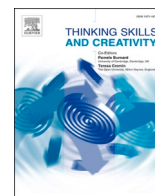


Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Thinking Skills and Creativity

journal homepage: www.elsevier.com/locate/tsc

Problem solving in East Africa: A contextual definition

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ARTICLE INFO

Keywords:

Problem solving
Contextualisation
Ethnographic study
Skill structure
East Africa

ABSTRACT

Over the years, the conceptualisation of problem solving as a transferable skill has led to the emergence of various constructs and framings. While the models and the defined stages of problem solving are similar across the available research studies, some have warned that the context in which problems are defined and solved matters and cannot be overlooked. This study, through an ethnographic design with 230 participants (113 males, 117 females), explored the meanings and understandings of problem solving within varied cultural contexts in Kenya (80 participants), Tanzania (55 participants), and Uganda (95 participants). The interview protocol was structured around three sections: (i) location and participant background information (9 items); (ii) definition of problem solving (4 items, all open-ended); and (iii) characterised traits of a problem solver (9 questions, all open-ended). A thematic and synthetic data analysis was applied obtaining a final system of categories and codes. The comparison of the findings of contextualisation studies on problem solving in the three countries shows significant similarities and only minor differences. The steps of this process that emerge from the interviews in the three countries surveyed are: identification of the problem; understanding the causes and consequences of the problem; asking for community members' advice and opinions about the problem; evaluating the possible solutions; and adopting the best one. Subskills, dispositions, and values linked to problem solving are influenced by the understanding of the self as being part of a community. Overall, the communitarian approach to problem solving—supported by the institutions available in each community and fuelled by values such as confidentiality, love, and trust—emerges as the most unique premise in the contextualised understanding of problem solving in East Africa.

1. Introduction

The globalised world is facing rapid growth in the complexity of human connections and rapid adjustments in resource availability and consumption. To face the features that characterise 21st century societies, education systems need to endow youth with competencies that help them in facing these rapid changes in all areas of life and to rethink the role of skills and knowledge in schools. Youth should not simply master new knowledge but encounter various types of knowledge to help them to become responsible citizens who can contribute to the challenges posed by the rapidly changing world (Csapó & Funke, 2017). To cope with these changes, there is need of individuals who effectively integrate foundational knowledge with skills that help them collaborate, think critically, creatively solve new problems, and manage conflicts and stress (Rotherham & Willingham, 2009).

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<https://doi.org/10.1016/j.tsc.2022.101180>

Received 14 March 2022; Received in revised form 24 October 2022; Accepted 26 October 2022

Available online 28 October 2022

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The widening gap between rich and poor, the burgeoning youth population, and the unemployment crisis in developing countries especially—as well as climate change, the ongoing destruction of the environment, and the current COVID-19 pandemic—are just some of the problems facing global citizens (Zembski & Ulewicz, 2020). Solving these problems requires robust measures and skills. This underscores the need to equip the youth with the problem-solving skills they will need to face such dynamic and complex challenges (Binkley et al., 2012; Low et al., 2016; Suarta et al., 2017).

The new competency-based curricula that have been adopted in Kenya, Tanzania, and Uganda over the past two decades (Heto et al., 2020; KICD, 2017; NCDC Uganda, 2019) have a specific focus on pedagogical models that foster problem-solving skills at the classroom level (Sikoyo, 2010). The teacher's role is meant to shift from the authoritarian model that has characterised the education style of most teachers in East Africa over the past century to a pedagogical approach that promotes the role of the teacher as a facilitator of learning who helps students practice self-discovery and self-regulation in their learning (NCDC Uganda, 2019; Sikoyo, 2010).

While problem solving has often been referred to as a 21st-century skill, research has been focused on this construct over the last half-century. While the definitions of and conclusions about problem solving have frequently differed (Hicks, 1991; Robertson, 2005), the cognitive processes that underpin problem solving commonly include aspects of exploring, understanding the problem, formulating possible solutions, planning for actions to solve the problems, executing the solutions, reflecting on the implemented solution, and monitoring the results (Binkley et al., 2012; Care & Griffin, 2017; Csapó & Funke, 2017; Rahman, 2019).

