

Concept mapping is an effective teaching and learning tool that allows for the establishment of a connection between students' learning processes and the theory of meaningful learning, and supports the organization of information through connections between concepts. A concept map can be defined as a graphical technique that presents the sub-concepts of a concept and the relationships between concepts and serves as a tool for assessing students' conceptual understanding within a specific subject area (Beyerbach & Smith, 1990; Novak & Gowin, 1998; Senemoğlu, 2023). Therefore, concept maps allow students to mentally structure information and then organize this information holistically, presenting it through visuals. They are also effective tools that can be used both in the teaching process and in the assessment phase. Concept maps are highly important because they are used in all areas of education, schematically showing the logical relationships and hierarchical structure between concepts, and connecting the relationships between concepts through propositions or keywords (Cañas & Novak, 2014; Jonassen et al., 1997; Vázquez Cano et al., 2013; Novak & Cañas, 2007).

Concept maps, developed in the 1970s as a research tool, have also created an environment conducive to meaningful learning, enabling new information to be retained in long-term memory, recalled when needed, facilitating subsequent learning, and allowing information to be utilised in logical reasoning processes when solving unconventional problems (Şahin, 2002). Consequently, individuals will become active learners and acquire characteristics such as reviewing what they have learnt, taking responsibility for their learning, and developing organisational skills (Caine & Caine, 2002; Ocak et al., 2025). In other words, meaningful learning will enable individuals not only to acquire knowledge but also to gain awareness regarding its application.

By structuring the Social Studies curriculum according to the constructivist approach, teaching programmes have been developed that utilise metacognitive skills to facilitate meaningful and lasting learning; these programmes are robust, linked to prior learning, and integrated with other disciplines and daily life around values, skills and competencies

(MEB, 2018). In Social Studies lessons, concept maps have become an important and useful tool for enabling students to think scientifically, establish connections between concepts, and organise and relate concepts under a fundamental framework.

A review of the literature reveals that there are studies on the use of concept maps in the teaching process. In particular, the positive impact of concept maps on the learning, teaching, and assessment processes has been highlighted (Aykutlu & Şen, 2012; Bes-Piá et al., 2011; Cañas & Novak, 2014; Duru, 2023; Kaymaz, 2022; Kılıç & Sağlam, 2004; Novak, 2010; Novak & Cañas, 2007; Sarıca & Çetin, 2012; Sever et al., 2009; Şahin, 2002; Ullah, 2020; Valadares, 2013; Vázquez-Cano et al., 2013; Yılmaz & Çolak, 2011). Furthermore, a literature review reveals that there are various studies on pre-service teachers' preparation of concept maps, particularly in fields such as science and mathematics (Bulut et al., 2021; Demirci & Kabataş Memiş, 2021; Horzum, 2018; Orak & Kandemir, 2023; Şahin & Ergene, 2024; Tekin et al., 2013; Tuluk, 2015; Tuluk, 2020; Turan Oluk & Ekmekçi, 2019; Ünal & Bozoğan, 2019; Yenil & Arslan, 2025; Yenil et al., 2022). However, it appears that there is insufficient work being done on concept maps in social studies lessons. In this context, examining trainee teachers' metaphorical perceptions of concept maps is significant in terms of revealing the symbolic values they ascribe to these maps.

The primary objective of this study is to reveal the metaphorical perceptions prospective social studies teacher regarding concept maps. In this context, the study aims to examine the meanings that teacher trainees attribute to concept maps and to determine their awareness of the impact of these tools on the teaching process. Additionally, it is thought that the study will contribute to the development of social studies teacher candidates' concept mapping skills, thereby increasing their teaching awareness.

In line with this main objective, the central research question of the study is defined as: "How do prospective social studies teacher perceive concept maps metaphorically, and how do they evaluate the roles of concept maps in fostering pedagogical differentiation?" Within the scope of this central research question, the sub-questions of the study are outlined below:

- What metaphors have social prospective social studies teacher created for concept maps, and what are their reasons for creating these metaphors?
- What are the prospective social studies teacher' perceptions of concept maps?
- What is the impact of concept maps on teaching?
- What are the advantages and disadvantages of concept maps?

