Universiteit Antwerpen

This item is the archived peer-reviewed author-version of:

Addressing creativity in higher education from a rhizomatic perspective

Reference:
de Vries E.W., Delnooz P., Velthuijsen H., Pinxten Rianne.- Addressing creativity in higher education from a rhizomatic perspective
Innovations in education and teaching international - ISSN 1470-3300 - (2022), p. 1-12
Full text (Publisher's DOI): https://doi.org/10.1080/14703297.2022.2103583
To cite this reference: https://hdl.handle.net/10067/1894030151162165141

uantwerpen.be
Institutional repository IRUA

Addressing creativity in higher education from a rhizomatic perspective

E.W. de Vries* [a, d], P. Delnooz [b], H. Velthuijsen [c] and R. Pinxten [d, e]

[a] *Institute of Engineering, Hanze University of Applied Sciences, Groningen, Netherlands;* [b] *Innovatie Academie, Breda, Netherlands;* [c] *Marian van Os Center for Entrepreneurship; Hanze University of Applied Sciences, Groningen, Netherlands;* [d] *Didactica Research Unit, Antwerp School of Education,* [e] *Behavioral Ecology & Ecophysiology, Department of Biology, University of Antwerp, Belgium*

*corresponding author: Eti de Vries, Institute of Engineering, Industrieweg 1, 9402 NP Assen, Netherlands, e.w.de.vries@pl.hanze.nl

Abstract

Global developments ask for 21st-century skills. Creativity is one of these skills and can be defined as the production of novel ideas by connecting entities that have not been connected before and whose connection is useful in a certain domain. The growth of rhizomes is an example where unconnected entities become connected in an unpredictable way, and by doing so, form a strong network. By taking this rhizomatic concept as leading, a Creativity course was developed to support international Engineering university students. We examined to what extent it increased the self-perception of the students regarding their creativity. Around two-thirds of the students had the idea that their creativity improved during the course. Around three-quarters of the students thought they added creativity to their project. Results of this case study suggest that rhizomatic education may positively influence students' perception of their creativity, although more research is needed to confirm these findings.

Keywords: creativity; higher education; rhizomatic education; international education; engineering

* Email: e.w.de.vries@pl.hanze.nl

Introduction

Why do we teach?

This question is at the heart of all educational efforts. What is it that education prepares future professionals for? Global developments in energy transition, digitalization, population growth and food supply ask for other knowledge and skills than is traditionally taught in education (Richards, 2010). The current assignment for education is to prepare students for a rapidly changing world (Cachia et al., 2010; Redecker, 2009). A requirement for developing skills to deal with the challenges at stake has been identified (Ananiadou & Claro, 2009), and is often referred to as a need for 21st century skills, such as core academic subject knowledge and skills (reading, writing, arithmetic), global awareness, entrepreneurial literacy, civic literacy, health literacy and environmental literacy, supported by learning and innovation skills, career and life skills, and information, media and technology skills (Dede, 2010). Many acknowledge the need for developing critical thinking and creativity (Voogt & Roblin, 2012).

In the Netherlands, a gap has been established between the current and desired situation with regard to the development of creativity and innovation skills of pupils and students (Onderwijsraad, 2013; Mbo-raad, 2015), which applies to all levels of education (Blok, 2015; Jolles, 2016). In the Engineering Department of Hanze University of Applied Sciences (UAS), Groningen, Netherlands, the necessity was felt to develop a Creativity course for international bachelor students in Engineering. In this case study, this Creativity course, which was built using a rhizomatic perspective (see: Theoretical framework) is described, and we examined if and to which extent it increased the self-perception of the students regarding their creativity.