In the literature, several forms of problem solving have been defined, and a clear distinction has been made between some of them, for example domain-specific and domain-general problem solving (Greiff et al., 2012, 2013). One group of authors argues for domain-specificity in problem solving, positing that problem-solving abilities depend on domain-specific knowledge and experience and are closely linked to the knowledge, expertise, and experience in a given domain (Chi & Wylie, 2014; Guerra et al., 2014; Schraw et al., 1995). The opposing school of thought argues for problem solving as a set of skills, knowledge, and abilities that are required for effectively dealing with complex and dynamic non-routine situations across different domains (Fischer & Neubert, 2015; Newell & Simon, 1972; Robertson, 2005).

Over the years, the position of problem solving as a transferable skill has led to the emergence of various conceptualisations and framings. These have included *complex* problem solving (Sternberg & Frensch, 1991), *interactive* problem solving (Greiff et al., 2013), and *analytical* problem solving (Fleischer et al., 2017; Greiff et al., 2013; Leutner et al., 2012). At the same time, there exists research that explores *everyday* problem solving (Willis, 1996), *creative* problem solving (Treffinger & Isaksen, 2005), *social* problem solving (Chang et al., 2004), or *collaborative* problem solving (O'Neil et al., 2003); learning in the new century requires individuals to be more open to new ideas, ready to accept a change of vision. The increasing use of information technologies is changing social trends, and people need to learn how to navigate through these channels of information. Concurrently, organisational structures require different skill sets: automation has led to a reduced need of a workforce performing repetitive tasks and an increased demand for more collaborative skills and teamwork (Care & Griffin, 2017). Problem solving requires a new set of skills that are more relational due to the increased need for interaction and coordination amongst people; the cognitive skills needed to face new challenges require also a set of social skills that are required for quality interactions in the process of problem solving (Care & Griffin, 2017). Participating in problem-solving activities requires individuals to possess social skills and to appreciate the need for and consequences of a collaborative effort. Although these interpersonal skills can be taught (see for example, Valtonen et al., 2021), affirmative dispositions toward a collaborative approach to problem solving also plays a central role; and the willingness to contribute to a joint effort is considered key. Thus, even if a person may have the skills necessary to solve complex and collaborative problems, dispositions influence how people behave and act in practice (Walker, 2003). Disposition refers to a stable attitude to act or think in a specific way (Valtonen et al., 2021, Walker, 2003); Dewey (1933) recognised the importance of disposition and noted how personal attributes are intertwined with the ability of a person to apply their logic and technical skills. Walker (2003) identifies dispositions as being mostly related to motivation, attitudes towards success or failure, open-mindedness, flexibility, honesty in facing personal biases, and willingness to reconsider one's own thinking.

Both the cognitive and social dimensions of problem solving highlight the importance of the context in which problems are defined and solved (Liem et al., 2014; Novick & Bassok, 2005). Novick & Bassok (2005) argue that the role of problem solvers and the steps they take are highly dependent on their backgrounds, their prior understandings, and their knowledge of the problem at hand; hence the need to distinguish between the problem solver's understating of the problem and the steps he or she takes to arrive at a particular solution. (Liem et al., 2014) highlight the need to take into account the socio-demographic (gender, age, language background) and socio-economic (parental education, various home resources) factors of the problem solvers. These findings build on the works of (Vygotsky, 1965) and (Luria, 1976), which have explored language, culture, beliefs, and social experience as fundamental in shaping cognitive development; the development of individuals occurs in the process of their participation in the life of their cultural communities. Cultural beliefs and values affect cognitive development by shaping people's ways of interacting with the world (Bronfenbrenner, 1986). Child development is a transformative process of growth that happens through participation in a community (Rogoff, 1990, 2003). It is for this reason that cognitive and social development can only be fully understood in the light of the cultural circumstances in which an individual grows, works, and interacts (Giacomazzi, 2022; Rogoff et al., 2018; Webb & Treagust, 2006). Cognitive development involves skills, knowledge, and values at an individual level, but it is also a collaborative effort that involves others; cross-cultural psychologists have observed cultural differences in the ways people interpret and solve their problems (Goodnow et al., 1976).

