects related to fine art/science closer to those who normally do not find interest in them, teachers use various methods of working with pupils (Ravanis, 2017). In this way, teachers want to increase fine art and / or scientific literacy (Mills & Doyle, 2019). Research shows that pupils who do not show interest in fine art and / or science do not achieve high levels of literacy (McBride et al., 2020; Tetikci et al., 2021). One of the methods is an interdisciplinary approach between fine art and science (Cutting & Kelly, 2015). Pupils with negative attitudes towards science and/or fine art find an interdisciplinary approach motivating, especially when tasks are included that can be related to worldly matters (Mills & Doyle, 2019).

Literature Review

An interdisciplinary approach itself fuses the methods and characteristics of multiple fields (Jones, 2009). With an interdisciplinary approach, pupils develop lasting knowledge (Lupo et al., 2019). The key to a successful interdisciplinary class is thorough planning (Purcell Cone et al., 2009). Even though planning such a lesson takes more time, the result usually has a good impact on the development of critical thinking and the ability to communicate and create (Lupo et al., 2019). These two qualities are among the most attractive and sought after in the job market today (Jones, 2009).

The starting point for planning an interdisciplinary approach is the structure and process of children's appropriation and expression of the world, not a school subject (Halapine, 2004; Milekšič, 1992). If we want to plan very successful interdisciplinary teaching, we need to meet certain conditions related to flexibility of schedule and organisation of schoolwork, a suitable work space and, if necessary, collaboration with other teachers, or a teaching team (Purcell Cone et al., 2009). In this regard, teachers must also be didactically and professionally qualified (Jones, 2009; Štemberger, 2007). All principles of the educational process must be considered when planning an interdisciplinary lesson (Štemberger, 2007). It is important to be familiar with contemporary techniques of planning the process and be aware of the developmental specifics of the children in the classroom. It is beneficial for the teacher to know what educational

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goals have already been achieved in previous years (Bopegedera, 2005; Brouillette & Graham, 2016). Educational goals to be achieved must be carefully planned and set (Bopegedera, 2005; Jones, 2009). The objectives need to be set separately for each subject and then the common content is meaningfully selected (Bopegedera, 2005). Consistency and accuracy are very important when planning an interdisciplinary lesson, because if not, the approach will not be achieved (Jurkovič, 2007). One of the benefits of an interdisciplinary approach is the promotion of wholesome pupil activity - the independent and active acquisition of the learning experience (Bopegedera, 2005; Halapine, 2004). The interdisciplinary approach can address pupils' cognitive, emotional, and psychomotor skills and increase their ability to learn (Jones, 2009). When pupils can connect different concepts and views on a particular topic, it means that they understand it better as well (Haidman et al., 2019; Maison et al., 2019). The connexion also helps in identifying pupils' misconceptions about learning (Mutlu & Nacaroğlu, 2019). In this context, it is also important for teachers to know how to teach pupils about learning (Petek & Lazzarich, 2019). An interdisciplinary approach can also have a negative impact when didactic solutions are oversimplified (Cutting & Kelly, 2015), learning goals are undefined (Bopegedera, 2005) or focused only on content connections, specifics of a subject are neglected, and when a teacher has problems with organisation and implementation (Sicherl Kafol, 2007). Science offers many opportunities for an interdisciplinary approach as it can be associated with many subjects (Barton & Haslett, 2007). Interdisciplinary work in science develops systematic thinking, which involves the analytical decomposition of a problem into smaller units and the ability to synthesise different results that can describe a particular phenomenon (Barton & Haslett, 2007; Beane, 1997; Busta & Russo, 2020). Pupils who are not confident in scientific areas can bring their knowledge from their strengths into a scientific context. This allows them to see that they can also be successful in science (Cutting & Kelly, 2015; Labianca & Reeves, 1980). Science speaks of the laws of nature, which we are still trying to understand, but fine art is supposed to be a concept we can all grasp. However, after reviewing the literature, we can still find that everyone has a different explanation for fine art (Cutting & Kelly, 2015). Therefore, fine art is more difficult to define than the laws of nature because it affects our feelings and stimulates our brain in different ways-visual, auditory, and through smells and touch. Coming into contact with art is therefore a very different and individual experience for each of us (Tacol & Šupšakova, 2019; Tamir, 2000). In science, the individual experience of a pupil in the role of a researcher is often neglected. Too rarely do we ask ourselves how a particular pupil or researcher came up with the idea for their way of doing research, how they were organised, what motivated them, and so on (Eisner & Powell, 2002). Thus, it happens that we do not use an interdisciplinary approach with the content in science that actually allows for an interdisciplinary connection with the fine art (Eisner & Powell, 2002). When we use an interdisciplinary approach between fine art and science, we can provide students with a special learning experience that motivates them from the standpoint of achieving certain scientific goals that may be difficult for some pupils to understand without the interdisciplinary connection (Potočnik & Devetak, 2018) as the learning content of science subjects are often interpreted as difficult and abstract to understand and learn (Pavlin & Čampa, 2021). When we include an artistic aspect in solving scientific challenges, we add an emotional component to the experience (Halapine, 2004). Connecting fine art and science allows pupils to use their understanding of scientific concepts to create artwork. We can use a science and art approach to present concepts to pupils through this type of interdisciplinary approach. Experimental learning is very prominent (Bowie & Cassim, 2016). It allows pupils to grasp an experience associated with a concept from two perspectives of very different fields. In this way, they can get a more holistic picture of the concept (Bopegedera, 2005; Dinçol Özgür & Yilmaz, 2017).

