Analysis and interpretation of an historical photograph among future teachers of social science subjects: Research using the eye-tracking method

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ABSTRACT

This article presents the findings of mixed-design research carried out in 2021 on a sample of students who were training to become teachers of social sciences subjects. The aim of the research was to determine the extent to which a carefully considered, didactically structured analysis of an iconographic historical source (an historical photograph depicting the occupation of Czechoslovakia by Warsaw Pact troops on 21 August 1968) influences the quality of the source's perception, analysis and interpretation. A computer test with a set of questions for the respondents (test subjects) was created as a research tool. The study used three methods of data collection and processing: audio recording analysis using open axial coding and categorization; eye-tracking to investigate the perception strategies of the test subjects; and structured interviews carried out with the test subjects following the test, in order to gain information about the course of the test and to indicate potential options for modifying the research tool. The results of the study showed that a didactically structured analysis of the iconographic source had a substantial positive effect on the students' perception strategies and the quality of their interpretation. If the test subjects are not guided towards a thorough observation of the image, identifying its individual elements and determining their meanings, they mostly overlook these important elements entirely, and their interpretation as a whole is very superficial. Another aspect of the source that is usually overlooked is the level of empathy, i.e. understanding of the individual experiences of the depicted people, bringing multiperspectivity in the perception of the depicted situation. These research findings should be taken into consideration during pre-graduate training for future teachers of social sciences subjects; graduates of teacher training degrees should possess these specific competencies and be able to implement didactically structured analyses and interpretations of historical sources in their teaching at primary and secondary schools.

KEYWORDS

Field-specific didactic research, Eye-tracking, Visual perception, Historical analysis, Historical image interpretation, Historical photographs, Teacher training students

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Introduction

International discussions among experts regarding the aims, principles and content of history teaching in the post-communist countries have been underway for more than a quarter of a century, and these discussions are helping to encourage the teaching profession towards a deep-rooted transformation of didactic paradigms. In the initial phase, these discussions focused mainly on de-ideologizing the presentation of history, and they subsequently shifted to emphasizing the principle of multiperspectivity (Stradling, 2003). This development was accompanied by a gradual shift away from narratively conceived, synthetizing textbooks, dominated by the authors' interpretation of history, towards textbooks based on constructivist principles and focusing on the development of historical thinking competencies. An inquiry-based approach, widely used in various pedagogical fields such as natural sciences didactics, has also begun to be applied in humanities and social sciences education. In the Czech Republic, unlike some other countries (such as the UK, France or Germany), this approach is still in its infancy. The inquiry-based approach develops pupils' competencies in analyzing and interpreting various types of historical sources – not only texts, but also iconographic, audiovisual and other types of sources: works of visual art, photographs, caricatures, posters, advertising, documentary and fictional films, graphs and statistical tables, cartographic materials, etc. (Sauer, 2000; Pandel & Schneider, 2005; Labischová, 2008; Schnakenberg, 2012; Činátl & Pinkas, 2014; Beneš & Gracová, 2015).

Besides this competency-based concept of education, there has also been a visible shift on the level of content, especially in the increased emphasis on 20th-century history and contemporary history. The aim of school history teaching in this context is primarily to ensure that pupils understand key milestones and events in modern and contemporary history, and are able to evaluate them critically and compare various interpretations of them. In the Czech Republic, these changes have been reflected in the school curriculum; the revision of the *Framework Education Programmes for Primary Education* should be complete by 2024 (RVP ZV, 2005). Increasing emphasis is being placed on interdisciplinarity, specifically on the interconnection of history and social sciences (civic studies); this principle is also embedded in the Czech secondary education curriculum. Schools have the option to create an integrated subject on the level of the school curriculum entitled "People and Society", which integrates the content of history and social sciences teaching. This is nothing new; a similar model has been implemented with a fair degree of success for example at *Gymnasium*-type schools in Austria, where students attend the obligatory subject "Geschichte und Sozialkunde/Politische Bildung" (history and social sciences/political education). The integration of related disciplines is also accentuated in the dimension of field-specific didactics; the approach known as trans-disciplinary didactics focuses on integrated similar content and methodological approaches on the level of empirical research and on creating close interconnections with school practice (Janík & Najvar, 2011; Slavík et al., 2017).