Related to this, the least examined premise in the literature seems to be the differences in the translation of the understandings of problem solving across cultural contexts. The available literature presents only a few examples of studies that question the westernised, mostly cognitive interpretation of the concept of problem solving, such as (Muthivhi, 2013) in the South African cultural context. Muthivhi (2013) investigated problem solving amongst South African TshiVenda-speaking students and demonstrated that the

acquisition of thinking processes and problem-solving skills are very specific to the sociocultural context and the learning activities to which children are exposed. Basically, the educational processes that take place in the classrooms do not build on the specific sociocultural background of the learners and “therefore, emphasise the use of language as a cognitive (or cultural-psychological) tool rather than as a carrier of meaning and facts, and thus privilege learners’ meaningful engagement with ideas and knowledge” (Muthivhi, 2013, p. 31).

The review did not locate any investigations of the cultural implications of problem solving in the East Africa region. Consequently, this study explored the meanings and understandings of problem solving within varied cultural contexts in Kenya, Tanzania, and Uganda, while interrogating the westernised hegemony in the definitions of this competence and drawing implications for teaching and assessment.

2. Research questions

The study aimed to answer the following questions:

- 1 What are the common features of how *problem-solving* skills are defined in Kenya, Tanzania, and Uganda?
- 2 What are the differences in how *problem solving* is defined across Kenya, Tanzania, and Uganda?
- 3 What are the most common subskills highlighted amongst adolescents, parents, and key persons (considering gender) in the three countries?
- 4 Which subskills are unique to each country?
- 5 What are the common dispositions and values identified by each category of participants: adolescents, parents, or key persons; male or female; Kenyan, Tanzanian, or Ugandan?
- 6 Which dispositions, behaviours, and values are unique to Kenya, Tanzania, and Uganda?

3. Methodology

In responding to the identified gap in the literature, we worked with three categories of participants: adolescents, parents, and key persons, in the three mentioned countries—Kenya, Uganda and Tanzania—in order to better understand how they define problem solving and describe the constitutive subskills, dispositions, and behaviours of these skills in adolescents (with a specific focus on teenagers aged 13–17). We also focused on investigating the differences and uniqueness amongst the three countries.

3.1. Study design

We used a brief ethnographic interview approach in order to explore perceptions and understandings of problem solving in Kenya, Tanzania, and Uganda. This approach, which has been previously used in Uganda (Boothby et al., 2017), allowed us to collect qualitative data from a large, diverse, and purposive sample of adolescents, parents, and key persons.

3.2. Sample

The study involved adolescent boys and girls aged, 13 to 17 years; parents or guardians; and key persons such as teachers, social workers, local leaders, and youth mentors, who are close to the adolescents. Study participants were purposively sampled from the 15 districts across the 3 countries that had the following characteristics: (i) core urban, low-income areas within the capital city; (ii) core rural, agricultural-rich, and within 100 km from the capital city; (iii) core rural characteristics, agricultural-rich, 300–400 km from the capital city; (iv) core rural characteristics, pastoralist areas, 400–800 km from the capital city; and (v) with different characteristics from all mentioned above. In order to attain a diverse representation of participants in the study, we randomly sampled two villages from each purposively selected district. From each selected village, we then conducted at least 4 interviews with adolescents (2 of each gender, and with a mix of those in primary school, secondary school, vocational training, and those out of school); 4 interviews with parents (2 of interviewed adolescents and 2 of non-interviewed adolescents, while mixing fathers and mothers); and 4 interviews with key persons (teachers, social workers, and other persons who consistently work with adolescents). Ultimately, we reached 230 participants (80 from Kenya, 55 from Tanzania, and 95 from Uganda). Furthermore, 76 participants were adolescents (36 males, 40 females); 78 participants were parents (35 males, 43 females); while 76 participants were key persons (42 males, 34 females), as shown

Table 1

Distribution of participants per category and country.

Country	Adolescents			Key persons			Parents			Total		
	M	F	T	M	F	T	M	F	T	M	F	T
Kenya	12	15	27	14	11	25	16	12	28	42	38	80
Tanzania	10	7	17	11	9	20	7	11	18	28	27	55
Uganda	14	18	32	17	14	31	12	20	32	43	52	95
Total	36	40	76	42	34	76	35	43	78	113	117	230

Notes: M = Male, F = Female, T = Total

in Table 1.