Despite the advantages of such an interdisciplinary approach, there is still a gap between the professions of science and art. Although these two fields are not difficult to connect, we find it hard to imagine and we reject the connection (Kandel & Mack, 2003). To overcome this kind of obstacle, we need to improve the previous good practice and connect common interests and goals. Science and art can be connected mainly through problem solving and experimental situations (Wenham, 1998). If we decide to adopt an interdisciplinary approach between science and fine art, we must be careful not to force it. We need to have legitimate reasons for using it and we also need the right conditions to accompany interdisciplinary teaching (Štemberger, 2007). We need to be careful to know the difference between artworks and scientific sketches, images and photographs. Scientific sketches must be clear, the information on them must be reliable, and aesthetically, they must be well organised and easy to read. If we mix scientific and artistic sketches, pictures, etc., we can create a problem with understanding the concepts and thus cause uncertainty among pupils (Tacol & Šupšákova, 2019). The connection should not simplify artistic and scientific theories but provide a different perspective to them (Kandel & Mack, 2003). Otherwise, situations can arise that lead to false, deceptive, and unscientific methods (Cutting & Kelly, 2015).

Methodology

Research Design

In Slovenian primary school, pupils from the first to the ninth grade - aged 6 to 14 - have a school subject related only to fine art (implemented by primary school teachers aged 6 to 10 and fine art teachers aged 11 to 14). In this subject, pupils develop artistic literacy, which comes from an understanding of visual space and is expressed in the active transformation of this space into art space (Kocjančič et al., 2011). Pupils receive science education through a school subject called "Knowing of the Environment" (pupils aged from 6 to 8 years). In this subject, pupils learn about different content from science and social studies (Kolar et al., 2011). They also have a school subject called "Science and Technology" (pupils aged from 9 to 10). In this subject, contents from science and technology are interwoven (Vodopivec et al., 2011). The fact is that there are guidelines for Slovenian primary school teachers to include interdisciplinary teaching of science and art. In the curricula for "Knowing the Environment" and "Science and Technology" the interdisciplinary approach is mentioned as a recommendation. The curricula also have a chapter dedicated to didactic recommendations related to interdisciplinary teaching. Among the recommendations, possible connections with fine art are also mentioned (Kocjančič et al., 2011; Kolar et al., 2011). In the fine art curriculum, the interdisciplinary approach is mentioned as one of the main concepts of the subject (Kocjančič et al., 2011).