Theoretical framework

Creativity as a topic for research has been and still is challenging, not in the least because there is no uniform definition for creativity (Sternberg, 1999), although there is a non-explicit consensus among researchers that a definition of creativity contains at least the words *novel* and *useful* (Mumford, 2003; Walia, 2019). In an educational context, the definition for 'Creating' in the revised taxonomy of Bloom (widely used in education) also describes the 'how' of creativity:

> "putting elements together to form a coherent or functional whole; reorganising elements into a new pattern or structure through generating, planning, or producing. Creating requires users to put parts together in a new way, or synthesize parts into something new and different, creating a new form or product. This process is the most difficult mental function in the new taxonomy" (Anderson & Krathwohl, 2001).

This description of 'Creating' will be used as a base for our definition of creativity in an educational context:

> "Creativity is the production of novel ideas by connecting parts that have not been connected before and whose connection is useful in a certain domain." (de Vries, n.d.)

An example of how to connect unconnected parts can be found in biology, where the growth of rhizomes follows a similar path. A rhizome, sometimes called a creeping rootstalk, is a stem of a plant that sends out roots and shoots as it spreads. The growth of rhizomes results in a strong network (think of weed), where nodes are being created in an unpredictable way. From the nodes, new roots or shoots are being spread. The nodes are the starting point for new connections to be made.

This rhizomatic perspective has also been described by Deleuze and Guattari (1987). In *A Thousand Plateaus*, these philosophers make a distinction between rhizomatic thinking and thinking according to the structure of a tree. Where the (traditional) tree represents the stable structure that changes incrementally, using its resources to grow vertically in order to dominate its surroundings but remaining rooted in its position, rhizomes, on the other hand, can be characterized by movement and direction. They spread horizontally into clear spaces where their path is typified by twists and turns without a clearly identified center (Deleuze & Guattari, 1987).

Connections enable new ideas and new resources and events to occur. When examining and theorising creativity, the rhizome model offers opportunities to show how creativity is based on connections and lines of thoughts (Styhre & Sundgren, 2003). The implications from the conceptualisation of creativity in terms of being a rhizome are that creativity can be managed in terms of making connections possible (Styhre & Sundgren, 2003). This rhizomatic model functions as a permission to try out new combinations of ideas, also according to Parson and Clarke (2013).

Cormier (2011; 2012; 2014) translated these rhizomatic principles for (higher) education. For Cormier, rhizomatic education works well in the complex domain. He made the following statements:

- Education should prepare students for dealing with uncertainty;
- The community can be/is the curriculum;
- The rhizome is a model for learning for uncertainty;
- Students are responsible for their own learning and the learning of others;
- The starting point is the learner, with individual learning needs.

The image of the growth of rhizomes also shows ways to develop new and modern curriculum designs and may be the starting point for newly developed courses in creativity in higher education. In exploring the possibilities of rhizomatic education, the main focus of this case study research was to get an overview to which extent a rhizomatic built course for Creativity influenced the self-perception of Engineering university students regarding their creativity and to which extent they used their creativity in building the end product for their minor, according to themselves.

The following research questions guided the study:

- How do the students perceive such a rhizomatic built Creativity course?
- How do the students feel about the development of their creativity?
- To which extent has creativity been put in the proofs of concept the students needed to develop for their innovation project, according to them?

Materials and methods

Education characteristics

As there is not yet a translation of how to use rhizomatic teaching and learning in a concrete way in the engineering domain, a rhizomatic built study unit for creativity was developed at Hanze UAS. This study unit was offered to students during a minor in a (European) Bachelor programme of Engineering (de Vries & Velthuijsen, 2016), where the need to develop students' innovative skills had been felt. A full bachelor consists of a study load of 240 ECTS, evenly spread over four years. A minor is a study programme (specialisation or generalisation) of 30 ECTS (semester). This particular minor can be followed by all students enrolled in Applied Sciences, including students from other universities worldwide, in their second, third or fourth year of study, depending on the various programs of study. In this minor, innovation projects have been centrally placed,

and supportive courses in knowledge and skills are offered to prepare the students to develop the innovation projects. For each innovation project, the assignment for the students was to develop a proof of concept. The following supportive courses for all students were offered: Design Methodology, Research Skills, Creativity, Sustainability, Arduino, Chemical Sensors, Operating Systems and Biological Sensors.