METHOD

The Research Model

This is a qualitative study employing phenomenological research design. The phenomenological design was utilised to examine in depth individuals' subjective experiences and perceptions of a specific phenomenon, as well as the meanings they ascribe to these experiences (Creswell 2018; Yıldırım & Şimşek 2016). The aim of the study was to reveal pre-service teachers' unique perspectives on concept maps. Consequently, the phenomenological design was deemed appropriate for gaining a deep understanding of pre-service teachers' thoughts and experiences regarding concept maps.

Study Group

The study group for this research consists of trainee teachers enrolled in the Social Studies Education Department of the Faculty of Education at a state university in Turkey during the 2025-2026 academic year. The prospective teachers included in the study group were selected using criterion sampling, one of the purposeful sampling methods. In purposive or judgemental sampling, participants are selected from specific units of the population based on their relevance to the research question and their familiarity with and understanding of the subject matter, as determined by the researchers (Adeoye 2023, 92; Etikan et al. 2016; Gay et al. 2012; Tajik et al. 2024). Third-year students were preferred due to the courses they had previously taken. The study group consists of 31 third-year students.

Data Collection Tools

The "Semi-Structured Interview Form" and the "Metaphor Form", prepared by the researcher, were

used as data collection tools. The use of multiple data collection tools in the study is important in terms of enhancing the study's reliability (Yıldırım & Şimşek 2016).

These data collection tools were utilized to uncover the topics that needed to be explored through the participants' responses (Merriam 2018). The metaphor form used as a data collection tool is a form containing the statement: "Concept maps are similar to..... because....." In this form, participants were asked to write in the blanks how they likened concept maps to a particular entity or object and to state the rationale for this likening. The semi-structured interview form, on the other hand, consists of three open-ended questions. This form was prepared by the researcher; following the input of an academic expert in social studies education and a pilot interview with three prospective teachers, the forms were finalized.

Pilot Application

The metaphor form and the open-ended semi-structured interview form to be used were prepared by the researcher. The forms were finalized after considering the opinions of an academician specializing in social studies education and conducting pilot interviews with three prospective teachers.

Data Collection Process

In the preparation of data collection tools, criteria aimed at ensuring validity and reliability in qualitative research (Merriam 2018; Patton 2018; Yıldırım & Şimşek, 2016) were taken into account. The metaphor form and the semi-structured interview form were prepared by the researcher. The prepared forms were systematically reviewed in line with the criteria of scope, clarity and comprehensibility; they were structured to ensure that the items were non-directive, exhibited an open-ended structure, and allowed participants to express their views freely. In this regard, the aim was to ensure the content validity of the measurement tool.

After providing participants with brief information on the purpose of the study and the meaning of a metaphor, the metaphor forms were distributed to the participants. Participants were asked to write in the relevant space on the form what they would

compare the concept maps to—whether a living or non-living entity, an object, or anything else that came to mind—and to explain why they made that comparison.

The combined use of a metaphor-based approach and a semi-structured interview format during the data collection process contributed to ensuring data diversity and enhanced the reliability of the research. Furthermore, the use of data obtained through different data collection tools in a mutually supportive manner was intended to strengthen the consistency and credibility of the findings.

Data Analysis

The data obtained from the metaphor questionnaire and the interview questionnaire were analysed using content analysis. Furthermore, researcher triangulation (Patton 2018) was employed in this study to enhance reliability and validity. In this method, the views of multiple researchers were consulted during the coding and theme-generation process; the resulting codes and themes were compared to reach a shared assessment. In this way, the aim was to reduce any subjectivity that might arise in the interpretation of the data and to enhance the reliability of the findings.

In this study, data triangulation was employed to enhance the validity and reliability of the findings. Data triangulation is regarded as a key strategy that strengthens the consistency and credibility of research findings by enabling the examination of the same phenomenon through different data collection tools (Merriam, 2018; Patton, 2018). Accordingly, the study examined whether findings obtained through different methods supported one another (Yıldırım and Şimşek, 2008), with the aim of enhancing the validity and reliability of the results.

To ensure validity, strategies for credibility, transferability, consistency and verifiability recommended in qualitative research were utilised (Christensen et al., 2020; Merriam, 2018). To ensure credibility, the data collection process was described in detail, and findings obtained from different data sources were evaluated using a holistic approach.

