Chapter 20

Use of Metacognitive Awareness for the Optimal Utilisation of Competencies in Ill-Defined Situations: A Study of Oskar Schindler (Schindler's List)

Punita Raj and Devika

Abstract A grasp over the theoretical concepts directs learners to the comprehension of basic learning but mere acquisition of knowledge does not ensure the path to its applicability in the given situation. Formal education provides engineering students with an environment that allows them to have proper facilities, experts to guide, and well thought -of and critically analysed problems. Awareness of, exposure to, and practice in self-reflective and self-directed learning also known as metacognitive awareness may be put to an incredible use. Engineering education, along with technical aspects, focuses on metacognitive awareness. This qualitative case study attempts to explore knowledge and skills of the character Oskar Schindler in the highly acclaimed real life incident based movie, Schindler's List. Oskar Schindler uses the concept of 'simple engineering' and makes his workers understand or execute a task by helping them understand and implement this concept successfully. This paper also documents the findings of an initiative where Oskar Schindler practically uses his competencies and metacognitive awareness to handle ill-defined or unthought-of problems efficiently, using ignorant and untrained hands.

Keywords Metacognitive awareness · Simple engineering · Competencies

20.1 Introduction

Engineering academic curriculum is mainly influenced by accreditation criteria programs (EA 2005; ABET 2008; ENAEE 2008) that are flexible, developmental and targeted at the specific needs of industries and engineers' expectations (Earnest 2005).

P. Raj · Devika (✉)

Department of Humanities and Social Sciences, Birla Institute of Technology and Science,
Pilani-Campus, Pilani 333031, RJ, India
e-mail: devika@pilani.bits-pilani.ac.in

P. Raj

e-mail: p20180428@pilani.bits-pilani.ac.in

© The Author(s) 2020

K. S. Sangwan and C. Herrmann (eds.), *Enhancing Future Skills and Entrepreneurship*,
Sustainable Production, Life Cycle Engineering and Management,
https://doi.org/10.1007/978-3-030-44248-4_20

In today's professional world, the employees would need metacognitive and self-controlled manner to take situation specific decisions (Conley 2014) and when and how to apply these particular strategies and skills, in doing tasks or solving problems at workplace efficiently (Flavell 1979; Prytula 2012; Sengul and Yasemin 2015). The combination of practical expertise and one's soft skills, i.e. amalgamation of non-technical and attitudinal competencies, helps professional engineers to become successful (Hissey 2000; Passow and Passow 2017; Azmi et al. 2018; Russo 2016; Leslie 2016). The theoretical knowledge only helps the learners become aware of different functionality of one's ability but the practical execution teaches them how to use these competencies with proficiency in unfavourable situations in real life (Williams et al. 2016).

20.2 Metacognition and Competence in Engineering Education

Metacognition is a higher-order thinking skill or process that makes learners aware of their awareness (Flavell 1979; Wenden 1998). Classified among 21st century skills, metacognition includes self-assessment of the development of critical thinking, communication skills, collaborative practices (Geisinger 2016), indefinite integral problems solving (Sengul and Yasemin 2015), etc. Through metacognition, learners can be more specific about how to monitor and modify the way they think, not only in academics but also in career and life in general (Prytula 2012).

The term competence, first used by Lundberg (1972) in 1970, is a set of demonstrable merits, i.e. the combination of practical and theoretical knowledge, skills, abilities, attitudes and behaviours, awareness and candidness; these competencies enable a person to perform skilfully, make valuable decisions, take effective action and correlate with performance on the job, that can be measured against well accepted standards, and can be improved through training and development (Passow and Passow 2017; Russo 2016; Leslie 2016). Competencies are divided into technical, non-technical and attitudinal/behavioural (Passow and Passow 2017; Russo 2016; Male et al. 2009).