Student sample

In total, 24 students signed up for the Creativity course, two of whom left after the first week (they decided to do another minor) and one student dropped out in a later stage. The course started in September and finished in February. The 21 students (20 males, 1 female) that finished the course were in the age category: 18-24 years and consented in participation in the course as test subjects for the research. Their fields of study were in the Engineering and Computer Science areas.

The five innovation projects students enrolled in were: How to prevent the killing of rhinoceroses in South Africa (N=3), How to develop a smart toilet (N=4), How to keep track of cattle in vast Western Africa (N=4), How to measure different elbow angles in a movement as aid for physiotherapeutic treatments (N=5), and How to analyse urine 24/7 (N=5). The innovative part of these projects was to solve the complex problems with sensor technology, being the main topic of the course of study in which the minor was offered.

Creativity course

Eight Creativity workshops were developed, of two hours each. As the main objective was to support the students in making unexpected connections, all workshops, in one way or another, related to making connections. This has been taken from the rhizomatic principle: 'Encourage ceaseless connection and diversity in people, resources and ideas' (Cormier, 2014). This rhizomatic feature determined not only the content of all workshops, but also the course set-up by using various and unexpected fields of expertise (Arts, Psychology).

The first workshop had a focus on complex problem solving, to familiarize the students with what it means to work on innovative and complex problems, in order to establish connections with the content of the project. By means of various assignments, they learnt about what is required to solve a complex problem. The discussion afterwards aimed to establish relations with the content of their project.

The second workshop focused on how to connect to each other: what are the qualities and passions in the group? The students were invited to give a short presentation about their professional passions. This way, they learned about unexpected expertise within the group.

Workshop three looked at making connections within their own environment and the individual past of the students by means of making an autobiographical mind map.

The fourth workshop aimed to enlarge the students' professional network: getting the outside world in. After a short presentation about networks and networking, the students sat together and were invited to map the features of their project and their network related to these features. This way, they could detect any missing knowledge and experience. Subsequently, they were invited to think of ways to expand their network.

Workshop five consisted of a discussion about the possibility of serendipitous findings when two entities become connected that have not been connected before. The trigger for this serendipity discussion was the movie *The Imitation Game*, by Morten Tyldum (2014). This movie is centered around the life story of Alan Turing, a mathematician who played a key role in building the Enigma-machine to decipher the German codes in World War II. In the movie, the breakthrough for making the machine work comes from overhearing small talk between colleague decoders and is as such an example of serendipity. The concept of serendipity is explained by the skill to find valuable things unintentionally.

Workshop six was meant to let the students' imagination flow by using the power of improvisation, in this way connecting to their individual intuition. The guest lecture consisted of all kinds of exercises in improvisation theater around making unexpected connections.

Workshops seven and eight were offered to show that two contradictory positions can also lead to new connections, by using the TRIZ-method, a creative problem-solving method mostly used in the engineering domain (Savransky, 2000; Gadd, 2011). In TRIZ, abstraction is the keyword. By abstracting from the specific problem at stake and defining the problem at a higher order, a broader perspective on solutions will become within reach. In total 40 main principles for general solutions have been described in TRIZ, which can be translated to the specific problem at stake.

Methods

After five workshops, two interview sessions were organised with a representative of each of the five project groups, with respectively three and two representatives per interview. The interview questions were sent beforehand to the various groups to enable them to discuss the questions together, and subsequently, the groups chose one spokes(wo)man to participate in the interview. The questions were the same for all groups:

1. What do you think of the Creativity course, so far?
2. What do YOU need to develop creativity?
3. How does creativity relate to your project in this minor, according to you?

Notes were taken during the interviews and these notes were translated into quotes.