Participants were assigned codes such as P1, P2, P3... to keep their identities confidential. Furthermore, direct quotations from participants'

statements were included. The data obtained in the study were transferred to a computer environment and subjected to content analysis. During the analysis process, the data were first coded; once the themes of the coded data had been identified, the findings were defined and interpreted.

A list of metaphors was compiled by considering what the participants in the study likened their concept maps to, and their explanations regarding these comparisons. At this stage, no participant was found to have a discrepancy between their metaphor and its rationale. Subsequently, the frequency (f) values of the metaphors generated were determined. A total of 20 different metaphors were produced by 31 participants. Subsequently, five categories were developed by considering the common characteristics of the metaphors expressed by the participants. The categories were formed by taking the similar themes of the metaphors indicated by the participants as a criterion; direct participant quotations relating to each category were also included. Data obtained from semi-structured interviews with participants were also subjected to content analysis, and codes were established. To strengthen the validity and reliability of the study, direct participant statements were included in the findings section.

Validity, Reliability, and Ethics

In the study, the data obtained from the three open-ended questions posed to participants and the data collected via the metaphor form were analysed separately. Both datasets were coded independently by the researchers; the inter-coder agreement coefficient proposed by Miles and Huberman (1994) was calculated to determine the consistency between the codings.

The agreement coefficient is calculated using the formula “the ratio of the number of agreed codes to the total number of codes” (Reliability = (Agreement) / (Agreement + Disagreement) × 100). According to Miles and Huberman (1994), a ratio of at least 70% is sufficient to ensure the reliability of the coding process. The analyses conducted in this study yielded an agreement rate of 80%. This ratio indicates that the coding process used in the study possesses a high level of internal consistency.

The ethical committee approval was obtained with decision number 66, numbered E-1280, at the meeting of the Caucasus University Social and Human Sciences Scientific Research and Publication Ethics Committee dated 19.02.2025.

FINDINGS

Findings Regarding The Metaphors Created For The Concept Map And The Reasons Behind Their Creation

Metaphors Created for the Concept Map

This section presents the metaphors developed by the participants in relation to the concept map. Participants were asked to complete the statement “A concept map is similar to because” and, based on the data obtained, a total of 20 different metaphors emerged. These metaphors reveal the meanings participants ascribe

to concept maps, how they perceive them, and the values with which they associate them. Table 1 lists the metaphors developed, the codes indicating the participant who developed each metaphor, and the number of participants (f).

An analysis of the metaphors created by 31 trainee teachers, as shown in Table 1, revealed that 20 distinct metaphors had been developed. It can be seen that the metaphors with the highest frequency are, in order: roadmap (f=4), spider's web (f=3), tree branches (f=3), tree (f=2), and visual schema (f=2). It is evident that the metaphors produced by the participants regarding the concept map exhibit diversity. The diversity of the metaphors created by the participants indicates that they have structured the concept map differently in their minds. As a result of the analyses, one metaphor was deemed invalid. This is because the metaphor produced did not align in any way with the rationale for the comparison.

Table 1: Metaphors relating to the concept map

Metaphor	Participants	f
Road map	P3, P18, P28, P29	4
Spider's web	P2, P9, P17	3
Tree branches	P8, P20, P24	3
Tree	P10, P23	2
Visual scheme	P11, P13	2
Story	P1	1
Education	P4	1
Framework	P5	1
Building something in your mind	P6	1
Work sheet	P7	1
Mind map	P14	1
Designing in your mind	P15	1
Clear water	P16	1
Our surroundings	P19	1
Compass	P21	1
Culture and heritage	P22	1
Interconnected chain	P25	1
Snowball effect	P26	1
Reinforcement tool	P27	1
Summary topic sheet	P30	1
My mother	P31	1

Conceptual Categories Relating to Metaphors Created for the Concept Map

Five categories have been established regarding the metaphors created by participants for the concept map. Table 2 shows the categories established, the metaphors belonging to these categories, the number of metaphors created, and the number of students who created each metaphor.

According to Table 2, the metaphors created by the participants regarding the concept map have been grouped into five conceptual categories. These categories have been identified as ‘Visualisation / Configuration’, ‘Mental Process / Thinking Style’, ‘Connections’, ‘Learning Tools’, and ‘Life / Roots’. It is observed that, based on the metaphors they created regarding the concept map, participants evaluated the concept map not only as a concrete tool that facilitates the formation and clarification of thought in the mind, supports learning by establishing cause-and-effect relationships between pieces of information to guide them, and organises knowledge systematically, but also as an approach that addresses learning from a human perspective. Below are the participants' direct statements regarding the five conceptual categories established and the metaphors included within these categories.