20.3 Literature Review

Metacognition can compensate for the lack of appropriate domain knowledge when metacognitive awareness leads to recognizing the areas of limited understanding, adapting working hypotheses, monitoring thinking, and revisiting early interpretations (Kim and Jeeheon 2013). Even in the new advanced technological era, engineers along with technical skills require employability skills (Robinson 2000), foreign language proficiency and better soft skill proficiency (Gilleard and Gilleard 2002),

multilateral and technical and non-technical expertise to deal with professionals in various disciplines (Inman 2006), problem-based learning (Kumar and Natarajan 2007), and competencies expanding beyond countries (Lucena et al. 2008). Engineering educators should focus on developing generic engineering competencies (Male 2010), cognitive competencies (Frank 2012), requirement of the industries (Nair et al. 2009), career aspiration (Itani and Issam 2016; Passow 2013), successful social behaviours (Bakar and Ting 2011), and the current level of skills owned by the staffs (Russo 2016). These competencies should be a part of the curriculum to develop both technical and non-technical skills among engineers (Azmi et al. 2018).

20.4 Objectives

The objectives of the paper are to study how the metacognitive awareness helps Oskar Schindler identify all the limitations and unfavourable conditions. It also focuses on identifying and analysing the competencies used by Oskar Schindler to execute his job and responsibilities.

20.5 Methodology

This qualitative case study is descriptive in nature. The character chosen for the study is Oskar Schindler from the movie *Schindler's List*. The character of Oskar Schindler is scrutinized for the use of his metacognitive awareness. Use of metacognitive awareness is analysed as per his understanding of the situations, processes and methods. An analysis of his jobs and responsibilities is done to find out the use of generic engineering competencies by him. Generic engineering competencies have been selected from the previous studies and shortlisted according to the need of industries and professional engineers (Russo 2016; Male et al. 2009).

20.6 Results and Analysis

Oskar Schindler used his metacognitive awareness to implement his generic engineering competencies, i.e. the combination of engineering (technical skills) and generic (non-technical/attitudinal skills) competencies to analyse and solve ill structured and ill-defined problems with efficiency (Spielberg et al. 1993). It was his metacognitive awareness that helped him use his competencies. Table 20.1 shows the types of generic engineering competencies, the specific categories of technical, non-technical and attitudinal/behavioural competencies, and the situations where Schindler used his metacognitive awareness to perform his tasks.

Table 20.1 Showing the types of competency, their category, and role of the metacognitive awareness in the use of competencies by Oskar Schindler

Competency	Category	Role of the metacognitive awareness in the use of competencies by Oskar Schindler
Technical	Problem solving	Schindler thought conceptually to define and analyse the problem of money, space, and work force. After evaluating the alternatives, he took money and space from Jews; paid them back in product; hired them as his work force in his factory; and balanced trades-offs (16:37)
	Practical ingenuity	Schindler used his practical knowledge, skills and familiarity with techniques, tools and materials in his factory (1:21:00). As a result, he could get the work done and fulfil his sole customer's needs
	Workplace changes	He recognized the scope for opportunities; made suitable adjustments to open his factory; gathered resources; and utilised them in the best possible way (13:08)
	Manufacturability	He evaluated and improved manufacturability of his product after getting the contracts from the German army (12:23). With his knowledge, awareness, and skills, he got better opportunity to sell products at a reasonably good cost
	Negotiation	Schindler negotiated and convinced his client (the German army) of their needs. He negotiated even with the Jews for money (21:17) and place (20:00). His justification of the need for workforce to make his factory work helped him convince the German army to allot him the required workforce

(continued)

Table 20.1 (continued)

Competency	Category	Role of the metacognitive awareness in the use of competencies by Oskar Schindler
	Design	Schindler used design methodology to gather information plan to set up a factory according to the needs of the German army; generated the idea of starting his factory after checking the feasibility, communicating with Jewish investors and SS officers, and seeking their help and approval
	Liability	After his failure in his previous efforts, he took the risk of starting a new company. Feasibility and execution of this task was maintained by his knowledge of technology, legislation, and standards
	Self-management	Schindler gave priority to his work as well as his personal life. He managed time and punctuality at his workplace. His self-management helped him arrange workers (12:55), provide employment and make profit to earn name for himself. Having established himself as a businessman, ultimately he could save the lives of Jews. Good level of output at his workplace satisfied the need of the German army
	Demeanour	He presented himself as a polite and helpful person, smartly dressed and confident in his apparel and appearance (1:15:20)

(continued)

Table 20.1 (continued)

