

Chapter #11

EDUCATION EXECUTIVES VIEWS ABOUT THE DEVELOPMENT OF AUTHENTIC LEARNING AND ASSESSMENT ENVIRONMENTS

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ABSTRACT

The aim of this study is to investigate how the concept of “authentic learning” and “authentic assessment” is formed in the discourse of education executives with previous teaching experience in primary and secondary education. Authentic learning is based on the theory of social constructivism, according to which the social nature of knowledge is emphasized and the learner builds knowledge by creating meaningful authentic activities. Authentic assessment is described as a dynamic form of assessment which focuses on the skills developed by students during the learning process (Woolfolk, 2007). The design of learning environments is based on the nine features of authentic learning, constructivism and the theory of embedded learning (Herrington, 2006). In this study examples of authentic activities that support authentic learning environments in which a variety of authentic techniques are used and they are related to different subjects are presented. The sample of the study consisted of 114 adults participating in a training program as a qualification for their professional development during the year 2018-2019. Quantitative analysis of the data was conducted. The analysis of the data revealed that an authentic learning environment consists of experientiality, interdisciplinarity, team work, problem solving, self-assessment, peer-assessment, real-world relevance, which are characteristics of authentic learning and assessment. Moreover, the implementation of authentic learning activities can lead to the development of the cognitive, metacognitive, social and communicative skills of the 21st century.

Keywords: authentic activities, authentic assessment, authentic learning, 21st century skills.

1. INTRODUCTION

The development of an authentic learning and assessment environment covers the three levels of knowledge: declarative knowledge, procedural knowledge and conditional dependent knowledge (Woolfolk, 2019; Reif, 2010). At the first level of knowledge, the declarative knowledge level, a general description of authentic learning is presented. The second level of knowledge, the procedural knowledge, describes the design of learning environments, based on the nine features of authentic learning, constructivism and the theory of embedded learning. At the third level of knowledge, the problem solving level, examples of authentic activities that support authentic learning environments are reported.

Authentic learning may be more important than ever in a rapidly changing world, where individuals are expected to progress through multiple roles. Although foundational skills (reading, writing, mathematics, history, language) remain essential, a more complex set of competencies are required today. The skills that are required to adapt to new conditions are classified into four categories (Binkley et al, 2012): ways of thinking

(creativity and innovation, critical thinking, problem solving, decision making, learning how to learn, metacognition), ways of working (communication, collaboration / teamwork), working tools (information and digital literacy), and living in the world (citizenship, life and career, personal and social responsibility). Therefore, schools must be connected with the real needs of society and promote changes that are necessary for the development of the 21st century skills. The changes must aim at different learning and assessment environments that can be created by "authentic learning".

However, it is observed that traditional methods and techniques are mostly used in teaching. According to the literature, these traditional teaching approaches produce inactive knowledge (Bereiter & Scardamalia, 1985; Bransford, Franks, Vye, & Sherwood, 1989; Gick & Holyoak, 1983; Renkl, Mandl, & Gruber, 1996). On the contrary, students taking part in authentic learning activities are able to develop cognitive, social and metacognitive skills, as they use knowledge to decide the steps and the strategies they must take on to solve a real life problem (Wornyo, Klu, & Motlhaka, 2018; Reeves, Herrington, & Oliver, 2002).

Authentic learning is based on the theory of social constructivism and supports authentic learning environments where learners build knowledge by creating meaningful authentic activities. Vygotsky (1978), Wertsch (1985), Lave (1991) and others argue that the acquisition of knowledge is the product of activities that take place in a particular cultural context. Knowledge is thus inseparably bound up with the social and physical environment in which it is developed and used rather than being an abstract entity (Roelofs & Terwel, 1999: 203). According to Lombardi (2007), authentic learning is "a type of learning that focuses on real-world, problems, using role-playing exercises, problem-solving activities, case studies, simulations, virtual learning communities, self-assessment and peer assessment" (p. 2). Har (2013) defines it as "learning which happens by participating and working on real-world problems" (p. 2). Finally, according to Pearce (2016) authentic learning is "learning which is designed to connect what students are taught in school with real-world problems of everyday life (p. 1). According to Frey Schmitt and Allen (2012), tasks are authentic if they mirror the complexity, collaboration, and high level thinking that is necessary in the most intellectual of professional problem-solving and decision-making (p. 10).