Table 2: Conceptual categories relating to metaphors

Categories (f =)	f	Metaphors (f =)	f
Visualisation / Configuration	6	<ul style="list-style-type: none"> ➤ Visual diagram (K11, K13) ➤ Framework (K5) ➤ Roadmap (K3, K18, K28, K29) ➤ Compass (K21) ➤ Tree (K10, K23) ➤ Tree branches (K8, K20, K24) 	13
Mental Process / Thinking Style	5	<ul style="list-style-type: none"> Story (K1) Building something in one's mind (K6) Designing in one's mind (K15) Mind map (K14) Clear water (K16) 	5
Connections	3	<ul style="list-style-type: none"> Spider's web (K2, K9, K17) Interconnected chain (K25) Run in a sock (K26) 	5
Learning Tools	4	<ul style="list-style-type: none"> Education (K4) Worksheet (K7) Reinforcement tool (K27) Summary sheet (K30) 	4
Life / Roots	3	<ul style="list-style-type: none"> Our environment (K19) Culture and heritage (K22) My mum (K31) 	3

Visualisation/Structuring: Six metaphors created by the participants fall into this category. A common feature of these metaphors is the organisation of information, the direction given to information, and the establishment of structure between pieces of information. Direct quotations relating to these metaphors are provided below:

P13: "Because it has steps and stages."

P18: "It clearly shows how to progress between topics, which information is linked to where, and the direction of learning."

P20: "The tree is the main topic, whilst the branches are the subtopics of the topic."

Mental Process / Thinking Style: The five metaphors created by the participants fall into this category. A common feature of these metaphors is the formation, clarification and shaping of thought in the mind. Direct quotations relating to these metaphors are provided below:

P1: Because there are situations where it is entirely up to the imagination, such as shaping and drawing in the way you want.

P14: Information is presented in an organised and interconnected manner.

P16: It reduces complexity and makes it easier to understand the information.

Connections: Three metaphors created by the participants fall into this category. A common feature of these metaphors is that they establish cause-and-effect relationships between pieces of information, ensuring that the flow of information remains unbroken. Direct quotations relating to these metaphors are provided below:

P2: There is a relationship moving from the centre outwards; every word carries a link and is connected to the others.

P25: Because they all flow together, interconnected.

P26: They are interconnected and link the topic together more effectively.

Learning Tools: Four metaphors created by participants fall into this category. A common feature of these metaphors is that they view the concept map as a concrete tool that supports learning. Direct quotations relating to these metaphors are provided below:

P4: It is like a light that illuminates a person and helps them find their way.

P7: It effectively summarises many topics and details, presenting the key elements to the student.

P27: It enables the student to see the subject as a whole in an engaging way that captures their attention.

Life/Roots: Three metaphors created by participants fall into this category. A common feature of these metaphors is that they approach concept mapping from a human, cultural and emotional perspective. Direct quotations relating to these metaphors are provided below:

P19: We classify and learn about every entity and living being we see around us, distinguishing between general and specific categories.

P22: We understand the importance of the cultural heritage left to a child by the culture they experience in their life, and learn more effectively.

P31: It is simple and beautiful.m

Findings Regarding Their Perceptions Of Concept Maps

Participants were asked, "What comes to mind when you hear the term 'concept map'?" Table 3 was compiled based on the responses received from the participants.

According to Table 3, participants stated that, thanks to concept maps, they were able to establish more connections between concepts in their minds (f=13) and organise their knowledge, as well as