However, the integrative concept of history and social sciences means that cross-cutting topics need to be incorporated into pre-graduate teacher training in order to ensure that future teachers will be able to teach the new-concept subjects with a high level of competence. This involves giving teacher training students a grounding in philosophy, political science, sociology, and (for future

history teachers) current political and social affairs; it also requires the incorporation of selected chapters from 20th-century history into the curricula of teacher training degrees for future teachers of social science fundamentals and civic studies. Besides providing a factual basis, it is also necessary to form and cultivate historical thinking competencies among future teachers of social sciences subjects, and their analytical and interpretative skills need to be systematically developed and enhanced. The analytical and interpretative models developed as part of history teaching didactics can be further modified and transferred to the educational content of social sciences subjects (e.g. a model originally developed for analyzing and interpreting a historical caricature can be modified and applied to present-day caricatures).

Theoretical basis

Visuality in history is investigated by a distinct area of historiographic research known as visual history. Here, iconographic historical sources are not viewed merely as a "supplement" to written or material sources; instead they are a subject of research in their own right (Paul, 2006; Handro & Schönemann, 2011). Visual sources (in history teaching, all visual didactic media) imbue knowledge of the contemporary world with a striking visuality, and they are an important type of material for the development of historical thinking competencies in pupils. They should not be used solely for illustrative, decorative functions (Mareš, 1995); instead, it is important that they should serve as effective carriers of historical information and historical knowledge.

When working with visual media, it is essential to didactically structure and guide iconographic perception, including a detailed description of individual elements and symbols. Research shows that if pupils perceive visual historical sources without any further information, their understanding is usually superficial or entirely erroneous; the teacher plays a crucial role in guiding pupils' perception and contextualizing the visual information within their system of prior knowledge – including judicious work with pre-concepts (Bernhardt, 2011, p. 46). It is also desirable to focus (usually by using catalogues of questions for pupils) on higher cognitive operations – analysis, comparison and interpretation, explanation of the historical and socio-political context, evaluation of the entire historical situation, characterization of the author's intentions and attitudes. Further key aspects are imagination, the development of empathy, the emotional level, aesthetic aspects, and the reflective nature of the entire analysis (Sauer, 2000; Pilarczyk & Mietzner, 2005; Lange, 2011; Labischová, 2020).

One type of material that can be widely utilized in the teaching process to support learning about 20th-century and contemporary history and to develop understanding of key events and processes is the historical photograph. This type of material documents not only important political events, but also other aspects; many historical photographs encompass psychological and social levels of meaning, capturing various social interactions, moments in working life, everyday life and leisure activities, family history, the history of childhood, fashion, the development of advertising, and more. In this connection, it is possible to apply one of the fundamental principles of historical education – the above-mentioned principle of multiperspectivity – as well as developing various aspects of historical empathy. Multiperspectivity is based on the assumption that no single historical narrative exists, and that historical events should be viewed from various perspectives (national, social, ethnic, political, cultural, gender). A multiperspectival approach to the same historical event and its evaluation contributes to a greater understanding of the past as well as an awareness of possible stereotypes in historical perception (Abbey & Wansink, 2022; Kropman, van Drie, & van Boxtel, 2019; Stradling, 2003).

A further important phenomenon is historical empathy. This enables us to empathize with the perceptions and experiences of people in the past, helping us to understand their emotions – though it is possible to maintain a certin distance, and we need not necessarily share those emotions. Historical empathy is not limited to the affective level; it also helps us to understand the motives that led to a particular action, behaviour, decision, or solution of a dilemma in various historical situations (Ellenwood, 2018; Lazarakou, 2008). Historical photographs offer considerable potential for developing historical empathy as part of history teaching.

Analysis and interpretation of historical photographs should focus not solely on their content, but also on their formal aspects and the means of expression used in them (e.g. black-and-white vs. colour photographs, light vs. shadow, perspective, interior vs. exterior, studio photographs vs. "spontaneous" moments, etc.). Other didactically beneficial aspects include various alterations of photographs, subsequent modifications, retouching and so on, as well as the purpose of these alterations, e.g. for use in propaganda (Labischová, 2020).

As has been stated above, there exist various interpretative models that can be used when analyzing and interpreting historical photographs in history teaching (Sauer, 2000; Pandel & Schneider, 2005; Schnakenberg, 2012). One example is Pandel's didactic model (Pandel, 2011, pp. 83–84), which comprises:

1. *Description and naming of elements and symbols* (who is shown in a photograph, how many people there are, what they are doing, their expressions and gestures, the place and time at which the scene took place).