At the end of the course, a questionnaire was distributed consisting of four open questions and a request to grade the eight workshops from 1-10:

1. How did you perceive the (rhizomatic built) Creativity course *in general*?
2. Do you think you have become more creative during this course? If so, why? And if not, why not?
3. What should be added to the course for you to become more creative?
4. According to you, did you add something creative in building the final product for your project in this minor? If so, what? If not, why not?
5. Give a grade on a scale from 1-10 for each of the workshops.

The answers to each of the open questions 1-4 were coded in different categories or dichotomously by two researchers. Additional remarks in the open questions were collected and are mentioned in the Results section. Data were analyzed using the statistical package SPSS 26 with a significance level of 0.05 being adopted. The overall average grade of the workshops was compared between students being positive about the workshops and those not being positive (question 1), and between students that thought they added creativity to their end product in the project and those that did not share this opinion (question 4), using Mann-Whitney U-tests. Differences between the average grades of the eight workshops was examined, using Related Sample Wilcoxon Signed Rank tests.

Results

Students' responses after five workshops

Overall, students valued the efforts made in helping them to develop their creativity (question 1):

> "We like the extra focus on creativity but working together with students from different disciplines is not that easy. We live in different worlds and use different languages. The engineering guys are not that creative."
> "Workshops are fun and nice to do. Focus on creativity is a nice addition to the other courses and the project in this minor."

Question 2 was meant to relate to another feature of rhizomatic education, where it is believed that the starting point for education should be the individual student, with her/his own needs. Interaction between group members was mentioned by the students as a feature for triggering own creativity, as well as incubation time. Students were also aware of their fixed patterns of thinking, that might block their creativity flow.

> "We need interaction between group members, to make us more creative in a project."
> "Some of us noticed, that we become more creative in moments of rest, like in the car or in a train."
> "We need a triggering of the mind, to be able to think in a different way."
> "We need to get directions in how to let fixed patterns of thinking go."

On the other hand, students did not feel that there was much possibility to transfer the insights of the course into the project (question 3):

> "The project already limits your creativity. Creativity lectures and the project are not synchronized."
> "In the project, everyone has his or her own tasks, and one performs them individually. You can be creative as a person, but not as a group. It would be nice to see what would happen if every group gets the same assignment. I think more creativity would spark, from competition between the project groups."

Students' responses after completion of the course

Thirteen students handed in a completed questionnaire. Nine students (69%) were positive about the Creativity course (question 1), varying from okay/fun to good and

interesting, and valued the course when the topics were directly related to the project (complex problem solving, TRIZ). One student remained neutral (8%), and three students (23%) thought the course was unnecessary or not applicable for technical students.

The eight students (62%) who noticed an improvement in their creativity (question 2) indicated that their creative problem-solving methods were stimulated and that the classes have helped to trigger another mindset. Two students especially mentioned the TRIZ workshops as helpful for developing their creativity. The five students (38%), who did not perceive an increase in creativity stated that they were already creative, they thought that there was no link between the creativity classes and the project, or that creativity cannot be measured.

Five students (38%) would like various matters to be added to the Creativity course (question 3), for example 'having more input from the professional field', 'more attention to design thinking' and 'doing more crazy stuff', including improvisation. Four students (31%) would like to see that the creativity course was more connected to the technical world and four other students (31%) thought the course was good as it was.

Ten (77%) students had the idea, that they used creativity in building the end product (question 4). They stated that it had become visible as well, because the robot arm they developed was new, they created a creative model or the application they built did not previously exist. Others claimed that they used creativity in solving the problems they encountered. The three students who answered the question with 'no' (23%) indicated, that it was not possible to add any creativity to the project because of the fixed requirements (especially the project around the urine analysis was mentioned) or that creativity is not something you can detect in a proof of concept.

The overall average grade for the eight workshops was $\bar{x} = 6.5$ (SD=1.41) and varied between 4.8 and 8.2 for the different workshops (Figure 1).