Authentic learning environments simulate real life problems and create the opportunity for using alternative approaches to solve a problem combining different ways of working and thinking. Therefore, problem-solving activities, simulations, on line learning communities, projects etc can be used to implement authentic learning in school environments. Reeves et al. (2002) describe what authenticity means in the design of learning activities. They present ten characteristics that define authentic Learning activities: 1. Authentic Learning activities have real world relevance, 2. Authentic Learning activities are ill-defined, 3. Authentic Learning activities require sustained student effort, 4. Authentic Learning activities involve multiple perspectives and resources, 5. Authentic Learning activities involve collaboration, 6. Authentic Learning activities provide opportunities for reflection, 7. Authentic Learning activities encourage interdisciplinary perspectives, 8. Authentic Learning activities integrate assessments, 9. Authentic Learning activities create polished products, 10. Authentic Learning activities produce diverse outcomes.

Students taking part in authentic learning activities are able to develop cognitive, social and metacognitive skills, as they use knowledge to decide the steps and the strategies they must take on to solve a real life problem (Wornyo et al 2018; Reeves et al., 2002).

2. METHOD

2.1. Objective and research questions

The objective of this study is to investigate the concept of “authentic learning” and “authentic assessment” as it was revealed by education executives with professional background in their field of expertise. In specific, the present study explores:

- How education executives create an authentic learning environment using specific examples of authentic learning activities.
- What results they expect to receive from the implementation of the authentic learning activities
- What the education executives consider as “authentic learning” and “authentic assessment”

Research Questions:

- What learning and assessment techniques do education executives use to ensure the authenticity of learning and assessment.
- What are the characteristics of authentic learning activities according to the education executives.
- What kind of skills do they consider students develop through the specific options.

2.2. Research strategy and instrument

A qualitative data analysis was carried out. The qualitative study was regarded appropriate because the researchers were interested to investigate how the concept of “authentic learning” and “authentic assessment” is formed in the discourse of the education executives (Delikari, 2005). All recorded data were analyzed by thematic analysis (Creswell, 2000). Data were collected in one phase for all the participants. The questionnaire that was administered to the education executives was divided into three parts.

The questions were closed and open type, so the education executives had the opportunity to express their perceptions about the meaning of authentic learning and authentic assessment. In the first part of the questionnaire they had to define the concepts “authentic learning” “and authentic assessment”. In the second part they had to describe the connection between authentic learning and authentic assessment and in the third part to give examples of authentic learning activities and techniques of authentic assessment that they had used in their teaching practices”. They had to answer questions such as the following: What do you consider is the difference between authentic assessment and traditional assessment? What types of authentic learning activities have you used in your daily school practice? Give some examples of authentic learning activities that you have implemented in your daily school practice. What skills do the students participating in authentic learning activities develop? Moreover, quantitative analysis of the data was conducted regarding the gender of the participants and the type of authentic activity chosen. 114 questionnaires were collected in total.

2.3. Participants

The sample of the research consisted of 114 adults participating in a training program in order to obtain a certification in leadership and management in education during the year 2018-2019. The trainees were education executives with previous teaching experience in primary and secondary level of education. During the training program they had to participate in a course entitled “Assessment in Education” and in specific in Educational Assessment.

3. RESULTS

48 men (42%) and 66 women (58%) participated in the study. 43 of the men and 56 of the women answered the questions. 15 of them did not answer the question about giving examples of authentic learning and assessment techniques.

*Table 1.
The participants according to gender.*

	<i>They answered</i>		<i>They did not answer</i>		<i>Participants</i>	
	<i>n</i>	<i>%</i>	<i>v</i>	<i>%</i>	<i>v</i>	<i>%</i>
<i>Male</i>	43	89,6	5	10,4	48	100
<i>Female</i>	56	84,8	10	15,2	66	100
<i>Total</i>	99	86,8	15	13,2	114	100

Table 2 shows the type of authentic activity chosen by education executives according to their gender.