The research focuses on primary school teachers' opinions about the implementation of the interdisciplinary approach in their teaching. It also examines how primary school teachers plan to incorporate science and visual arts learning objectives into their publicly available anonymous lesson plans.

In this research, we focused on the following research questions:

1. What are the different viewpoints of primary school teachers regarding the interdisciplinary approach between science and fine art, and in which educational period (age 6 to 8 or age 9 to 10) do they find it more useful to use it?

2. How often do primary school teachers use the interdisciplinary approach between science and fine art and with what content?

3. Do primary school teachers address the goals and concepts from both areas equally?

Sample and Data Collection

The research involved the use of a descriptive method based on studied literature and an empirical part in which qualitative and quantitative research approaches were used. We used a causal non-experimental method of educational research.

A total of 138 primary school teachers participated in the study. The sample is non-random. The participating teachers teach children aged 6 to 10 years. Some teachers teach younger children from the first educational period (as pupils aged 6 to 8 are called in Slovenia) and some teachers teach children from the second educational period (as pupils aged 9 to 10 are called in Slovenia). In the interview, the sample was also not random. In total, 9 primary school teachers cooperated.

Table 1. The questions from the interview

1. Why, or why not, do you choose to use an interdisciplinary approach between science and fine art subjects in your work?
2. How do you envision this interdisciplinary approach; how would you define it?
3. Do you think it makes more sense to use an interdisciplinary approach of fine art and science subjects in the lower (age 6 to 8) or higher grades (age 9 to 10)? Why do you have this opinion?

For the analysis of lesson plans, 30 anonymously written lesson plans were acquired from publicly available websites and forums, as well as from the teachers who cooperated in the research.

Analyzing of Data

Primary school teachers indicated their opinions about the meaningfulness of the interdisciplinary approach between science and fine art in relation to the age of the children on a closed scale from one to five. They were asked about the meaningfulness of the interdisciplinary teaching explored for children aged 6 to 8 and the same question for children aged 9 to 10. The teachers also expressed their opinion on the topic with an additional open type question. In the questionnaire, teachers also answered the question about the frequency of using the interdisciplinary approach between science and fine art. They chose between the options: never, rarely, occasionally, frequently and very frequently. In the interview, teachers were again asked about the frequency of use of the researched interdisciplinary approach, why they chose it, what associations they had with it, how they would explain what it is, and if they could give an example of said interdisciplinary approach. They were also asked what age of children they thought the approach would be most appropriate for and why. A structured formula was used in the analysis of the lesson plans. Lesson plans were used that indicated they included the interdisciplinary approach between science and art. We examined whether the lesson plans had clearly defined learning objectives and whether the objectives regarding the lesson plan were met. We found the number of lesson plans with clearly defined learning objectives from both domains, the number of lesson plans that included content from both domains, and the number of stated and achieved learning objectives from both domains. In discussions among the authors of this paper, a rubric for lesson plans was developed. This rubric was used to collect data. After the data collection, the authors discussed and reached a 96% agreement. Based on this data, codes and findings were formed and descriptively described. Basic statistical measures were calculated (arithmetic mean, frequency of responses, measure of dispersion, correlations, and discriminations) to process the data collected from the questionnaires (Mesec, 1998). For the analysis of the interviews, a qualitative approach of data analysis with determination of codes and categories was used. Each author conducted an analysis of the interview data and codes were established. The codes were then discussed, and the agreement was 94%. In cases where the authors assigned different codes to specific interview data, the discussion led to agreement on how to assign a code to each interview data. For the analysis of lesson plans, the method of document analysis (Vogrinc, 2008) was used. A combined question type was used for the questionnaire. Open-ended question types were also used in the interview. Lesson plans were acquired from interviewed teachers and from forums on websites. A qualitative approach was used to process the documents (Mesec, 1998; Vogrinc, 2008). Process models from analyses were created prior to interviewing. A list of categories and subcategories was created. Data that correlated with the categories were written down and additionally summed. From this, themes or main ideas were formed. In this way, the data described were logically ordered. The data were included in the narrative description of the findings. The literature was also largely included in the written description of findings. The findings were summarised in relation to the literature and findings from the research (Vogrinc, 2008).