3.3. Data collection methods and instruments

Prior to the fieldwork, the research team members participated in two-half day trainings, on the 19th and 21st of October 2020, in order to equip them with knowledge and skills to conduct the fieldwork. The training covered the following aspects: the background and objectives of the study; study approach and methods; data collection methods and tools; and ethical issues when conducting research involving human subjects. Thereafter, data collection was conducted over a period of two weeks. Two methods of data collection and instruments were used to generate participants' understanding of problem solving in their context.

Individual ethnographic interviews were implemented on a one-to-one basis with the identified adolescents, parents, and key persons. Interviews were conducted in English and the local language most spoken in the study districts; audio was recorded and transcribed to facilitate data analysis and report writing. The interview guide was translated into local languages and checked by two professional translators. The recorded interviews in local language were transcribed into English and checked by a second translator for accuracy. The interview protocol was structured around three sections: (i) location and participant background information (9 items)—study location, gender, age, and highest level of education attained; (ii) definition of problem solving (4 items, all open-ended)—defining the word problem solving, and stating it in the local language, and how someone can become a better problem solver; and (iii) characterised traits of a problem solver (9 questions, all open-ended)—in which participants were asked to think about an adolescent that according to them is a good problem solver. They were then asked to describe five factors that help these adolescents to solve problems in a successful way.

3.4. Coding and data analysis

The following steps were followed in the data analysis process: transcription of the data; identification of the main categories (axial coding) starting from the definition and the structure of a skill (i.e., subskills, dispositions, values, etc.) and codes within each category (open coding); and thematic coding.

AXIAL CODING: A coding system was established to analyse the 230 interviews about problem solving following the thematic analysis approach. Thematic analysis is “a method for identifying, analysing and reporting patterns (themes) within data” (Braun & Clarke, 2006, p. 79). The analysis was conducted centrally for all the interviews from the three countries. For the analysis of the interviews, we established a coding system based on *contextual (descriptive) variables*, including (1) the category of participants, (2) the sex of the participants, and (3) country (see Table 1 above). In *quantitative* terms, the contextual variables were analysed descriptively (frequency and percentage) using Microsoft Excel and Dedoose.

The coding system also considered *content variables* related to (4) definition and process described by the participants, (5) sub-skills, (6) dispositions and values, and (7) support systems and factors that enhance *problem-solving* skills. In *qualitative* terms, as recommended by Gibbs (2018) and using the Dedoose program (version 8.3.41), we performed an analysis of the understanding of *problem solving* as presented in the interviews—paying specific attention to elements of contextualisation in contrast with what had been established from the literature review.

Nine Research Assistants analysed 15 interviews to achieve inter-rater reliability of the coding system.

OPEN CODING AND THEMATIC ANALYSIS (Thomas & Harden, 2008): Free-line-by-line coding of interviews—including sentences or paragraphs as the analysis unit—was conducted. This was followed by the organisation of the “free codes” into related areas to construct “descriptive” themes. Last, the “analytical” themes were developed; additional concepts, understanding, hypothesis of the data emerged by way of this synthetic analysis.

The analysis process involved the identification of patterns of similar ideas, concepts, or topics to establish the connection and integration of information with the theoretical foundation of these ideas (Miles & Huberman, 1994) and a suggested indication or evidence for contextualisation. The codes were created following the criteria for qualitative evaluation: dependency, transferability, credibility, and verifiability (Duffy, 1987).

Furthermore, the *synthetic analysis* followed the three stages indicated by Thomas and Harden (2008): the free “line-by-line” coding of the primary interviews, including sentences or paragraphs as the unit of analysis; the organisation of these “free codes” into related areas to construct “descriptive themes”; and the development of “analytical themes” (p.4). The latter go beyond the findings of the primary interviews and generate additional concepts, understandings, or hypotheses. These analytical themes are then compared with the recommendations for assessment, intervention, and policymaking to contextualise East Africa's *problem solving*.

In addition, the *triangulation* technique (Flick, 1992, 2014) was used by the researchers to search for, identify, select, evaluate, and summarise data from interviews using pre-defined criteria and emergent categories.

Finally, *data reduction* was applied through the mixed-method analysis: (1) the initial subgroup classification of the interviews is based on the category of the participants (adolescents, parents, and key persons; sex of the participants; country and districts); and (2) data reduction involves techniques of extracting and coding data. These mixed-method analyses were carried out using the Dedoose program, which allows the frequency of the codes to be analysed in terms of the participants' demographic information and which integrates qualitative and quantitative data. In this regard, three types of descriptive analysis were conducted: code co-occurrence, cross-tabulation of the code and participants' characteristics, and cross-tabulation of the code and two or more characteristics of the participants.