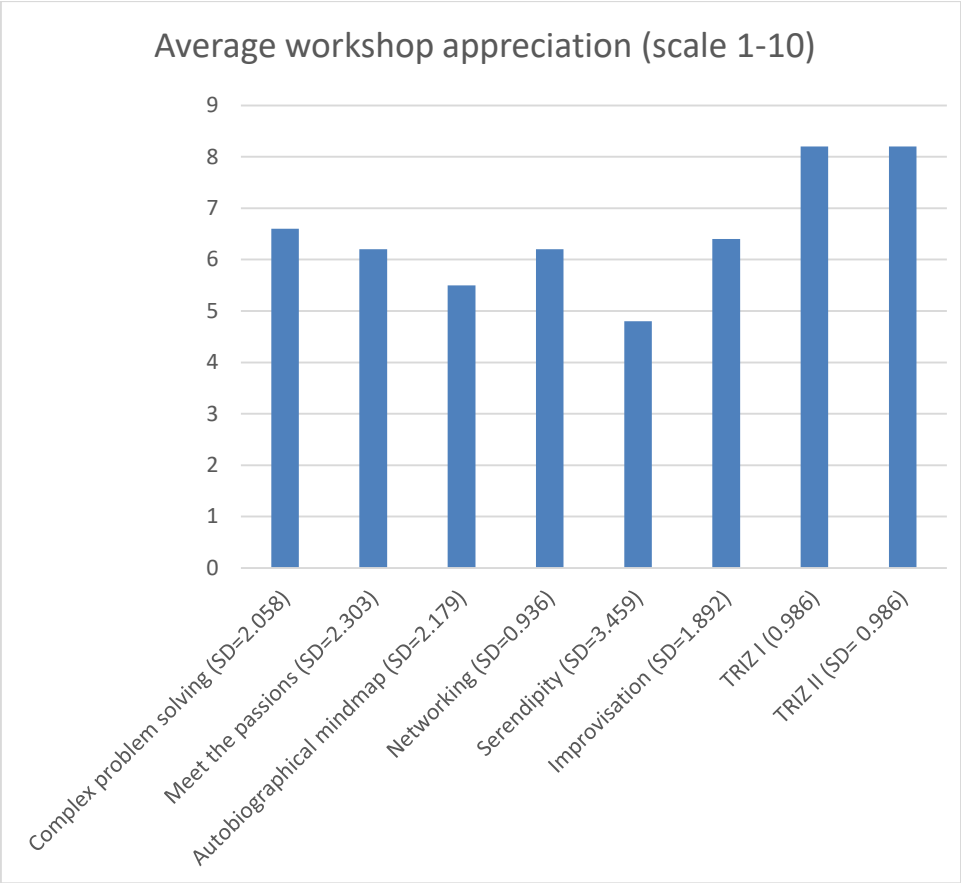

Figure 1. Average workshop appreciation (scale 1-10)

Students with a more positive opinion about the course in general had a higher appreciation for the Creativity course (*M*=6.82; *SD*=0.59, *N*=9) than those with a less positive opinion (*M*=6.00; *SD*=1.43, *N*=4). The appreciation for the course was also higher for the students who thought they had added something creative to the end product (*M*=6.85; *SD*=0.71, *N*=10) than for those who did not share this opinion (*M*=5.63; *SD*=1.21, *N*=3). In both cases, differences between both groups were however not significant (U=10, p=0.26 and U=25, p=0.11). Pairwise comparisons between the appreciation for the different workshops revealed that the average grade of both TRIZ workshops was significantly higher than the average grade of all other workshops (Wilcoxon signed rank test, $p<0.03$), while other differences between pairs of other workshops were not significant ($p>0.12$ in all comparisons).