2. *Meanings* (ethnic, social etc. affiliations of the people in the photograph, formal vs. informal relationships, their behaviour, the situational context).

3. *Documentary importance* (which historical event is depicted, whether it is a one-off or repeated event, who was or could have been the photographer, the purpose for which the photograph was taken, why this particular photograph is used in teaching/in a textbook).

4. *Narration* (narrate the story of the depicted moment, including what happened before and after the depicted scene).

This study presents the results of empirical research using the eye-tracking method, which is very useful for investigating mental processes of visual perception and cognition (in the case the analysis and interpretation of iconographic materials) by monitoring eye movements (Duchowski, 2007). This method was originally applied outside the education system, e.g. in military applications, driver training, marketing and advertising, cartography or kinanthropology. A useful basis for pedagogical research can be provided by cognitive psychology (Rehder & Hoffman, 2005; Vandeberg et al., 2013; Dogusoy-Taylan & Cagiltay, 2014). Educational research has so far focused its attention primarily on the process of reading (and related disorders), specific features of on-line teaching and e-learning, and processes of perception when engaged in learning tasks (Jamet, 2014; Kekule, 2014; Knight & Horsley, 2014; Persaud & Eliot, 2014). In history and social sciences teaching didactics, several studies have explored the research potential of the eye-tracking method by comparing didactically structured and unstructured analyses of historical sources, specifically caricatures in history teaching and pre-graduate teacher training (Labischová, 2018, 2019).

Research aims and methodology

The study presented here draws on previous research into the visual perception of historical caricatures. The main *aim* of the study was to determine whether there exist substantial differences in the quality of perception, analysis and interpretation of a historical photograph when carrying out a didactically unstructured learning task and a didactically structured task (using questions inspired by Pandel's interpretative model); the respondents (test subjects) were students training to be teachers of social sciences subjects.

Research design

The methodology used for the study was a mixed research design, combining qualitative and quantitative methods. Here the qualitative aspect is dominant; the quantitative aspect plays a supplementary role. The research tool used was a computer test carried out using a Tobii TX300 Eye Tracker machine with Tobii Studio software, consisting of one didactically unstructured question and a set of nine didactically structured questions guiding the test subjects in their analysis and interpretation of a historical photograph. The data analysis was carried out using the following methods:

- Audio recordings of the respondents' verbal answers were made. A literal transcription was made, and the answers were evaluated by means of open and axial coding, categorization and partial quantification of the data.

- Visual recordings made by the eye-tracking machine were evaluated (i) in the form of graphic depictions of the measurement results, and (ii) on the basis of statistical data and calculations (mean frequency and duration of individual eye fixations on precisely defined areas of interest). The graphic depicting incorporated (a) *gaze plots*, recording the trajectory of subjects' gaze and the positions of their individual fixations; (b) *heatmaps*, depicting the intensity of fixations using a colour scale on which red is the highest intensity and blue the lowest; (c) *gaze opacity maps*, on which the parts of the image with the most intense fixations are displayed in light shades while the places with the least intense fixations are dark.

- After completing the test, all the respondents (test subjects) reflected on the test via a structured interview whose main aim was to identify the test questions that were difficult or less comprehensible (if any) and to evaluate the proposed catalogue of test questions for pupils from a didactic perspective.

The test was based on a well-known photograph by Václav Toužimský, taken in the morning of 21 August 1968 in the Czech city of Liberec during the occupation of Czechoslovakia by Warsaw Pact troops (Figure 1). According to the photographer's memoirs, he took the photograph while standing on the roof of the city's photography centre and watching in amazement as a Soviet tank (no. 314) entered a covered arcade and collided with a pillar. The photograph captures the moment at which the tank crashed into one of the buildings lining the square. It is still not known what caused the accident; in Toužimský's opinion the tank driver may have momentarily fallen asleep or been under the influence of alcohol (Matyášová, 2014).

This particular photograph, Figure 1 (p. 6) was selected for a number of reasons. It depicts a scene from an important historical event; it captures a dynamic situation; and it shows a number of people behaving in various different ways (i.e. it is not a portrait photograph). It is also a photograph that is quite frequently used for didactic purposes, and it is featured in several history textbooks (Parkan et al., 2017, p. 123). Moreover, the situation depicted in this iconographic historical source offers opportunities for imagination; thinking about how the people depicted in the photograph experienced the events; and the creation of narratives.