Results

The literature often confirms a positive impact of the interdisciplinary approach between science and fine art in primary school (Brouillette & Graham, 2016; Cutting & Kelly, 2015; Haidman et al., 2019). In the following text we present the results of the study among Slovenian primary school teachers collected through questionnaires, interviews, and the analysis of lesson plans. Therefore, we focused on teachers' opinions regarding the interdisciplinary approach between science and fine art - their points of view (perceptions) about the interdisciplinary connection, the frequency of its use, the concepts that most connect teachers and the equality of teaching about learning objectives from both areas of the interdisciplinary connection. Equally taught learning objectives are the indicators of the interdisciplinary approach in the truest sense of the word.

The following is the first research question and the results obtained. What are the different viewpoints of primary school teachers regarding the interdisciplinary approach between science and fine art, and in which educational period (age 6 to 8 or age 9 to 10) do they find it more useful to use it?

From Table 2, it can be summarised that teachers overwhelmingly justify the interdisciplinary approach between science and fine art as useful. A few less justify the approach as very meaningful. None of the teachers who responded consider the approach to be pointless.

Table 2. Opinion about the importance of the interdisciplinary approach between science and fine art

The meaningfulness of the interdisciplinary approach	f	f %
Completely meaningless	0	0
Meaningless	1	0,5
Undecided	13	10
Meaningful	89	64,5
Very meaningful	35	25,5
Total	**138**	**100**

In the questionnaires and interviews, teachers justified their positive opinion. They stated that pupils memorise the subject matter better and easier, the approach itself is useful and brings many opportunities to make the lessons more interesting.

Table 3. Codes and Categories from teachers' interview responses about positive attitudes, benefits, and limitations of the interdisciplinary approach

Codes	Categories
Easier and better memorization of science concepts during art activities; additional clarification of science and art concepts; easier presentation of the problem; greater interest; more interesting didactic activities	Positive attitudes and benefits
It is easier to combine science with other subjects; pupils have a deeper experience in the science part, while the fine art part only follows the science part (the fine art part is neglected)	Limitations

Pupils are more motivated, have direct experiences with the materials and linking different contents - learning about real life experiences is made possible, e.g.: "*I use an interdisciplinary approach because it gives the kids extra motivation ... it is easier for them to insist on the science part if they can make artworks at the same time and deal with both subjects indirectly (Teacher 8)*". Teachers also indicated some negative observations. They stated that learning objectives related to fine art are neglected, e.g.: "*I think fine art kind of falls behind because kids often just focus on the issue and delve into the science aspect of it. The products are then inferior from a fine art perspective (Teacher 3)*" and that science is easier to connect with other school subjects than fine art, e.g.: *"I do not often use the interdisciplinary approach between fine art and science... I find it easier to combine science with other subjects, such as Slovenian language, mathematics, or music (Teacher 9)"*.

The results of the teachers' questioning about the usefulness of an interdisciplinary approach between science and fine art in relation to the age of the pupils are presented below.