Discussion and conclusions

The main question in this case study was: To which extent does a rhizomatic built course in Creativity influence the creativity experience of Engineering students from the Applied

Sciences programme, according to them? Most of the students experienced creativity enhancement during the course, which they thought they also translated into creative solutions for the final proof of concept they had to develop. Still, some students stated that creativity cannot be taught or that it is not something for technical students. Accordingly, other researchers document the effect of implicit theories on self-related processes (Job et al., 2010). These theories include beliefs about the nature of human attributes, such as whether intelligence and personality are fixed or incremental. In the context of creativity, it could be that people differ in their implicit beliefs about the possibility to develop creativity or not. Another explanation could be that creativity depends on personality characteristics. Literature suggests that 'openness to experience' is related to creativity (Kaufman, 2013; Batey et al., 2010). In this case study, it could be that not all students opened up to the new experiences, as is also suggested by some of the students.

The average appreciation for the workshops was sufficient, but not very high. An explanation might be that some of the workshops were really out of the Engineering students' comfort zone (autobiographical mind mapping, improvisation exercises). Bond et al. (2006) reported resistance to learning when students were asked to step out of their comfort zone. The TRIZ workshops on the other hand, related to the Engineering context, were highly valued.

The rhizomatic focus in the described Creativity course was on connecting unconnected things, trying to get the students ready for learning how to deal with complexity. Our qualitative findings revealed that students were triggered by the realization that set patterns of thinking can block their way of seeing new possibilities. They also were of the opinion that not all projects requested creativity, due to the given set of components to work with. Accordingly, Noddings (2013) stated that overly prescriptive curriculum standards undermine creative processes and outcomes.

From a rhizomatic point of view, the starting point is the learner. Some students suggested other topics that might stimulate their individual creativity, such as competition, incubation time and interaction between group members. Bittner & Heidemeier (2013) stated that competition may induce higher levels of creativity in situations in which a competitive mindset induces a promotion (willing to win) compared to a prevention (not willing to lose) focus.

The rhizomatic concept has also been explored in a course around leadership, where Eaton (2015) applied rhizomatic principles to the organisation and assessment of the course. Students were stimulated to use sources from multiple disciplines and could

choose between forms of assessment according to their needs or preferences: podcast, vlog, blog, for example, as such also relating to the rhizomatic principle of starting with the learner's individual needs. Eaton stipulated that there is not a 'unique, good' way to develop a course in a rhizomatic way, but that applying the rhizomatic principles helps to break through more traditional ways of teaching and learning.

The course itself could be enhanced by relating more to the other subjects in this minor. The students experienced the emphasis on creativity as a 'stand-alone' topic and could not transfer their insights to other subjects. The alignment with the projects could also be intensified, as some students stated that there was no possibility for creativity because of the set requirements for the outcome of the project.

Our case study gives directions in what to include when designing creativity courses, based on the student perceptions: (more) interaction between group members, competition between groups, relations with the professional field, connections to the technical world (TRIZ) and attention for thinking patterns.

Limitations

The following limitations in the present study should be acknowledged. First, we did not measure the effect of the rhizomatic course on creativity of the students itself, but only on the students' own experience with this novel approach. Second, a case study can only give an indication of a direction for future research. The number of students and workshops were small, which may have affected the validity of the research. Other ways of collecting data instead of group interviews and a questionnaire, for example individual interviews to provide a deeper understanding of the research issues, and larger sample sizes are needed to examine if more students feel this way about the rhizomatic approach. Third, our findings regarding the perception of the students about whether they added creativity to their project are only valid for the five projects included in this study. With other projects, the results might have been different. Finally, it should also be noted that the course itself was still organized in a top-down way. For rhizomatic learning to occur, one could give the students the opportunity to participate in the set-up and the content of the course.

Acknowledgements

The authors thank Josie Meaney-Ward for language review.

Funding

No funds, grants or other support was received.

Disclosure statement

No potential conflict of interest was reported by the authors.

Consent to participate

All participants in this research consented to participate.