Figure 1.

Czech city of Liberec, August 1968

Notes. Photographer, Václav Toužimský. The photograph has been cropped for the purposes of the test. Source: https://www.lidovky.cz/domov/pribehy-fotek-ze-srpna-68.A140820_214718_ln_domov_sm

The test itself involved looking at the photograph, reading the questions that were successively displayed on the computer monitor (with the photograph constantly visible), formulating verbal answers to the questions and saying the answers aloud. No time limit was set for answering.

The test consisted of ten questions:

1. What is depicted in the photograph?
2. Which historical event is it?
3. How did you recognize the historical event?
4. Why are there almost no cars in the street?
5. Does the tank have any special markings? Why?
6. How are the people in the foreground perceiving the situation?
7. Why are the people in the foreground looking on without doing anything?
8. What are the people at the right in the arcade experiencing?
9. What is the tank driver probably thinking?
10. How did representatives of Czechoslovakia react to the 1968 occupation?

The first question is a didactically unstructured, relatively general question. According to Bernhardt, this type of question is not ideal from a didactic perspective, and such questions often lead to a superficial, rapid glance at the photograph without any deeper understanding of its meaning (Bernhardt, 2011, p. 46).

The nine following questions comprise a structured didactic task based on general interpretative models. Question no. 2 is focused on the identification of the historical event (the occupation of Czechoslovakia by Warsaw Pact forces on 21 August 1968). Question no. 3 encourages respondents to situate the event within the context of their existing knowledge and to state which elements depicted in the photograph enabled them to identify the historical situation.

Questions nos. 4 and 5 encourage more detailed observation and explanation. Questions nos. 6–9 explore the psychological dimension, encouraging respondents to empathize and think about various motivations and causes of the depicted people's behaviour and experiences. The answers to these questions cannot be derived directly from the photographs; instead the focus is on historical imagination, which can be stimulated by appropriate questions. The answers may be inspired, for example, by the non-verbal behaviour of the people depicted (standing and looking on, walking past without showing much interest, running away through the arcade, etc.), and they can develop the respondent's imagination (What is the tank driver thinking? Does he actually know where he is? What effect does the civilians' behaviour have on him? Did he crash into the wall deliberately or by mistake?). The last question is likewise not directly related to the photograph, but requires a certain degree of knowledge related to the historical event.

The research was conducted in November 2021 in the eye-tracking research laboratory of the Faculty of Education, University of Ostrava (Czech Republic). The respondents were 18 students studying for a teacher training degree to become teachers of social sciences subjects. Students training to become history teachers were deliberately not included in the sample; the aim of the research was to determine the level of analytical and interpretative competencies in future teachers of related subjects, i.e. subjects which will incorporate interdisciplinary overlaps with history teaching. The respondents comprised 12 women and 8 men aged 20–24 who were training to become teachers of civic studies for primary schools in combination with training to become teachers of one other subject (mathematics, Czech language, English language, art education, physical education). The test lasted on average 10 minutes for each respondent. All the respondents received concise information about the form of the test and precise instructions on answering. Eye calibration was carried out before the test.

The testing complied with the basic ***ethical principles of pedagogical research***. All the test subjects signed an informed consent document prior to testing. They were informed about the aims and process of the research, and after the test they were able to see the results of their own test as well as the anonymized results for the entire tested group. The rules stipulated for the research process were complied with fully. Anonymity was assured, and the research data (the measurement data and transcripts of the audio recordings of the subjects' verbal answers) were stored in a password-protected computer. The names of the test subjects have been changed for the purposes of this paper.

Research results

The data collected as part of the research indicate that the eye-tracking method, in combination with the analysis of audio recordings and subsequent interviews focusing on the course and conditions of the test, can generate valuable information about the process of perception and cognition and about the different perception strategies used by respondents when interpreting historical sources – not only photographs, but also for example caricatures (Labischová, 2018) and other types of sources.

Analysis of audio recordings

Based on transcriptions of the audio recordings of respondents' verbal interpretations, open and axial coding, a categorial system was created. This system became the basis for the following phases of the research data analysis (Table 1).