Competency	Category	Role of the metacognitive awareness in the use of competencies by Oskar Schindler
Non-technical	Communication/Information management	He kept every kind of documents and information with him, whether it be the lists of Jewish workers or any claim funds. Schindler prepared the list of the Jews and maintained the documents to save the lives of the Jews (2:15:54) (2:19:00). He always stayed up to date about the need of the stock, work force, place, and money, indeed. It helped him to understand not only the waste but also the need of it. He clearly presented his agenda before Stern, his accountant and asked him to do accordingly. He could make people listen to him with due respect
	Teamwork	As a good team worker, he trusted, listened and respected other team members irrespective of their identity. He built team cohesion in his factory to manage conflict and work with Jews, SS officers, and even Nazi officers (1:15:54)
	Decision making; analytic skill	Schindler made decisions within the domain of time and knowledge constraints. Using his knowledge and strong analytic power, he successfully planned the commencement of his factory. He arranged for the work force, money, and place. Whatever he knew, he utilized it in the best possible way and worked hard to make things work successfully at any cost (13:30)

(continued)

Table 20.1 (continued)

Competency	Category	Role of the metacognitive awareness in the use of competencies by Oskar Schindler
	Creativity	He thought laterally using his creativity and critical thinking to establish his factory in the most unsuitable conditions and chose the German army as his sole client (12:00)
	Coordinating	Schindler believed in the coordination of the work. He made all discordant elements and situations like limited resources, unfavourable conditions, lack of trained hands (2:15:00), proper permission, resources, etc. fall in place and worked efficiently to make things work in his favour
	Action orientation	Schindler avoided delays and smoothly maintained a sense of urgency, which helped him to save the lives of Jews. He prepared a list of Jews working in his factory, flimsily associated with work force but intentionally associated with human lives (2:15:30)
	Leading	Schindler recruited Jewish team members and managed cooperation to get the job done, motivated and inspired them to work hard, and promised to help them in return (1:26:47)
	Entrepreneurship	Schindler identified the need of the market, zeroed in on his customer, gathered and utilized all possible resources to focus on the production. Using innovation and commercializing opportunity as an entrepreneur, he successfully switched over from enamel to kitchenware (30:00)

(continued)

Table 20.1 (continued)

Competency	Category	Role of the metacognitive awareness in the use of competencies by Oskar Schindler
	Marketing	His sole customer never seemed to be dissatisfied with the needs and delivery of his products
	Mentoring	Schindler advised and trained his workers and co-workers to continue working despite all limitations and hurdles, which earned them their livelihood as well as lives (23:00)
	Supervising	He supervised the work of his workers by keeping an eye on them from the top of his factory, which was considered to be his favourite place (38:00). He directed the execution of the activities of the workers
	Focus	The centre of Schindler's interests and activity was running the factory, which he maintained by making every possible efforts at multiple levels (39:30)
	Embracing changes	Schindler initiated every possible new approach and technique. It was not that he embraced the choice; in fact, he floated with it as per the technology, capital, initiation, driving force, etc. (1:16:30)
	Life-cycle	Schindler was aware of the life-cycle situation that after the end of the war, his factory would go down, but he still took the risk of starting his project of opening factory and making best products without being worried about the aftermath (12:28)

(continued)

Table 20.1 (continued)

Competency	Category	Role of the metacognitive awareness in the use of competencies by Oskar Schindler
	Workplace politics	He knew how to deal with the workplace politics and social dimensions, both apparent and subtle. He had to be extremely sensitive as he worked in an unusual societal condition, which was quite precarious (11:54)
	Networking	Schindler maintained personal network with workers, co-workers, Stern, organizational and social networks with Nazi and SS officers and with others (31:00)—whosoever could be of any great help to him
	Interdisciplinary	He interacted and traded with people from diverse discipline and professions like Jews for money and space, and Nazi officer and SS officers for infrastructure and work force (2:41:00)
	Honesty	Schindler always demonstrated honesty in his work and made his work related intentions clear to Jews, Nazi officers, SS officers and Stern
	Meeting skills	Officially, Schindler chaired and participated constructively in timely meetings with Nazi officers, contractors and investors (20:00); unofficially with Jewish workers to get help (38:30), maintain work conditions, and manage work force. He involved himself even in community and public debates

(continued)

Table 20.1 (continued)