Notes on contributors

Eti de Vries is an educational scientist and is finishing a PhD-research around creativity in education at the University of Antwerp, Belgium. For the Hanze University of Applied Sciences in Groningen, the Netherlands, she is currently working as programme manager in educational innovation. Before, she worked as a senior lecturer Professional Skills in the Engineering Department at HUAS.

Paul Delnooz (PhD) is the founder of the Innovatie Academie in the Netherlands. He is specialised in the innovation of education, leadership and research methodology. He writes books, gives presentations, guides PhD students and supports schools and other types of organizations in educational innovations.

Hugo Velthuijsen is currently director of the Centre of Expertise Entrepreneurship at Hanze University of Applied Sciences in Groningen, the Netherlands. He has a Ph.D. in Artificial Intelligence from the University of Maastricht (1992). Hugo worked 23 years at KPN in R&D, corporate sales, and senior business management (1986-2008), before moving to HUAS as professor of Business & IT and leading professor of Entrepreneurship (2008-2018).

Rianne Pinxten is professor in didactics of Biology, Chemistry and Physics, and STEM-education in the Antwerp School of Education, University of Antwerp, Belgium. She is also affiliated to the Department of Biology. Her research interests are in evolution and animal behaviour education, STEM education and science teacher training.

References

Ananiadou, K., & Claro, M. (2009). *21st century skills and competences for new millennium learners in OECD countries*. (OECD Education Working Papers, No. 41). Organization for Co-operation and Development. http://dx.doi.org/10.1787/218525261154.

Anderson, L.W. & Krathwohl, D. et al. (Eds.) (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of Educational Objectives*. Allyn & Bacon (Pearson Education Group).

Batey, M., Chamorro Premuzic, T. & Furnham, A. (2010). Individual Differences in Ideational Behavior: Can the Big Five and Psychometric Intelligence predict Creativity Scores? *Creativity Research Journal, 22(*1), pp. 90-97.

Bittner, J. & Heidemeier, H. (2013). Competitive mindsets, creativity, and the role of regulatory focus, *Thinking Skills and Creativity, 9*(2), 59-68.

Blok, B.Z. (2017*). Kanteling van een onderwijsparadigma [Twist of an educational paradigm*]? *Onderwijsinnovatie 19*(2), 37-39. https://www.ou.nl/documents/40554/383618/OI_2017_2_web.pdf/aff395d1-351d-97d0-3aa9-2dee04b74dcd.

Bond, C., Fevyer, D. & Pitt, C. (2006). Learning to use the Internet as a study tool: a review of available sources and exploration of students' priorities. *Health Information and Libraries Journal 23*(3), 198-196.

Cachia, R., Ferrari, A., Ala-Mutka, K., & Punie, Y. (2010). *Creative learning and innovative teaching: Final report on the study of creativity in education in EU member states.* (JRC Working Papers JRC62370). European Commission, Joint Research Centre. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/creative-learning-and-innovative-teaching-final-report-study-creativity-and-innovation.

Cormier, D. (2011, November 5). *Rhizomatic learning – Why do we teach?* Dave's Educational Blog: Building a better rhizome. http://davecormier.com/edblog/2011/11/05/rhizomatic-learning-why-learn/

Cormier, D. (2012, April 8). *A review of rhizomatic learning in Mendely*. Dave's Educational Blog: Building a better rhizome. http://davecormier.com/edblog/2012/04/08/a-review-of-rhizomatic-learning/

Cormier, D. (2014, April 1). *Explaining Rhizo14 to Oscar*. Dave's Educational Blog: Building a better rhizome. http://davecormier.com/edblog/2014/04/

Dede, C. (2010*).* Comparing frameworks for "21st Century Skills. In J. Bellance & R. Brandt (Eds.)*, 21st century skills: Rethinking how students learn* (pp. 51-76). Solution Tree Press.

Deleuze, G. & Guattari, F. (1987). *A thousand plateaus: Capitalism and schizophrenia*. University of Minnesota Press.