Table 1

Proposed categorial system for the analysis and interpretation of a historical photograph, with specific examples of codes created during the analysis of the audio recordings of respondents' verbal answers

Category	Subcategory	Category designation	Description/content of the category, specific examples of codes
Historical event	Time	HU1	(21. 8.) 1968
	Location	HU2	Liberec, Czechoslovakia
	Description	HU3	occupation, invasion by Warsaw Pact (Soviet pact) forces
Elements of the photograph (detailed description)	People – appearance, outward manifestations of behavior	PF1	clothing, hair, hands in pockets, crossed arms, running away, standing
	Place and buildings	PF2	square, larger city, arcade, shops, (collapsing) wall, parking lot
	Objects and other	PF3	cars, motorcycles, bicycle, tram lines, tank (marked with a number and a stripe), signs (on shops), black-and-white photograph
People's experiences	People in the foreground	CH1	curiosity, passivity, doing nothing, surprise, waiting, dismay, powerlessness
	People in the arcade	CH2	panic, shock, fear (for lives), horror, feeling of danger
	Tank driver	CH3	obeying orders, unawareness, has wrong information (thinks he is liberating the country), regret, excitement, aggression, feeling of power, awareness of his mistake and fear of consequences, under the influence of substances (alcohol, drugs)
Broader historical context	Ideology	HK1	communism, socialism, reformist/conservative wings of the communist party
	Reaction of political representatives	HK2	powerlessness, passivity, consent (welcoming the arrival of troops), dissimulation (attempt to "smooth over" the situation), rise of conservative communists
	Reaction of the public	HK3	destruction of hopes, feeling of betrayal, emigration, passivity, active resistance among part of the population, aversion to Russians

All the subcategories in the categorical system presented above were quantified in terms of absolute frequencies. Graph 1 (p. 9) shows the differences in the quantitative occurrence of the individual codes between the didactically unstructured analysis (question no. 1 in the test) and the didactically structured analysis (questions nos. 2–10).

Graph 1

Comparison of absolute frequencies – Occurrence of subcategories (by code) in didactically structured and didactically unstructured analyses of the historical photograph
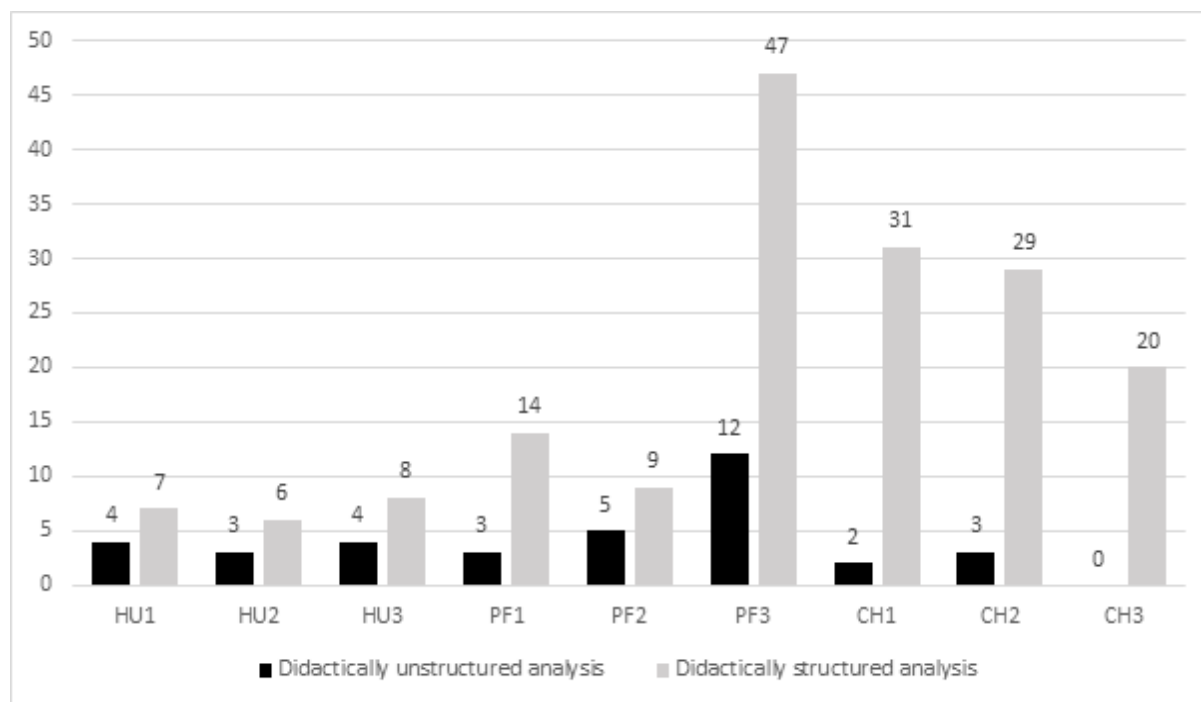
Graph 1 only shows categories HU, PF and CH because these categories were related to the direct observation of the photograph. Category HK (question no. 10 in the test) was not mentioned at all by the respondents in the case of the didactically unstructured analysis, and in the didactically structured analysis the frequency of occurrence of the subcategories was as follows: HK1 = 5, HK2 = 13, HK3 = 16. Comparing the occurrence of the subcategories for the other questions, it is evident that the occurrence was always substantially higher in the case of the didactically structured analysis – most strikingly in subcategory PF3, related to the detailed observation of the photograph (objects and other). There are also marked differences in subcategories CH1, CH2 and CH3, i.e. in the dimension of empathizing and imagining the experiences of the people in the foreground and in the arcade as well as the thoughts of the tank driver.