Table 4. Opinion about the usefulness of an interdisciplinary approach in the first (6 - 8 years) and second (9 - 10 years) educational periods

	Completely meaningless		Meaningless		Undecided		Meaningful		Very meaningful		Total	
	f	f%	f	f%	f	f %	f	f%	f	f%	f	f%
First educational period (6 - 8 years)	0	0	1	1	5	7	50	68	18	24	74	100
Second educational period (9 - 10 years)	0	0	0	0	8	13	39	61	17	27	64	100
Total	0	0	1	7	13	9	89	65	35	25	138	100

On average, teachers found the above interdisciplinary approach useful in both (M=4.1; SD =0.6) educational periods (6-8 and 9-10 years). Most of the teachers rated the interdisciplinary approach as useful for children aged 6-8 years (68%), while 24% of the teachers find the said approach very useful. After that, there are some undecided teachers (7%) and teachers who rated the approach as meaningless (1%). None of the teachers who answered the question find the approach totally useless for children aged 6 to 8 years. Most of the teachers (61%) rate the said approach as useful for children aged 9 to 10 years. Some of the participating teachers think that the approach is very useful (27%), some of them (13%) are undecided on the matter, but none of the participating teachers think that the approach is pointless or totally pointless. In the open part of the questionnaire, there were some participating teachers who stated that the approach is more useful in the first period of education (ages 6-8). They explained their opinion and said that teaching and learning at a practical level is more important for younger children. They also stated that there is more content in the curricula of the first educational period in Slovenia (ages 6-8) that can relate to an interdisciplinary approach.

Table 5. Codes and Categories from teachers' interview responses about the age of the pupils and the planning of the interdisciplinary approach

Codes	Categories
In both ranges (6-8 and 9-10 years), as they constantly acquire manual skills and expand the content of the subjects; at the practical level, work must be done mainly in the first range, but the connecting content is also useful in the higher grades	Age of the pupils
It is not necessary that the activities are separated, e.g., two hours of science and two hours of fine arts; we can combine the activities equally (according to the objectives of a single subject); the content is determined by the curriculum and the activities depend on the planning of the teacher; it is necessary to plan the interdisciplinary activity with quality	Planning of the process

Teachers from the interview stated that they think an interdisciplinary approach is useful regardless of the age of the pupils, e.g.: *"In both cases it makes sense to me ... it depends on the level of understanding and development... the tasks need to be designed so that the kids understand them (Teacher 6"*). They think that with such approach all pupils can gain important craft skills, e.g.: *"Pupils acquire manual skills in this way (Teacher 2"*). They emphasised that the interdisciplinary connection can be found in any curriculum if you look for it. They believe that it is more important to adapt methods and lesson planning to the developmental level of pupils and to specific needs in the classroom than to decide whether to use the approach for certain age groups. In this context, they emphasise that careful lesson planning is very important when it comes to successful interdisciplinary teaching, e.g.: *"It seems to me that the pupils' interest depends on the teacher's preparation ... the content is determined by the curriculum, and the activity depends on the teacher's planning, that is crucial (Teacher 7)"*.

The second research question is: How often do primary school teachers use the interdisciplinary approach between science and fine art and with what content?

We investigated the frequency of using the interdisciplinary approach between science and fine arts in Slovenian schools. Half of the teachers (52%) reported that they use the interdisciplinary approach occasionally, about once a month. The rest of the teachers use the approach rarely/never or frequently/very frequently. Teachers defined the content they thought made the most sense for the interdisciplinary approach between science and fine art. They said that this is also the content that most connects them. In the first education period (ages 6-8), they named the following combinations of concepts as the most meaningful: forces and motion (science) and line (art) (32% of teachers found this meaningful), procedures (science), and drawing, painting, sculpting, and graphic accessories (art) (25% of teachers found this meaningful). This is followed by the combination of procedures and skill (science) and drawing and sketching (art). The combinations of natural events (science) with the concepts of prints (2% of responses), substances (science) and galleries (art) (11% of teachers found it useful), forces and motion (science) with colours (art) (2% of teachers found it useful), and forces and motion (science) with galleries (art) (2% of teachers found it useful) are the least popular among participating teachers. In the second educational period (ages 9-10), teachers named the following combinations of concepts as the most meaningful: living things (science) and sculptures (art) (62% of teachers found it meaningful), people (science) and sculptures (art) (62% of teachers found it meaningful) and living things (science) with warm and cool colours (art) (48% of teachers found it meaningful). The connections between concepts of ceramics, letterpress, and rhythm (art) with the concept of substances (science) were not considered meaningful by any of the participating teachers. The most frequently mentioned concepts that lend themselves well to interdisciplinary connections in science relate to people and living things and conservation and substances. The most frequently mentioned concepts in the art relate to sculpture and spatial design. The concepts of shapes and surface design are not mentioned as often but are still represented.