Eaton, P. (2015, August 19). *Rhizomatic learning: Applying the pedagogical concept to the study of leadership in higher education*. Paul William Eaton@profpeaton.

Gadd, K. (2011). *TRIZ for engineers: Enabling inventive problem solving*. John Wiley and Sons.

Jolles, J. (2016, July 2). *De tiener, zijn brein en de ontplooiing.* [The adolescent, his brains and the evolution]. Webpublication 160206. http://www.jellejolles.nl/de-tiener-het-brein-en-ontplooiing/.

Kaufman, S. B. (2013). *Creativity, flow and openness to experience.* [Public presentation]. Studium Generale lecture, Groningen, Netherlands.

Mbo-raad (2015). *Het mbo in 2025: Manifest voor de toekomst van het middelbaar beroepsonderwijs [*vocational education in2025: manifesto for the future of vocational education]. https://www.mboraad.nl/publicaties/het-mbo-2025-manifest-voor-de-toekomst-van-het-mbo.

Mumford, M. (2003). Where have we been, where are we going? Taking stock in creativity research. *Creativity Research Journal*, *15*(2-3), 107-120.

Noddings, N. (2013). Standardized curriculum and loss of creativity. *Theory into practice, 52*(3), pp.210-2015. Doi: https://doi.org/10.1080/00405841.2013.9804315

Onderwijsraad (2013). *Een smalle kijk op onderwijskwaliteit. De stand van educatief Nederland 2013* [a narrow look on the quality of education: The situation of educational Netherlands]. https://www.onderwijsraad.nl/publicaties/adviezen/2013/11/04/een-smalle-kijk-op-onderwijskwaliteit.

Parsons, J., & Clarke, B. (2013). Rhizomic thinking: Towards a new consideration of social studies practice. *Social Studies Research and Practice*, *8*(3), 89-98. https://www.socstrpr.org/wp-content/uploads/2013/11/06523-Parson.pdf.

Redecker, C. (2009). *Review of Learning 2.0 Practices: Study on the Impact of Web 2.0 Innovations on Education and Training in Europe* (JRC49108). European Commission, Joint Research Centre. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/review-learning-20-practices-study-impact-web-20-innovations-education-and-training-europe.

Richards, R. (2010). Everyday creativity: process and way of life- four key issues. In J. C. Kaufman & R. J. Sternberg (Eds). *The Cambridge handbook of creativity*, (1st ed., pp. 189-215). Cambridge University Press.

Savransky, S. (2000). *Engineering of creativity: introduction to TRIZ methodology of inventive problem solving*. CRC Press. https://doi.org/10.1177/003172170909000905.

Sternberg, R. (1999). *Handbook of creativity*. University Press.

Styhre, A. & Sundgren, M. (2003). Creativity as connectivity: A rhizome model of creativity. *International Journal Internet and Enterprise Management, 1*(4), pp. 421-436.

Tyldum, M. (Director). (2014). *The imitation game* [Film]. Weinstein Company.

Voogt, J. & Roblin, N. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national policies. *Journal of Curriculum Studies, 44*(3), 299-321. https://doi.org/10.1080/00220272.2012.668938.

Vries, E.W. de (n.d.). *De effectiviteit van leerkrachten in het basisonderwijs: Creativiteit als kritische factor voor het verhogen van motivatie en leerprestaties bij basisschoolleerlingen*. [Effectiveness of teachers in primary education: creativity as critical factor for enhancing motivation and learning achievement in primary school children]. [Unpublished doctoral dissertation]. University of Antwerp, Belgium.

Vries, E. de & Velthuijsen, H. (2016). *Engineering students revisited: a design for innovative power.* [Poster presentation]. Annual Conference of the American Psychological Association, Denver, {CO}, USA.

Walia, C. (2019). A dynamic definition of creativity. *Creativity Research Journal, 31*(3), 237-247.