Focusing on the data collected from the answers to question no. 1, it can be stated that the didactically unstructured analysis and interpretation caused substantial problems for the future social sciences teachers. The respondents generally did not manage to correctly identify the historical event depicted, and one-third of them thought that it was a scene from the Second World War. Their observation of the photograph was very superficial; the most commonly mentioned element of the photograph was the tank which dominates the photograph. Questions nos. 2–10 were intended to guide the respondents, encouraging them to think more deeply about the photograph and to formulate more complex answers.

The combination of questions nos. 2 and 3 led to a more frequent recognition of the event depicted; this was aided by a thorough observation of the photograph and all the details depicted in it. Respondents most frequently mentioned the clothing and hairstyles, cars, the type of tank ("more modern than Second World War vehicles") and the shop signs:

> But it wasn't in Germany… When I look at it, I see the Czech sign *Sklo – porcelán*
> [Glass – porcelain], so it was in this country, I didn't see that before. (Robert)

In response to question no. 4 (about the reason for the absence of cars), students stated (with approximately equal frequency) the danger posed by military vehicles or fear of confiscation or damage, the prohibition of vehicles from entering the square, and the simple fact that car ownership was less common at the time. Question no. 4 proved particularly difficult (the markings on the tank). In the large majority of cases the students mentioned the number 314; only two respondents stated that the tank was marked with a white stripe to aid identification of the Warsaw Pact tanks.

Questions nos. 6–9 focused on multiperspectivity in interpretation (the different perceptions of the situation by the people standing and watching in the foreground, the people in mortal danger in the arcade, and the tank driver). In order to understand historical events, it is important to take into consideration not only knowledge, but also the affective dimension – the ability to empathize and to understand how the people involved would have experienced the events in different ways. The results of the study showed that teachers need to target this aspect of understanding, and to encourage and stimulate pupils to think in this manner.

Regarding the people standing in the foreground and looking on without doing anything, the respondents noticed that some of the people had their arms crossed or their hands in their pockets. The respondents mostly characterized these people's emotions as shock, surprise, curiosity, "paralysis" (in the sense of not knowing what they had to do), disappointment, dismay, and powerlessness (as civilians cannot do anything against military hardware that is clearly much more powerful than them). They repeatedly mentioned the "onlooker effect", noting parallels with the present day:

> If the photograph had been taken nowadays, those people would certainly have pulled out their mobile phones and captured the events. (Martina)

Regarding the people fleeing the scene of the collapsing wall after the tank's collision with the building, the answers most frequently mentioned panic, horror, shock, rapid escape, feelings of immediate danger, fear for life. The students' thoughts on the tank driver's experience are very interesting. Their answers diverge quite substantially. Some respondents thought that the tank driver must have been aggressive, aware of his superior power, enjoying his dominance, which excited him, or they stated that he was simply following orders. Other respondents thought about why the tank had collided with the building: the driver may have been under the influence of alcohol or other drugs, he may have crashed into the wall deliberately, or he may have made a mistake and was thus fearful of the consequences and the reaction of his superiors. Some of the students applied their prior knowledge of the historical event, and stated that the tank driver had been given incorrect information, so he did not know where he was and he thought that he had come to liberate the country.