Notably, for each of the quotations included in the findings, we have included a *code* that helps identify the category of the participant. In each code, the first letter represents the country ('K' for Kenya, 'T' for Tanzania, and 'U' for Uganda), the second letter

represents the category of participants (e.g., 'A' for adolescent, 'P' for parent and 'K' for key contact person), and the final number represents the number assigned to the participant. Finally, for instance, codes will be written as: U-A-<number> to mean that, the quote is for an adolescent (A), from Uganda (U), whose interview identification number is (10).

3.5. Ethical considerations

The research team upheld approaches that address ethical considerations in dealing with different categories of participants. These included obtaining informed consent for participation in the interviews as well as agreement for audio recording, ensuring the confidentiality of information obtained from the participants, compensating participants (i.e., adolescents were given story books), and ensuring voluntary participation. Precautions were also taken to ensure adherence to the COVID-19 guidelines issued by the Ministry of Health at that time, especially those of not exceeding 15 persons for each gathering, wearing masks, physical distancing, and washing and sanitising of hands.

4. Findings

The findings are presented according to the identified *content variables* related to (1) the definition and process described by the participants, (2) sub-skills, and (3) dispositions and values that enhance problem-solving skills.¹

4.1. The definition and the process of problem solving

This theme or category concerns the codes and analysis of the definitions of problem solving as provided by the participants in the three countries. Precisely, participants were asked to (i) explain the word "problem-solving"; (ii) state other words that mean the same as problem-solving; and (iii) state how problem-solving is called in their local language (Table 2).

Table 3 presents the frequency of the codes disaggregated by gender. Here and in the following sections the gender disaggregation is presented only as number of excerpts and not as number or percentage of participants who mentioned the code, as in Table 2.

The analysis of the findings on the definition and on the process of problem solving in the three countries presents some similarities and a few differences that deserve to be highlighted.

The participants mainly presented problem solving as synonymous with finding solutions to challenges or problems: "various ways of reaching solutions to personal problems or problems of others" (U-A-01, U-A-09, U-A-10, U-A-11, U-K-01, U-K-03, U-K-15, U-K-18, U-P-03, U-P-16, U-P-18); "It is a genuine way in which a person can solve his private issues in life circumstances" (K-A-29). A synonym for the word "problem" is "challenge" (T-K-09, T-K-18, T-K-31, T-K-32, T-K-38, T-K-42), as another participant expressed it: "To solve, what I know is to explain or deal with the challenges facing you, the challenge from the environment you live in." (T-K-15). This aspect was mentioned frequently by the participants, and it usually corresponds to a direct translation of problem solving in the local languages. Facing a problem as a challenge suggests a willingness to confront it and find a positive solution. Nevertheless, some participants used powerful language to refer to the process of solving a problem, such as "getting rid of" (T-A-29, T-P-10), "remove" (T-K-39, T-K-43), "eliminate" (T-K-42, T-P-18), "eradicate" (T-K-02, T-P-01), "preventing or avoiding problems" (U-A-03, U-K-38), or "fighting problems" (U-P-40). The use of these synonyms might have been influenced by the participant's ways of looking at a problem or by the local culture's perception of the problem. In some cases, it is also possible that the expressions for defining problem solving in a participant's language might have fostered a negative perception of the word *problem*.

In all three countries, several quotes refer to problem solving as an act of resolving conflicts between people, helping community members overcome a difficult situation, or preventing others from making regrettable choices. One of them stated, "I understand problem solving as solving conflicts amicably" (U-A-19), or that it is "to solve a conflict when you meet people fighting" (T-A-01). This is particularly relevant amongst adolescents, who frequently point to relational problems as the most significant challenges they face. Participants also refer to problem solving as the process of helping others resolve their challenging situations, showing a robust communal link amongst people in the community to which they belong.

Though the participants appeared to be relatively unfamiliar with the process itself in terms of a set of cognitive processes, findings reveal other vital aspects of problem solving. To decide on the most viable solution to a particular challenge, the participants identified the following essential steps: identifying the problem, knowing and understanding the problem, asking for advice, evaluating the options and choosing between them, and finding the best solution. Only a few participants mentioned outlying elements like praying to God.