*Table 2.
Types of authentic learning activities according to gender.*

	<i>Men</i>		<i>Women</i>		<i>Total</i>	
	<i>v</i>	<i>%</i>	<i>v</i>	<i>%</i>	<i>v</i>	<i>%</i>
project	21	23,3	28	22,8	49	23,0
portfolio	11	12,2	23	18,7	34	16,0
role-playing	6	6,7	5	4,1	11	5,2
case study	6	6,7	5	4,1	11	5,2
problem solving	6	6,7	5	4,1	11	5,2
rubric	7	7,8	5	4,1	12	5,6
concept map	5	5,6	9	7,3	14	6,6
simulation	3	3,3	9	7,3	12	5,6
self-assessment	5	5,6	7	5,7	12	5,6
peer-assessment	4	4,4	8	6,5	12	5,6
diary	2	2,2	3	2,4	5	2,3
ICT	7	7,8	5	4,1	12	5,6
experiment	2	2,2	3	2,4	5	2,3
brainstorming	0	0,0	1	0,8	1	0,5
observation	3	3,3	3	2,4	6	2,8
debate	1	1,1	1	0,8	2	0,9
visit	1	1,1	3	2,4	4	1,9
Answers in total	90	100	123	100	213	100

The findings resulting from qualitative data collected through questionnaires were grouped in three categories according to the objectives of the study. The researchers divided the findings of the research into the following three categories: the types of authentic learning and assessment techniques, the characteristics of authentic learning environments and the skills the students can develop through the participation in authentic activities, according to the perceptions of the education executives with previous experience in education.

The education executives, who were of different specialties and had previous experience in teaching, gave examples of authentic learning and assessment activities supporting authentic learning environments used in their daily school practice in a variety of subjects such as Maths, History, Geography, Biology, Science, Literature, Religious Education, Chemistry etc.

Most education executives in the sample (n=83) answered that projects and portfolios are the authentic techniques they mostly use in their school practices. According to their answers, projects and portfolios have the characteristics of authentic learning and assessment and support authentic environments. Using the above techniques, students learn to work in groups, reflect on their experiences, develop critical thinking, cognitive, social and metacognitive skills, and use strategies to solve a problem, design plans and follow steps to achieve a goal, as the answers of the participants in the study revealed. *"In Religious Education, my students planned a religious tour of the Parthenon for Muslims. During the course the students created a portfolio which included photos, explanations of important constructions and activities, samples of interviews, list of books they have read and content related to the topic they were working on"* (P. 25). In addition, reflection can be developed with the use of portfolio in the learning process *"I used portfolio as an assessment technique in History lesson. It is a flexible and valuable authentic technique which gradually revealed the personal development of the students and helped me to assess them in a holistic way. This technique helped students to be aware of themselves and discover their own skills"*. Moreover, *it helped me to reflect on my teaching and improve it.* (P. 81).

One dominant skill that came up from the study is the problem-solving skill. Students use a variety of sources distinguishing relevant from irrelevant information and associate the gained knowledge with everyday life discovering links in order to solve a problem. Thus, they become an active part of the learning process and they stayed motivated through the process of creation. Moreover, from the answers of the participants came out that cognitive skills, such as search for information was developed as well. *"The students developed the skill to recognize information and to choose what was relevant to the subject"* (P. 58).

From the answers of the participants came to surface the fact that all the above authentic activities are a form of experiential learning, through students are initially exposed to an experience and then encouraged to reflect on it and develop new knowledge, skills, attitudes and behaviors (Phillips, 2004). Indicative examples of projects that focus on experiential learning are the following: *"In Geography I asked the students to make a research of a country they were interested in and to make a tourist guide of that country. Then they had to take on the role of a tour guide (role playing).* (P.3). In a project that took place in a primary school in a touristic area *"My students in the English class had to make a tourist guide for their area in which they had to highlight the advantages of their area among other schools in Greece in order to attract other students visit it. Students had the chance to select between a printed tourist guide and a digital one by creating a website or posting it on local blogs"* (P.10). The students gained practice in identifying the most important points of a story and learned how to write in a captivating manner.