The third research question is whether primary school teachers address the goals and concepts from both areas equally? Analysis of the 30 lesson plans shows (see Table 6) that only one of the lesson plans had appropriate fine art and science learning objectives, but it was not indicated as interdisciplinary approach.

Table 6. Analysis of lesson plans that included the interdisciplinary approach between science and fine art

Number of lesson plans: 30 (100%)			
Number of lesson plans clearly stated to include an interdisciplinary approach between science and fine art			29 (97%)
Number of lesson plans that included clearly stated objectives from both fields			0 (0%)
Number of lesson plans that included both fine art and science content			13 (43%)
Number of science learning objectives stated in lesson plans	18	Number of science learning objectives met in relation to lesson plan content	18 (100%)
Number of fine art learning objectives specified in lesson plans	176	Number of fine art learning objectives met in relation to lesson plan content	167 (95%)

None of the lesson plans had clearly articulated cross-curricular learning objectives, that is, none of the lesson plans had objectives that related to the subjects that were to be connected interdisciplinary. Teachers noted that almost all lesson plans included an interdisciplinary approach, but only 13 of them had clear connections between fine art and science content. There were many lesson plans that had potential for enhancement that could be met by adding more learning objectives and more detailed content. However, they did not include cross-curricular learning objectives and content at a level where they would be clearly separated in relation to the areas and learning objectives written down in the lesson plan. Lesson plans were also found to have fewer science learning objectives, or none. Learning objectives from both areas were counted and it was found that there were only 18 written and met objectives from science and 176 written objectives from fine art in the lesson plans, 95% of which were met. Science content was included as a motif or as an aid in presenting materials and techniques or in presenting and solving problems in the fine art. In reviewing the lesson plans, it was also noted that although the teachers in the study defined the interdisciplinary approach quite clearly, they still mostly had difficulty in planning interdisciplinary lessons. Although the lesson plans showed some good opportunities to implement the interdisciplinary approach correctly, the teachers were not able to formulate appropriate objectives. Some of the lesson plans mentioned science content only briefly, so that it was not even explained; it was used as an association (the content was only mentioned so that the children remembered that they had heard about it somewhere, but no learning objectives from this area were achieved).

Discussion

From the results, we can conclude that teachers use the interdisciplinary approach between science and fine art quite frequently. Their views about it are mostly positive. Primary school teachers in Slovenia think that this approach can be useful in the first (age 6-8) and in the second (age 9-10) educational periods. Some of them mentioned that pupils in the first educational period need a lot of practical experiences, which the researched approach can provide. Teachers mentioned connections with the scientific concepts of living things and people, conservation, and substances as the most useful. Connections between concepts related to living things and people are meaningful because we can draw important sources for pupils' visual and creative development from this topic (Halapine, 2004). Basic recognition of the simple anatomy of animals, humans, and plants can keep pupils from relying on unreliable and trivial models that have been presented to them but not well explained. With such models, we cut off their development of fine art skills