Question no. 10 focused on the broader historical context and required a certain degree of knowledge of the historical event depicted. The respondents' answers did not distinguish much between the reactions of Czechoslovakia's political representatives and the reactions of the general public. With regard to the political representatives, they most frequently spoke about the destruction of the hope that had been engendered by the "Prague Spring", the end of Czechoslovakia's home-grown path of "socialism with a human face", subjection to the dictates of the Soviet Union, the retreat of the reformist wing of the communist party and the return of its conservative wing. With regard to the public, the respondents mentioned their immediate responses (reversing traffic signs, protest graffiti) as well as the longer-term consequences of the occupation (some citizens emigrated, others became dissidents, while others attempted to adapt to the new situation either in order to benefit their careers or simply out of fear).

The measurement with the Eye Tracker machine made it possible to record the precise length of time that the respondents devoted to each of the questions. Table 2 (p. 11) shows that there were no substantial differences in the answer times, so e.g. no gradual decline in concentration was noticed. The respondents spent the most time on the first and last questions.

Table 2

Average time spent observing the individual questions in the test (in seconds)

Question no.	1	2	3	4	5	6	7	8	9
Average time (s)	29.6	22.8	22.3	23.5	22.6	25.9	22.4	21.5	27.4

Note. Question no. 10 is not shown, as it does not relate directly to the observation of the photograph.

Analysis of visualized data

Visualized data collected by measuring with the Eye Tracker machine was generated, analyzed and subjected to comparison using heatmaps, gaze opacity maps and gaze plot maps to express the intensity of the respondents' gaze on the individual elements of the photograph, the course and frequency of their fixations, saccades and regressions. For selected test questions, areas of interest were monitored; these are specific areas of the photograph where respondents' gaze was concentrated or which were not looked at.

The results show substantial differences in the quality of perception of the photograph between the didactically unstructured analysis (question no. 1) and the didactically structured analysis (questions nos. 2–10). During the first question, the respondents' gaze focused almost exclusively on the central part of the photograph – the tank; this corresponds with the verbal answers that they gave. They briefly looked at the people standing in the foreground, but many of the respondents entirely overlooked the people in the arcade (at the right of the photograph) running away from the collapsing wall. This is evident from Figure 2 (the heatmap), and even more evident from Figure 3 (the gaze opacity map), which shows how a large part of the photograph remained a "blank", causing respondents to essentially ignore some of its important elements.

Figure 2

Heatmap (all respondents) – Question no. 1

1. Co je zachyceno na fotografii?

Figure 3

Gaze opacity map (all respondents) – Question no. 1

By comparison, the didactically structured questions encouraged the respondents to observe the photograph much more carefully and to focus their attention on various parts of the image. It should be pointed out that this concerns primarily questions nos. 3, 4 and 6–9, which encouraged the respondents to look at individual elements within the photograph (cars, the people in the foreground, the people in the arcade, the tank driver). By contrast, question no. 10 was not directly related to the observation of the photograph, instead requiring respondents to possess a degree of prior knowledge; here their gaze "wandered" in a highly random manner, often entirely outside the image.

Figures 4–6 present different variants of the data visualization (gaze plot map, gaze opacity map, heatmap). The gaze plot map makes it possible to visualize the course and progression of saccades and fixations, i.e. to identify the perception strategy chosen by each individual respondent, including which elements the respondent's gaze focused on first, which elements they focused on next (this progression is marked with numbers), and which elements the respondent's gaze returned to; the size of the circles indicates the differing durations of the fixations. For example, Figure 4 (for question no. 3, i.e. how the respondents recognized the historical event) shows that the respondent Vanda focused her gaze primarily on the central part of the photograph, but she then transferred her attention to the people in the foreground, and to a lesser extent to the people in the arcade. She hardly looked at the topmost part of the photograph, where there are no people (only broken windows), nor did she notice the shop signs.

The gaze opacity map (Figure 5 – for question no. 4, i.e. why there are hardly any cars in the street) shows that in this case the respondents looked carefully at the entire area of the square. The heatmap (Figure 6) likewise shows that the question (question no. 6, i.e. how the people in the foreground are perceiving the situation) substantially influences the progress of the respondents' gaze and encourages them to focus in more detail not only on the central part of the image.