Competency	Category	Role of the metacognitive awareness in the use of competencies by Oskar Schindler
Attitudinal/behavioural	Concern for others	Schindler thought of the welfare of others in his organization, voluntarily shared information about his factory, ensured fair and liable decisions both for his workers and factory. Facilitating others' contribution, he didn't let anything discard his duties and responsibility (2:45:00)
	Safety	Schindler implemented measures to improve health and safety issues among his workers at all levels, across ages using his best ability not to let his workers go to the camps by justifying their employability at his factory
	Loyalty	Schindler always stayed loyal in representing his company positively to Germans as well as Jews (42:00)
	Ethics	He had the power and justification to kill, cheat or deny the wages or rights but he didn't
	Commitment	Schindler was always committed to doing his best
	Risk taking	Schindler took risks without being afraid of the consequences. He moved beyond, probably all the time. Neither society nor political conditions were favourable for him; still, he took the risk of running the factory
	Up to date	Schindler stayed up to date with current events, contemporary business concepts, and techniques to work efficiently (12:12)

Metacognitive awareness, the knowledge about the person, the task and the strategy, is a learner centred approach. Beyond the curricula, examples of such nature can be referred to, to help the learners think of/visualise situation specific decisions (Conley 2014). Learners can be guided to be more specific in monitoring the task execution and mentoring their own thinking (Williams et al. 2016). Use of such situation specific examples may also allow discussion on the relevance of problem finding before problem solving, seeking close ended as well as open ended solutions, working with the resources available, thinking through the complexities, etc. (Flavell 1979; Prytula 2012; Sengul and Yasemin 2015; Williams et al. 2016). The learners can be made aware that the way they think is liable to be acclimatised when they revisit their earlier interpretations (Kim and Jeeheon 2013).

20.7 Discussion and Implications

Despite any training, technical and domain expertise, Schindler's metacognitive awareness for self-assessment helped him recognize the areas of limited understanding, analyse the adverse situations, solve the complex problems, and be specific about how to monitor and modify the things around him. His metacognitive awareness, known as being aware about awareness, made him use his competencies to solve the problem of money, space, and work force for opening his factory. He believed in 'simple engineering' and used his technical competencies, practical knowledge, skills, ability and familiarity with techniques, tools, materials to analyse and overcome the problems. He used his interpersonal skills, i.e. non-technical competencies to communicate and take situation specific decisions. These competencies compensated for his technical skills in maintaining system safety, building his team cohesively, believing in himself, and making a fortune for himself. His attitudinal/behavioural competencies helped him become aware of the scenario and its demand. He knew how to deal with the needs/demands of German army. His factual and conceptual knowledge formed the foundation of his ability. Application of metacognitive awareness and competencies made him perform his tasks and deal with all the hurdles and **chiselled his behaviour to meet the demands and expectations of his customer**. His positive workplace adaptation led his organization and employees towards improved productivity with higher morale. He remained up to date with current events, contemporary business concepts, and techniques.

20.8 Conclusions

Metacognitive awareness and competencies help in the execution of engineers' aptitudes and abilities. They make them more mindful of what they are doing at their workplace and how these skills and competencies might be used differently in different situations. When it comes to knowledge, there are different kinds of knowledge

and different ways of acquiring metacognitive awareness and competencies but it is practical knowledge that often leads to a deeper understanding of a concept through the act of seeing, doing and experiencing.