Table 2: Conceptual categories relating to metaphors

Categories (f =)	f	Metaphors (f =)	f
Visualisation / Configuration	6	<ul style="list-style-type: none"> ➤ Visual diagram (K11, K13) ➤ Framework (K5) ➤ Roadmap (K3, K18, K28, K29) ➤ Compass (K21) ➤ Tree (K10, K23) ➤ Tree branches (K8, K20, K24) 	13
Mental Process / Thinking Style	5	<ul style="list-style-type: none"> Story (K1) Building something in one's mind (K6) Designing in one's mind (K15) Mind map (K14) Clear water (K16) 	5
Connections	3	<ul style="list-style-type: none"> Spider's web (K2, K9, K17) Interconnected chain (K25) Run in a sock (K26) 	5
Learning Tools	4	<ul style="list-style-type: none"> Education (K4) Worksheet (K7) Reinforcement tool (K27) Summary sheet (K30) 	4
Life / Roots	3	<ul style="list-style-type: none"> Our environment (K19) Culture and heritage (K22) My mum (K31)) 	3

create a visual diagram (f=10) in a way they could understand. Some participants noted that concept maps play an important role in making learning lasting (f=5). Concept maps play a significant role in ensuring that information becomes lasting and that meaningful learning is achieved. Examples of participants' views are provided below:

P5: "A concept map is a way of making learning easier and more lasting by grouping and schematising the information to be conveyed."

P26: "When I think of a concept map, what comes to mind is establishing connections between topics."

P27: "They are diagrams that facilitate connections between topics, thereby contributing to the student's learning."

Findings Regarding The Impact Of Concept Maps On Teaching

Participants were asked, "How do you rate concept maps as a teaching tool?" Table 4 was compiled based on the responses received from the participants.

According to Table 4, the majority of participants stated that concept maps facilitate learning (F=10), promote long-term learning (f=8) and organise

knowledge (f=6). Based on the participants' responses, it is understood that concept maps organise information in the mind and facilitate the learning process, thereby laying the groundwork for a lasting learning environment. Meaningful learning is achieved through the mental organisation of concepts using concept maps. Furthermore, the responses indicated that concept maps contribute positively in terms of ensuring clarity (f=3), visualising information (f=3), supporting meaningful learning (f=3), simplifying teaching (f=3), facilitating learning through enjoyment (f=3) and being cost-effective (f=3). Examples of participants' views are provided below:

P5: "I find concept maps useful for facilitating learning and ensuring retention. Grouping concepts or presenting them schematically transforms a complex subject into an easier one."

P8: "Concept mapping is an important activity in education and teaching because it enables students to learn more easily and enhances retention."

P24: "It approaches knowledge as a whole rather than in fragments. This makes it more memorable. As

Table 4: Impact on teaching

Impact on teaching	Participants	f
Facilitating learning	P5, P8, P9, P11, P17, P19, P22, P25, P28, P30	10
Ensuring lasting learning	P3, P5, P7, P8, P15, P24, P27, P28	8
Structuring information	P3, P12, P18, P20, P24, P28	6
Ensuring clarity	P10, P21, P28	3
Visually visualizing information	P12, P24, P28	3
Supporting meaningful learning	P3, P12, P30	3
Simplifying instruction	P14, P16, P26	3
Making learning fun	P1, P15, P26	3
Economical	P2, P21, P31	3
Activating prior knowledge	P4, P12	2
Serving as a tool to support learning	P23, P29	2
Increasing academic achievement	P21	1
Increasing curiosity	P26	1
Making information concrete	P6	1
Being engaging	P13	1
Guiding the teacher	P19	1

it visualises knowledge, it engages visual intelligence rather than relying on rote memorisation.”

The Advantages And Challenges Of Concept Mapping

Participants were asked, “What are the advantages and challenges of concept mapping?” Table 5 was compiled based on the responses received from the participants.

According to Table 5, participants stated that concept maps play an important role in facilitating

long-term learning (f=13) and making learning easier (f=9). Furthermore, it plays an important role in terms of promoting active participation (f=6), simplifying the presentation (f=4), facilitating learning through enjoyment (f=4), visualising information (f=4), establishing connections between topics (f=3) and simplifying the presentation (f=3). Based on the participants' responses, it is considered that concept maps not only support the teaching process positively but also contribute to lasting learning by organising information, linking concepts together and visualising them.