In experiential learning, which is a basic characteristic of authentic learning, knowledge and experience are acquired outside the traditional academic classroom setting. An example of an outdoor authentic activity is the following: *"I was working as a teacher in a primary school in Athens. For Science my students had to study the plants, so they made their own vegetable garden and in this way they learned all the stages of vegetable development, the ways of cultivation, the parts of the plants, their species, the amount of*

water they need as well as the frequency of watering. They learned how to take responsibility for the protection of the plants, got to know their enemies and the ways to protect them” (P.33).

In role-playing activities it is important to enable and encourage students to explore different perspectives on the topics from various points of view. According to the examples they gave: *“Learning takes place through a role-playing game for students, sometimes assuming the roles of traders and sometimes customers. In an experiential way, students learn how to use the knowledge they acquire in dealing with real-life situations”*(46). In various authentic learning activities students act out roles in a particular scenario and have the chance to see a problem from different perspectives. In a role – playing activity *“The students take on the role of Municipal Counselor and try to face the big problem of pollution in the city they live. They try to propose solutions in order to solve the problem”* (P.100). The most important session of this activity is the discussion about what the students learned, as they reflect on their own experiences, discuss the strategies they implemented and the ways they can apply them in real life.

In addition, the use of the diary as an authentic technique provides opportunities for reflection: *“Students write down in a diary the effort they made, the learning process and the means they used in order to complete the tasks they undertook, the problems they faced, the cognitive conflicts that finally helped them understand various concepts, their reflections and the evaluation of the knowledge gained* (P.62).

According to the participants’ answers based on their own experience in all kinds of authentic activities (project, simulation, role playing, case study, c-map etc) students become an active part of the learning process through their participation in authentic activities. *“Students act on their own by researching data, recording opinions, exchanging opinions and announcing results.”* (P.40)

Through specific examples based on the education executives’ experience, the relevance between authentic learning activities and real world situations was revealed. One of the participants mentioned: *“In Social Studies students should create a virtual business and take on different roles. Students started searching for funding, they designed products, materials, they gave interviews, made presentations at exhibitions and promoted sales. Students managed to create a movement in the local community, offered publicity to the idea of remunerative recycling with dozens of references in print media and many interviews on radio and television stations nationwide. These students have already made the first step of an entrepreneur. Most of their classmates may not have the chance to do that in their lives”* (P.88).

Another basic characteristic of authentic learning and assessment which became apparent from the analysis of the answers is team work. In all kinds of authentic learning activities students work in groups, interact with others, cooperate and respect the other members of the team. The analysis of the answers revealed that *“Students share and exchange views, attitudes, experiences and information about a problem”* (P.58). In classrooms team work can be encouraged through tasks that are addressed to a group rather than an individual. Moreover, collaboration can be established through communication technology.

The analysis of the data revealed self-assessment and peer assessment as dominant authentic characteristics in the kinds of authentic activities that were described by the participants (project, simulation, role playing, case study, c-map, diary etc.). The education executives based on their teaching experience referred that in authentic learning environments students are able to learn on their own how to find answers to some of the inconsistencies they came across and to resolve the ambiguities embedded in some of the tasks. According to their answers: *“In Literature I asked students to work in groups in*

order to study two poems of the same poet, Carver Raymond. Then they had to assess their classmates using an analytic rubric. By assessing their classmates work, they reflected on their own learning process". "They could get information from the other team members and compare it with theirs, express their point of view and correct their mistakes". (P.11).