References

- Azmi AN, Kamin Y, Noordin MK (2018) Competencies of engineering graduates: what are the employer's expectations? *IJET* 7(2.29):519–523. <https://doi.org/10.14419/ijet.v7i2.29.13811>
- Bakar AA, Ting C (2011) Soft skills recommendation systems for IT jobs: a bayesian network approach. In: 2011 3rd conference on data mining and optimization (DMO). IEEE, Selangor Malaysia, pp 82–87. <https://doi.org/10.1109/dmo.2011.5976509>
- Conley DT (2014) Learning strategies as metacognitive factors: a critical review. EPIC, Eugene
- Earnest J (2005) ABET engineering technology criteria and competency based engineering education. In: 35th ASEE/IEEE frontiers in education conference. Indianapolis, IN, pp 7–12. <https://doi.org/10.1109/fie.2005.1612046>
- Flavell JA (1979) Meta-cognition and cognitive monitoring: a new area of cognitive development inquiry. *Am Psychol* 34(10):906–911
- Frank M (2012) Engineering systems thinking: cognitive competencies of successful systems engineers. In: Dagli CH (ed) New challenges in systems engineering and architecting conference on systems engineering research (CSER) 2012, Procedia computer science, vol 8. Elsevier, Missouri, pp 273–278. <https://doi.org/10.1016/j.procs.2012.01.057>
- Geisinger KF (2016) 21st Century skills: what are they and how do we assess them? *Appl Measur Educ* 29(4):245–249. <https://doi.org/10.1080/08957347.2016.1209207>
- Gilleard J, Gilleard JD (2002) Developing cross-cultural communication skills. *JPI* 128(4):187–200. [https://doi.org/10.1061/\(ASCE\)1052-3928\(2002\)128](https://doi.org/10.1061/(ASCE)1052-3928(2002)128)
- Hissey TW (2000) Education and careers 2000: enhanced skills for engineers. *Proc IEEE* 88(8):1367–1370. <https://doi.org/10.1109/5.880089>
- Inman W (2006) What are you talking about? Want to see your proposals sail past management? Stop sounding like an engineer. *Ind Eng ABI/INFORM Glo* 36(1)
- Itani M, Issam S (2016) Engineering students' perception of soft skills, industry expectations, and career aspirations. *JPI* 142(1):04015005. [https://doi.org/10.1061/\(asce\)ei.1943-5541.0000247](https://doi.org/10.1061/(asce)ei.1943-5541.0000247)
- Kim M, Jeeheon R (2013) The development and implementation of a web-based formative peer assessment system for enhancing students' metacognitive awareness and performance in ill-structured tasks. *Education Tech Research Dev* 61(4):549–561
- Kumar M, Natarajan U (2007) A problem-based learning model: showcasing an educational paradigm shift. *Curr J* 18(1):89–102. <https://doi.org/10.1080/09585170701292216>
- Leslie C (2016) Engineering competency model. ASEE Ann Conf Exposit Proc. <https://doi.org/10.18260/p.26627>
- Lucena J, Downey G, Jesiek B, Elber S (2008) Competencies beyond countries: the re-organization of engineering education in the United States, Europe, and Latin America. *JEE* 97(4):433–447
- Lundberg CC (1972) Planning the executive development program. *Calif Manag Rev* 15(1):10–15. <https://doi.org/10.2307/41164394>
- Male SA (2010) Generic engineering competencies: a review and modelling approach. *ERP* 37(1):25–51
- Male SA, Bush MB, Chapman ES (2009) Identification of competencies required by engineers graduating in Australia. In: Kestell C, Grainger S, Cheung J (eds) 20th conference of the AAEE: engineering the curriculum. School of Mechanical Engineering, the University of Adelaide, The University of Adelaide, pp 882–887
- Nair CS, Patil A, Mertova P (2009) Re-engineering graduate skills: a case study. *EJEE* 34(2):131–139

- Passow HJ (2013) Which ABET competencies do engineering graduates find most important in their work? *JEE* 101(1):95–118
- Passow HJ, Passow CH (2017) What competencies should undergraduate engineering programs emphasize? A systematic review. *JEE* 106(3):475–526
- Prytula MP (2012) Teacher metacognition within the professional learning community. *IES* 5(4):112–121. <https://doi.org/10.5539/ies.v5n4p112>
- Robinson JP (2000) What are employability skills? Alabama Cooper Extension Sys 5(3):1–3
- Russo D (2016) Competency measurement model. In: European conference on quality in official statistics (Q2016). Madrid, 31 May–3 June 2016
- Sengul S, Yasemin K (2015) Meta-cognitive aspects of solving indefinite integral problems. In: 7th World conference on educational sciences, (WCES-2015) *Procedia-Social and Behavioral Sciences*. Elsevier, Athens-Greece, pp 622–629. <https://doi.org/10.1016/j.sbspro.2015.07.205>
- Spielberg S, Molen GR, Lustig B, Spielberg S (1993) *Schindler's list*. Universal Pictures, United States
- Wenden AL (1998) Metacognitive knowledge and language learning. *Appl Linguist* 19(4):515–537
- Williams SA, Morelock J, Matusovich H, Cunningham P (2016) Lessons in transfer: better understanding of engineering students' metacognitive development. Paper presented at the frontiers in education conference, Erie, PA

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.