Table 5. The advantages and challenges of concept mapping

		Participants	f
Advantages	Providing lasting learning	P4, P5, P6, P8, P11, P13, P15, P18, P21, P23, P28, P29, P31	13
	Facilitating learning	P3, P10, P5, P8, P11 P12, P17, P19, P30	9
	Encourages active participation	P1, P2, P3, P15, P18, P29	6
	Simplifies the explanation	P14, P16, P18, P28	4
	Providing learning through fun	P1, P2, P15, P28	4
	Visualises information	P3, P6, P13, P22	4
	Enabling connections between topics	P14, P21, P29	3
	Simplifies the explanation	P16, P21, P28	3
	Saves time	P7, P19	2
	Makes information concrete	P5, P17	2
	Being useful in dense content	P9, P20	2
	Reinforcing information	P27	1
	Improving fine motor skills	P6	1
	Providing meaningful learning	P21	1
	Activates prior knowledge	P12	1
	Applicable to different subjects	P12	1
Aiding learning	P13	1	
Challenges	Being time-consuming	P6, P11, P12, P13, P16, P17, P18, P22, P24, P26, P28, P29, P31	13
	Not suitable for every subject	P7, P10, P14, P20, P24, P25, P26,	7
	Not suitable for every student	P3, P8, P12, P13, P18, P19	6
	Difficulty in preparation	P23, P27, P29, P30	4
	Difficulty in drawing	P4, P6, P15	3
	Difficulty in establishing connections between concepts	P17	1
	Difficulty in application in large classrooms	P11	1

Participants noted that preparing concept maps is difficult due to reasons such as the time it takes (f=13), their unsuitability for every topic (f=7) and their unsuitability for every student (f=6). Some participants also stated that preparing them (f=4) and drawing (f=3) were difficult for them. Examples of participants' views are provided below:

P2: "I think it offers advantages. Children learn by having fun and participating actively."

P6: "As an advantage, mental images form in the student's mind, leading to lasting learning. As a difficulty, the student may struggle to create the map due to time constraints."

P7: "The advantage is that it enables more effective learning in a shorter time. However, in social studies lessons, where topics are dense and comprehensive, practical activities can sometimes be challenging for students,"

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

In this study, participants' perceptions of concept maps were examined through metaphors and their views. The 'road map' metaphor is significant in the metaphors participants created regarding 'concept maps'. This is because looking at a map provides information about the general structure of the route to be taken and enables the direction to be plotted on the road map. Concept maps are similar to roadmaps in that they show the order in which to progress through a topic and how to reach the goal when teaching it.

The use of the "spider's web" metaphor for concept maps was interpreted as the establishment of relationships between concepts centred around a main concept. Consequently, concept maps are viewed as a structured network of knowledge, much like a spider's web, consisting of interconnected concepts radiating from a central point. Consequently, concept maps have facilitated the meaningful organisation of information and created an environment for integrating new information with prior knowledge (Cañas & Novak, 2014). The use of the "tree branches" metaphor for concept maps, on the other hand, is perceived as the subject being divided into

sub-sections under a main heading. Concept maps are also described as a structure that, like a tree, starts from the root and branches out, organising information from the general to the specific. It appears that concept maps enhance participants' creativity based on the metaphors they create and support creativity in the process of establishing relationships between concepts (Kalaycı & Çakmak, 2000; Novak & Gowin, 1984, cited in Wandersee, 1990).

The metaphors created by the participants regarding the concept map have been grouped into five conceptual categories. Participants viewed concept mapping not only as a tool for clarifying thoughts, systematizing information, guiding knowledge, establishing cause-and-effect relationships between pieces of information, supporting learning, and providing a tangible means of understanding, but also as an approach that addresses learning from a human perspective. In particular, the 'visualisation/structuring' category ('visual schema', 'framework', 'roadmap', 'compass', 'tree' and 'tree branches') stood out in terms of organising information, directing it and establishing structure between pieces of information. Studies have also shown that visualisation takes centre stage in terms of establishing meaningful connections between pieces of information, relating new information to prior knowledge, and facilitating recall through the use of concept maps (Buzan, 2009; Cañas & Novak, 2014; Novak & Gowin, 1984, cited in Wandersee, 1990). Furthermore, there are studies that emphasise that concept maps are tools that facilitate the linking of concepts and visualise them (Yenil et al., 2022).