In order to provide opportunities for students to reflect on their learning, the learning environment needs to provide an authentic task. The construction of a concept map and the creation of a portfolio enable students to identify their in different stages of accomplishment. As they pointed out *"Using concept maps, we can identify students' weaknesses and adapt their lesson to their needs". "Students choose the tasks they will include in their portfolio based on goals and criteria that are defined by them with our help" (P.74).*

In order to provide authentic assessment in classrooms it is required the assessment to be integrated with the activity and to provide criteria for assessing varied products. *"When participating in a competitive process with specific criteria to be met by the team, each member of the team was being evaluated at the daily meetings where feedback, peer comments and views of other members of the team and me were given,". (P.3).*

From the answers of the participants became prominent that authentic learning activities encourage interdisciplinary knowledge and involve multiple resources. *"In Environmental Education the aim of the project was to make students aware of the need for energy saving, renewable energy sources, to bring them in contact with the environment and to become aware of the value of this kind of energy, ie to know how to produce renewable / green energy; solar energy, wind, through photovoltaic systems and geothermal energy. The research encouraged interdisciplinary as the students needed to combine knowledge from different courses, such as Computer Science, English and Engineering / Electrical Engineering (P.2).*

In authentic activities students are able to get engaged in inquiry and problem solving, decision making and scientific research. Problem solving was emerged as a basic characteristic and as a metacognitive skill. In a given example based on the experience of the participants *"A rainy day can be the cause for exploring the circle of water. In Physics the students asked me questions, such as "Why is it raining?", "Where does the rain come from", etc. After activating the pre-existing knowledge, I followed the steps of constructive learning, meaning I asked students to formulate questions and make predictions. They were led to formulate functional definitions and draw conclusions. Through experimentation they approached the concepts of melting, coagulation, solubility, ventilation" (P.22).*

The answers of the participants revealed that ICT was used in most authentic activities, such as portfolios, simulations, online diaries, rubrics, c-maps etc and supported collaboration and team work. *"Students in collaboration with me created an online diary - blog where on a daily basis they posted topics related to daily school life, society, family, and the scientific community. Moreover, they posted announcements of events, school holidays, excursions and educational programs. The online diary is a technique of authentic assessment for stakeholders in the school community" (P.14).*

Finally, according to the education executives the students showed sustained effort and they focused on their goal through their participation in authentic activities. For instance, in a project that took place in Social studies: *"The students of second grade took voluntary action for the inclusion of refugees, immigrants in the local community. They organized sports, entertainment, arts, and music activities with children from different cultural backgrounds, so that all the children from different countries were included in our school life and community. They concentrated their effort on helping them in their daily schhol life and they developed the skills of planning, creativity and innovation, acceptance of diversity, flexibility and adaptability (P. 2).*

4. DISCUSSION

In this study we have focused on the definition of authentic learning and authentic assessment according to the perceptions of education executives with previous experience in education. From the analysis of the data we are led to the conclusion that the basis for authentic learning is the belief that students learn more easily and in depth if knowledge is combined with existing experience and practical application in everyday life (Reeves et al., 2002). The participants, who had previous experience in teaching through specific examples given were led to the definition of authentic learning and authentic assessment, which is consistent with the literature (Lombardi, 2007; Har, 2013; Herrington & Oliver, 2000, Wornyo et al., 2018). From the results of the research the authentic techniques that have been used the most were projects, portfolios, problem solving, self-assessment and peer assessment, role playing and the use of ICT.

According to the analysis of the examples given in authentic learning and assessment environments regarding the development of skills, students are provided the opportunity to construct their own knowledge, through research and problem solving and develop critical thinking and metacognitive skills. They work in groups and take initiatives. Through inquiry and the expression of different ways of thinking, students are encouraged to collaborate, to respect and consult one another (Wornyo et al., 2018). For example, in project based learning, working in groups, using ICT for searching information, developing a topic of research and presenting the findings and the conclusions are practices of authentic learning. These activities are conducive for creating an authentic learning environment where the real world becomes a part of the educational experience. For example, in Social Studies Lock and Duggleby (2017) argue that “when students are engaged in authentic learning that uses a global classroom approach, it influences how they see themselves as global citizens” (p. 21).