(Wenham, 1998). The correlation with ecology and conservation is also useful because some concepts from these fields can help with a deeper understanding of fine art concepts and vice versa (Mutlu & Nacaroğlu, 2019; Ozer Aytekin, 2020). Some teachers understand scientific experiments, sketching and making posters related to scientific content as an interdisciplinary correlation between science and fine art. Such cases cannot be defined as interdisciplinary because they do not involve fine art learning objectives (Cutting & Kelly, 2015; Tacol, 2003). For example, even if pupils draw something, it is important for a teacher to distinguish between artwork and scientific sketches, which are made during science lessons and therefore have no fine art education value (Karlavaris & Berce Golob, 1991). Teachers are mostly able to correctly define the interdisciplinary approach in this study. Most of them mention interdisciplinary learning objectives and look for them in the curriculum. Accordingly, it is surprising that it was clear from the review of lesson plans that they have difficulties in planning interdisciplinary lessons. It is to be hoped that many teachers, though deficient in the design of suitable lesson plans, will compensate by their performance in the classroom. However, most participating teachers still have much room for improvement. With well-written lesson plans, they can only contribute to the quality of teaching. For optimum performance, a lot of effort must be put into thorough planning (Purcell Cone et al., 2009). The teachers' professional and didactic competence and an optimal working environment matter (Štemberger, 2007). Teachers usually refrain from writing down interdisciplinary learning objectives, which are a very important part of the interdisciplinary approach itself. With clearly written objectives, we could avoid neglecting one of the subjects, which is one of the possible problems that can occur in the interdisciplinary connection of fine art and science. Writing down learning goals is one of the conditions for a high-quality interdisciplinary approach (Purcell Cone et al., 2009; Štemberger, 2007). Teachers mostly noted neglect of fine art, but when reviewing lesson plans, it was found that they mostly omit science learning objectives, even if they label the lesson plan as an interdisciplinary lesson that includes fine art and scientific content. They usually focus on content and motive. They base fine art problems on it, and as soon as there is a scientific aftertaste to it, they mark the lesson as interdisciplinary. Even though some of the science learning objectives are sometimes met in such lessons, teachers would be more aware of them if they wrote them down. This would make them focus more on them.

Conclusion

Primary school teachers in Slovenia are aware of the benefits of an interdisciplinary approach between science and fine art, but some of them do not approach it properly. They plan it very carelessly. Although the curricula in Slovenian schools contain recommendations for the interdisciplinary approach, it would be helpful if some instructions were added in the chapters related to the approach. For example, the instructions could include precise recommendations on how to write lesson plans, state objectives and compose the lesson. Since the lesson plan is usually the first tool the teacher reaches for when planning a lesson, even a few additional sentences could make a difference.

Recommendations

For the future research, we should avoid differentiating pupils in the first and second educational periods, as was found, teachers think the approach is appropriate for both. As for the analysis of lesson plans, it would be good to focus on those that incorporate fine art goals into science instruction rather than the other way around. From our research, it is also clear that there are possible avenues for future research. Since teachers seem to have the most difficulty with planning this approach, researching this topic would likely yield useful results that would help solve problems encountered when using this type of interdisciplinary approach.

The implications for teaching focus on the recommendations that teachers develop very specific fine art and science-oriented lesson plans. These lesson plans should include appropriately selected learning objectives from both subject curricula. To achieve these goals, teachers develop specific fine art and science activities, attempting to clearly connect the two subject areas. Using this approach, teachers should avoid neglecting one subject while focusing on the other, as this could lead to problems encountered when combining fine art and science in an interdisciplinary manner.

Limitations

There are some limitations to this research. There were difficulties in recruiting teachers for this research, especially those who try to incorporate art into science and vice versa, so we included those teachers who were willing to participate. It was difficult to find publicly available lesson plans to analyse (online forums and similar internet pages). We were able to gather more fine art plans that included cross-curricular science objectives than the other way around. It would be good to also focus on those that incorporated fine art objectives into science lessons if we could get them from teachers and other available sources.

Authorship Contribution Statement

Potočnik: Conceptualization, design, analysis, writing. Košir: Data acquisition, data analysis / interpretation. Devetak: Editing/reviewing, supervision.

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