Based on participants' perceptions of concept maps, it appears that they use concept maps to establish connections between concepts in their minds, organise information, and create a visual diagram in a way that they can understand. Some participants have noted that concept maps play a significant role in making learning lasting and ensuring meaningful learning. There are also studies on how concept maps enhance the retention of concepts and contribute to meaningful learning (Campelo & Piconez, 2016; Çolak, 2010; Guzzetti, Williams, Skeels & Wu, 1997). Concept maps are seen to facilitate meaningful learning by establishing connections between concepts and

showing the relationships between them (Kortelainen & Vanhala, 2004; Şahin, 2001; Wickramasinghe et al., 2008), and by creating a visual schema through the keywords used. Furthermore, concept maps not only facilitate inter-conceptual relationships and serve as a visual learning tool through keywords (Yenil et al., 2022) but also contribute to participants becoming aware of their visualisation skills.

When examining findings regarding the impact of concept maps on the teaching process, it is evident that these tools facilitate learning, enhance retention, and make a significant contribution to the structuring of knowledge in the mind. By enabling individuals to organise the knowledge they possess and relate it to new information, concept maps make the learning process more systematic and meaningful. In this context, it can be said that concept maps play a supportive role in the learning environment, thereby laying the groundwork for lasting learning. Furthermore, by presenting information visually, concept maps ensure that relationships between concepts are presented in a clearer and more comprehensible manner. This helps learners to grasp and structure the information more easily. In conclusion, it can be stated that concept maps simplify the teaching process, support meaningful learning, and enhance the quality of learning. It has been noted that concept maps facilitate meaningful learning (Cañas & Novak, 2014; Valadares, 2013), prevent rote learning (Ullah, 2020) and make learned information more enduring (Kavak, 2009; Kılıç & Sağlam, 2004; Kürümlüoğlu, 2019; Sarıca & Çetin, 2012).

When the advantages of using concept maps are examined, it becomes clear that they serve an important function in supporting long-term learning, facilitating the learning process, encouraging active student participation and simplifying the presentation of information. Furthermore, the fact that they make the learning process more enjoyable, enable the visualisation of information, and facilitate the establishment of meaningful connections between topics enhances the effectiveness of concept maps in the teaching process. Concept maps contribute not only to positively supporting the teaching process but also to the systematic organisation of information

and the clear presentation of relationships between concepts. This structure, presented through visualisation, enables learners to comprehend information more easily and retain it more effectively in long-term memory. In this regard, it can be said that concept maps are an effective teaching tool for achieving meaningful and lasting learning. Studies have also concluded that concept maps help information to be retained, ensure that information is organised in a meaningful way, enable students to relate new information to prior knowledge, and facilitate meaningful learning by visualising concepts (Buzan, 2009; Cañas & Novak, 2014; Kavak, 2009; Sarıca & Çetin, 2012).

When examining the disadvantages of concept maps, the time-consuming nature of the preparation process stands out as a significant limitation. In particular, the process of identifying concepts, establishing relationships between them and organising them visually requires additional time and effort on the part of both teachers and pupils. Furthermore, the fact that concept maps are not suitable for every subject or every level of pupil is also considered a disadvantage. Students' individual differences, prior knowledge levels and learning styles can prevent the expected benefits from concept maps from being realised in every situation. There are also difficulties encountered in preparing concept maps, such as drawing, selecting appropriate topics, establishing relationships between concepts (Aktaş & Güler, 2011; İmer Çetin & Taşar, 2015; Tuluk, 2015; Ünlü et al., 2006), and making connections (Şahin & Ergene, 2024). According to the findings of this study, whilst concept maps are an effective teaching tool, they have limitations such as the time-consuming nature of the preparation process and the fact that they are not equally suitable for all learning content and student groups.

RECOMMENDATIONS

Based on the findings of this research, activities and practice-based exercises can be included for prospective teachers to prepare concept maps. The time required for preparing and drawing concept maps is reflected in the distribution of concept maps. Therefore, applications can be included to allow

prospective teachers to apply their visual narrative and visualization skills.

Ethics Statements

The study was conducted in accordance with the principles of research ethics. Ethical approval for this study was obtained from the Ethics Committee of Kafkas University Social and Human Sciences Ethics Committee.

Participation in the study was voluntary. All participants were informed about the purpose of the research and provided their informed consent before participating. The confidentiality and anonymity of the participants were ensured throughout the research process, and the data collected were used only for scientific purposes.

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Generative AI Statement

As the author of this study, I used the AI tool ChatGPT for language editing and minor wording improvements. After using this tool, I carefully reviewed and verified the final version of the manuscript.

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