Perhaps the most unexpected step reported was that of *asking for advice*: "I will tell him [the adolescent] to share it with his brother or his mother, his father is dead, but he has a brother..." (T-A-42); "I tell my friends and parents to help me solve the problem, so they help me find solutions to the problem" (U-A-03). This is linked to the communitarian view of problems and of problem solving. Sharing personal problems and asking for advice on how to deal with them emerges as very important and routine, especially from a young person. This is because participants think that youths are too inexperienced to face problems alone, that they lack the necessary skills, and that consulting an adult is part of the learning process, but also that the community has the responsibility to help others and that a challenge faced by one person is a challenge faced by the whole community. As one key contact person put it: "Since we are talking

¹ Since each participant often mentioned more than one code in their definition of problem solving and in the description of the process, the percentage does not total 100. This number has been calculated based on the total number of participants in each country.

Table 2

The frequency and percentage of the codes identified in defining the process of problem solving in Kenya, Tanzania, and Uganda.

Category: Definition/PROCESS Codes	Kenya (Participants)		Tanzania (Participants)		Uganda (Participants)	
	FREQ.	%	FREQ.	%	FREQ.	%
Praying to God	11	13.75	2	3.64	8	8.42
Facing problems	14	17.50	11	20.00	45	47.37
Finding solutions	70	88.75	50	90.91	72	75.79
identifying a problem	23	28.75	15	27.27	20	21.05
judgement	7	8.75	9	16.36	4	4.21
Asking for advice	19	23.75	12	21.82	52	54.74
Knowing/Understanding a Problem	49	61.25	21	38.18	38	40.00
Total Participants	80		55		95	

Table 3

Number of excerpts for each code identified in defining the process of problem solving in Kenya, Tanzania, and Uganda by gender of the participants.

Category: Definition/Process Codes	Kenya (No. of excerpts)		Tanzania (No. of excerpts)		Uganda (No. of excerpts)	
	Female	Male	Female	Male	Female	Male
Praying to God	7	7	1	1	7	4
Facing problems	6	11	3	12	40	34
Finding solutions	81	89	44	62	93	53
Identifying a problem	13	17	6	9	13	14
Judgement	8	4	3	9	3	1
Asking for advice	0	0	7	10	58	29
Knowing/ Understanding a Problem	31	42	12	18	34	31

about youths who are not adults, therefore, parents and relatives who live with them ... They should help to solve their challenges" (T-K-15).

While *finding solutions* is the most important step mentioned by all the participants across the three countries, *knowing and understanding the problem* is the second most relevant in Kenya and Tanzania, but not in Uganda, where the aspect of *facing the problems* is cited as relevant by almost half of the participants and *asking for advice* by over 50% of them. However, this last step is mentioned by around 20% of the participants in Kenya and Tanzania.

Another finding that varied by country is the reference to one's relationship with God. The percentages of the participants who cite this vary across the three countries: in Kenya it is mentioned by 13.8% of the participants, only by 3.6% in Tanzania, and 8.4% in Uganda.

Regarding gender, the contribution of men to the codes that emerged as a process of problem solving is more prominent in Tanzania and Kenya. More women mentioned praying to God, judgement, and sharing and finding solutions to problems, whereas more men mentioned identifying the problem, knowing or understanding the problem, and dealing with problems as important steps in solving them. In Uganda, women participants mentioned findings solutions and asking for advice more than male participants.

4.2. Subskills of problem solving

The problems the participants mentioned as the most frequent in the lives of adolescents relate to family (money and education of children) and relationships (conflicts in the community and amongst peers). Consequently, the kind of subskills highlighted by Kenyans, Tanzanians, and Ugandans go beyond the mere process skills that describe the cognitive steps a person takes to solve a problem, to include all those skills that help a person achieve the goal of finding a solution to each of life's daily challenges.

Table 4 compares the frequency of codes to define the relevant subskills of problem solving in the three countries.

Table 4

Frequency and percentage of the codes identified as subskills of problem solving in Kenya, Uganda, and Tanzania.