As it became apparent from the examples of authentic activities described by the participants, in the project method students are able to explore and solve problems by choosing information through collaboration and dialogue. The results are in line with other research, where through Project Based Learning (PBL), they have the opportunity to be involved in problem-solving, decision-making and scientific research (Hmelo-Silver, 2004; Panasan & Nuangchalerm, 2010; Thomas, 2000). Regarding rubrics, according to Jonsson, and Svingby (2007), when they are used by students to assess their own performance, the students are encouraged to take responsibility for their own learning and they are able to appreciate the strengths and weaknesses of their learning work. On the contrary, Orsmond and Merry (1996), argue that students might not find the qualities in their work even if they know what to look for, since they have a less developed sense of how to interpret criteria.

In authentic learning and assessment contexts students act out multiple roles, experiment and apply skills in diverse situations, organize, assess and synthesize information, relate facts, concepts, develop complex ways of communication, narrate and give explanations in order to present their conclusions (Roelofs & Terwel, 1999).

The findings of this study indicate that the above techniques give students the opportunity to use previous experiences and knowledge and share them in groups in order to gain new knowledge. According to Jarvis (1999:122), this happens because these techniques are focused on students who use pre-existing knowledge to solve problems and collaborate. Authentic learning is an active learning process where students are not passive. It has been observed that this learning is necessary for developing critical thinking skills and scientific contents (Apedoe, Walker, & Reeves, 2006).

As far as experientiality and interdisciplinarity are concerned, the analysis of the data indicated that they are key characteristics of authentic learning, as we find them as key characteristics in many examples of our study, such as project, portfolio, role playing and problem solving. This is in line with the literature according to which students' experiences are enriched by providing them multiple perspectives of a single topic or issue and authentic learning activities encourage interdisciplinary perspectives (Oliver, Herrington, & Reeves, 2011). Authentic activities can be integrated and applied into different subject areas and lead beyond domain-specific outcomes (Bransford, Sherwood Hasselbring, Kinzer, & Williams, 1990).

From the answers of the participants, it became evident that assessment of authentic learning can take the form of a number of assessment measures which do not include formal tests, such as portfolios, diaries, and self-assessment but they create opportunities which enable students to craft polished performances (McLellan, 1996). In this context authentic assessment enriches the teaching process and does not occur only at the end of the learning process but during it (formative assessment).

Finally, the important role of ICT in authentic learning environments was mentioned by most of the participants in their responses. In specific, ICT (Information and communications technology) was used in various authentic activities, such as e-portfolio, simulations, rubrics, e-diary etc. The 21st century skills can be built by having students complete literacy assignments from the viewpoint of a blogger. Students can edit peer work, share the product with the learning community and interact with others through online resources. Establishing a deeper familiarity with computers will also help with computer-based assessments. For example, Koenders (2006) reports how authentic online learning in Biology enhanced the learning experiences of the learners.

In most cases, technology provides the capacity to support them from a distance enabling them to consult and collaborate as they work (Oliver et al., 2002). The easy accessibility that the web provides to various resources enables them to share content and to create learning communities which can interact easily. Undoubtedly, the internet can be used most successfully to encourage reflection through the use of reflective online diaries, rubrics or e-portfolios and simulations, as it was revealed from the study (Piburn & Middleton, 1997; Lebow & Wager, 1994; Young, 1993).

5. CONCLUSION/FUTURE RESEARCH DIRECTIONS

The learning tasks implemented by the education executives with experience in teaching and education provided the opportunity to introduce interesting and challenging authentic tasks in classrooms of primary and secondary education. Describing specific examples of authentic learning and assessment activities they tried to define what they consider as authentic learning and authentic assessment.

According to their answers the authentic learning tasks and activities undertaken exposed both students and teachers to learning experiences that have enhanced social and metacognitive skills of them both. Students applied knowledge in practice and in real-life situations and they developed critical thinking, through experiential activities. Education executives reflected on their work.