Figure 4

Gaze plot map, example from one respondent (Vanda) – Question no. 3

Note. Unlike the heatmaps and gaze opacity maps, the gaze plot map cannot practically be displayed for all the respondents together, as the differently coloured circles denoting individual fixations would overlap and cover each other and the resulting image would become impossible to interpret.

Figure 5

Gaze opacity map (all respondents) – question no. 4

Figure 6

Heatmap (all respondents) – Question no. 6

Reflections on the test

The final reflection on the testing process was conducted in the form of a structured interview with all the respondents, who expressed their opinions on the following:

- Which question they considered the most difficult;
- Whether any of the questions were less comprehensible (or incomprehensible) to them;
- Whether the set of structured questions (nos. 2–10) helped them to observe, understand and interpret the photograph better than the first question did.

Most of the respondents stated that the most difficult questions were the identification of the historical event (as it could be confused with the Second World War) and the reaction of Czechoslovakia's political representatives (as the answer required a broader knowledge of the historical context). Some of the respondents stated that they had problems with the question about the tank's markings. A recurring response concerned the difficulty of guessing what the tank driver was probably thinking:

> The most difficult one was about what the tank driver was thinking. Putting myself in the tank driver's situation as he just drove in there and demolished it. (Daniela)

> Because it's difficult to put yourself in the tank driver's position. When you put yourself in the position of somebody who's in the street, you can say how you'd react. But the idea that I'm inside a tank and harming somebody – I'm not capable of empathizing with that. (Andrea)

All the respondents stated that none of the questions were incomprehensible to them, and that the structured analysis was of great assistance in helping them to concentrate on details, orient themselves better within the photograph, and think more deeply about the various levels of the photograph, including empathy and the experiences of the people depicted in it:

> I looked at the parts of the photograph that I'd not looked at previously. (Jakub)

I noticed things that I didn't see at first sight. (Marika)

In the third question I realized I should look properly at the shop signs. (Robert)

In the first question I just looked at the whole image, but in the other questions I thought about it differently. (Helena)

It helped me to notice better what was happening there; thanks to how it was presented, I always just focused on one part of the photograph. (Andrea)

Gradually, as I went through the questions, I focused more on the situation and I thought more about it. It moved me forward in a way. (Daniela)

When I first saw the photograph, I didn't really know, but as the questions progressed, I thought more about it and began to see other things in it that I could interpret. (Michaela)

Conclusion

In conclusion, it can be stated that among university students there exist substantial differences in the quality of perception, analysis and interpretation of iconographic historical sources depending on whether they are set didactically unstructured or didactically structured tasks. In the first case (unstructured tasks), the respondents' answers are much more superficial; they overlook important details in the image, do not explore its various levels of meaning, and do not notice its psychological aspects (e.g. the experiences and motivations of the people involved). By contrast, an appropriately selected catalogue of questions guides the analysis and interpretation, encouraging respondents to think more deeply, empathize with the participants, and situate the photograph in its historical context. These findings correspond with the results of other studies (Bernhardt, 2011; Labischová, 2018, 2019), and they could potentially represent one of the important evidence-based foundations for innovations in pre-graduate training for future teachers. In the author's opinion, if future primary and secondary school teachers are to develop their pupils' analytical and interpretative competencies, it is essential that they themselves should possess these competencies – and so university-level teacher training should place greater emphasis on these aspects.

The findings of the study presented in this paper also suggest that the eye-tracking method, which has so far not been widely applied in research of history and social sciences teaching didactics, makes it possible to investigate the perception strategies used by respondents (pupils, students, teachers), and to identify the most intensively observed parts of a photograph as well as the parts which are observed less intensively or not at all. Questions prepared by teachers or didactic experts can thus encourage pupils to focus on these areas. The potential uses of the eye-tracking method are much wider, ranging from comparative studies of textbooks and their psychodidactic properties to pupils' perception of cartographic materials and various types of historical sources as well as the perception of art works and museum exhibits. Besides further subject-specific didactic research using the eye-tracking method, it will also be important to carry out research among students who are training to be teachers, in order to determine how they think iconographic sources can be used in their future teaching, what goals they plan to set, which competencies they intend to develop in their pupils, and which teaching methods they will apply for this purpose.

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