Although authentic learning and assessment techniques are appealing, much research needs to be conducted on how to foster them in an effective way in classrooms. For example, teachers could introduce authentic activities by replacing textbooks with historical documents in History lessons. They could design problem-based activities to replace lectures and support innovation with visualizations, simulations, and interactive

technologies. Their learning goals can be achieved if they rethink the assessment strategies they use. Taking all these under consideration, much research needs to be conducted on the importance of the role of teachers who need to have a clear rationale for completing the task, understanding of the real-life application of the task and appropriate support to complete the task. Future research needs to focus on authentic environments that support student learning and enrich learning experiences. However, for this to happen it is necessary for teachers to carefully design and facilitate classroom tasks that promote the principles of authentic learning.

Finally, the findings could be a trigger for further research in which the perceptions and views of the students about authentic learning and assessment could be investigated. Though the research focuses on authentic learning activities at primary and secondary level of education authentic activities could be successfully implemented in teaching various subjects at tertiary level, as well.

REFERENCES

- Apedoe, X., Walker, S., & Reeves, T. (2006). Integrating inquiry-based learning into undergraduate geology. *Journal of Geoscience Education*, 54(3), 414–421.
- Bereiter, C., & Scardamalia, M. (1985). Cognitive coping strategies and the problem of inert knowledge. In S. S. Chipman, J.W. Segal, & R. Glaser (Eds.), *Thinking and learning skills*, (pp. 65-80). Hillsdale, N.J.: Erlbaum.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining Twenty-First Century Skills. In B. McGaw & E. Care (Eds), *Assessment and Teaching of 21st Century Skills* (pp 17-66). New York, NY: Springer.
- Bransford, J. D., Franks, J. J., Vye, N. J., & Sherwood, R. D. (1989). New approaches to instruction: Because wisdom can't be told. In S. Vosniadou & A. Ortony (Eds.), *Similarity and analogical reasoning* (pp. 470–497). Cambridge University Press. <https://doi.org/10.1017/CBO9780511529863.022>
- Bransford, J. D., Sherwood, R.D., Hasselbring, T.S., Kinzer, C.K., & Williams, S.M. (1990). Anchored instruction: Why we need it and how technology can help. In D. Nix & R. Spiro (Eds.), *Cognition, education and multimedia: Exploring ideas in high technology* (pp. 115-141). Hillsdale, NJ: Lawrence Erlbaum.
- Creswell, J. W. (2000). *Research design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications.
- Delikari, P. (2005). The formation of the concept of 'grading' in Math teachers' discourse. In X. Kynigos (Ed.). *The Teaching of Mathematics as a Field of Research in the Society of Knowledge: Proceedings of the 1st Conference of the Association of Mathematics Teaching Researchers* (pp. 280-291). Athens: Greek Letters.
- Frey, B., Schmitt, V.L., & Allen, J. P. (2012). Defining Authentic Classroom Assessment. *Practical Assessment, Research, and Evaluation*, 17. doi: <https://doi.org/10.7275/sxbs-0829>
- Gick, M. L., & Holyoak, K. J. (1983). Schema induction and analogical transfer. *Cognitive Psychology*, 15(1), 1–38. [https://doi.org/10.1016/0010-0285\(83\)90002-6](https://doi.org/10.1016/0010-0285(83)90002-6)
- Har, L. B. (2013). *Authentic learning*. Hong Kong: The Hong Kong Institute of Education. Retrieved from www.ied.edu.hk/aiclass/
- Herrington, J. (2006). Authentic E-Learning in Higher Education: Design Principles for Authentic Learning Environments and Tasks. In T. Reeves & S. Yamashita (Eds.), *Proceedings of E-Learn 2006--World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 3164-3173). Honolulu, Hawaii, USA: Association for the Advancement of Computing in Education (AACE).
- Herrington, J. & Oliver, R. ((2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Technology*, 48(3), 23-48.

- Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), 235–266.
- Jarvis, P. (1999). *Adult and Continuing Education: Theory and Practice*. London: Routledge.
- Jonsson, A., & Svingby, G. (2007). The use of scoring rubrics: Reliability, validity and educational consequences. *Educational Research Review*, 2(2), 130–144. doi:10.1016/j.edurev.2007.05.002
- Koenders, A. (2006). An authentic online learning environment in university introductory biology. In J. Herrington & T. Herrington (Eds.), *Authentic learning environment in higher education* (pp. 48-60). Hershey, PA: Information Science Publishing.
- Lock, J. & Duggleby, S. (2017). Authentic learning in the social studies classroom: Connecting globally. *One World in Dialogue*, 4(1), 20-27.
- Lombardi, M. (2007). Authentic Learning for the 21st Century: An Overview. In D. Oblinger (Ed.), *Educause Learning Initiative (ELI)*, 2. EDUCAUSE.
- Lebow, D., & Wager, W.W. (1994). Authentic activity as a model for appropriate learning activity: Implications for emerging instructional technologies. *Canadian Journal of Educational Communication*, 23(3), 231-144.
- Lave, J. (1991). Situating learning in communities of practice. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 63–82). American Psychological Association. <https://doi.org/10.1037/10096-003>
- McLellan, H. (1996). *Situated learning perspectives*. Englewood Cliffs, NJ: Educational Technology Publications.
- Oliver, R., Herrington, J. & Reeves T. (2011). *Authentic activities and online learning*. Research Online: ECU Publications Press.
- Orsmond, P., Merry, S., & Reiling, K. (1996). The importance of marking criteria in peer assessment. *Assessment and Evaluation in Higher Education*, 21(3), 239–249.
- Panasan, M. & Nuangchalerm, P. (2010). Learning outcomes of project-based and inquiry-based learning activities. *Journal of Social Sciences* 6(2), 252-255.
- Pearce, S. (2016). *Authentic learning: What, why and how? e-Teaching Management Strategies for the Classroom*. Retrieved from http://www.ancel.org.au/ancel/ACEL_docs/Publications/e-Teaching/2016/e-Teaching_2016_10.pdf
- Phipps, N. (2004). Experiential learning: Definitions, reflections, conditions, In *Adult Education*, (pp. 4-10), Athens: Metaichmio.
- Piburn, M. D., & Middleton, J.A. (1997, January). *Listserv as journal: Computer-based reflection in a program for preservice mathematics and science teachers*. Paper presented at the International Conference on Science, Mathematics and Technology Education, Hanoi, Vietnam. ED 404 330.
- Reeves, T.C., Herrington, J., & Oliver, R. (2002). Authentic activities and online learning. In A. Goody, J. Herrington, & M. Northcote (Eds.), *Quality conversations: Research and Development in Higher Education*, (pp. 562-567). Jamison, ACT: HERDSA.
- Reif, F. (2010). *Applying Cognitive Science to Education: Thinking and Learning in Scientific and Other Complex Domains*. Cambridge, MA: MIT Press.
- Renkl, A., Mandl, H., & Gruber, H. (1996). Inert Knowledge: Analyses and Remedies. *Educational Psychologist*, 31(2), 115-121.
- Roelofs, E. & Terwel, J. (1999). Constructivism and authentic pedagogy: State of the art and recent developments in the Dutch national curriculum in secondary education. *Journal of Curriculum Studies*, 31 (2), 201-227.
- Thomas, J. W. (2000). *A review of research on project-based learning executive summary*. San Rafael, CA: The Autodesk Foundation.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Harvard University Press.
- Wornyo, A, Klu. E., & Motlhaka, H. (2018). Authentic Learning: Enhancing Learners' Academic Literacy Skills. *International Journal of Applied Linguistics & English Literature*, 7(4), 56. <http://dx.doi.org/10.7575/aiac.ijalel.v.7n.4p.56>
- Woolfolk, A. (2019). *Educational psychology* (14th Ed.). Pearson.

- Woolfolk, A. (2007). Social cognitive and constructivist views of learning (Chapter 9). In *Educational Psychology* (pp. 204-245). Upper Saddle River, NJ: Prentice Hall.
- Young, M.F. (1993). Instructional design for situated learning. *Educational Technology Research and Development*, 41(1), 43-58.

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