Category:Subskills	Codes	Kenya (Participants)		Tanzania (Participants)		Uganda (Participants)	
		FREQ.	%	FREQ.	%	FREQ.	%
Interpersonal Skills	Communication: expressive	17	21.25	6	10.91	13	13.68
	Communication: receptive	43	53.75	6	10.91	34	35.79
	Cooperation/ Collaboration	8	10.00	15	27.27	5	5.26
	Guidance/ Counselling	34	42.50	24	43.64	60	63.16
	Leadership	10	12.50	4	7.27	4	4.21
Intrapersonal Skill	Relationship skills	52	65.00	21	38.18	52	54.74
	Self-confidence	17	21.25	14	25.45	20	21.05
Self-Management	Planning					11	11.58
Total participants		80		55		95	

Participants mentioned several subskills as key to being a good problem solver. Looking at Table 5, it appears that the most relevant codes are the ones that refer to relationships with others: *Relationship skills, Cooperation and collaboration, Guidance and counselling, Communication, Leadership, and Empathy*.

It is clear that for the participants, perception of the self is closely related to the perception of the community in which they live; problems seem not just to affect the person but the whole community, family, or group of friends with whom people share their lives. Thus, *relationship skills* are crucial, and they are linked to adolescents' abilities to mediate conflicts or help people reconcile with friends after a dispute. A Kenyan adolescent said:

Whenever he wants to solve a problem, he's the person who does not ambush you wanting to solve the problem. He can't be on one party's side; he takes sides with both parties. If he takes sides with one person, he is not a problem solver. (K-A-32)

Relationship skills are mostly linked to the abilities of youths to "mediate a conflict" (T-P-07, T-P-37) between people or help them to reconcile with friends in case of a dispute (T-A-11, T-A-36, T-K-07, T-K-42, T P -P-13, T-P-28, T-P-37). This subskill is considered highly relevant in all three countries; however, over 50% of the participants in Kenya and Uganda mentioned it compared with less than 40% of the participants in Tanzania.

Related to this, a number of participants emphasised the importance of *cooperation*; people add value, and their contribution can be valuable for resolving others' problems. This aspect is considered relevant in Tanzania, but much less in Kenya and Uganda. As one adolescent participant presented it: "They say that where there are people, there is a lot you will find out. Therefore, it will help to build cooperation" (T-P-27). Another participant presented it in a similar way: "To solve a problem you need to cooperate with everyone" (T-A-29).

Given the prominence of relationship skills and the need for adolescents to advise or be ready to receive advice when they need help overcoming a difficult situation, young people should have good *communication skills* and be receptive to other people's suggestions.

He has a high level of influence; they respect him and listen to him when he instructs in class. (T-K-42)

You may have a point, but you can't express yourself, so how will you discuss with those with whom you want to come to a solution? Communication is very important because I might have a solution, but I can't express myself (K-K-35)

This kind of person needs to be a good listener (T-P-10) and ought to demonstrate empathy or "compassion" (T-K-07, T-P-13). Guiding people effectively requires a specific capacity for openness and attentiveness to their needs while respecting their point of view.

Some participants in all three countries consider *Receptive communication skills* important, but the differences between countries is large: more than 50% of the Kenyan respondents mention receptive skills as key, compared with only around 10% of the Tanzanian respondents.

Another relevant subskill is *guidance and counselling*, which was mentioned by more than 40% of the participants in each of the three countries. A good problem solver is called upon to help the community, and in order to do so, he or she should be able to guide and advise friends or family members on the matter at hand. A problem solver needs to be a good listener and ought to show empathy. Dealing with people to guide them requires a certain openness and attentiveness to their needs while respecting their point of view: "I would buy another pen for the kid in order to keep him composed, and then I would counsel him on how he should keep his pen better by always keeping it in the maths set whenever he is not using it" (U-P-40). Another participant shared: "She counsels us whenever we have misunderstandings. She tells us what to do and what not to do. We usually leave the meeting happy as though we had no misunderstandings" (U-A-37).

Notably, more men in Kenya and Tanzania contributed to the codes that relate to social skills, unlike in Uganda, where more women find social skills very relevant.

Another area of interest is related to *self-identity*. Only a minority of the participants in the three countries mentioned that these skills are vital for nurturing an independent problem solver, and they referred primarily to self-confidence as being an important skill, while a few others (less than 10%) in Kenya and Tanzania referred to self-awareness. The following excerpts support this finding: "One should also be confident. You have to believe that whatever you have decided to learn to do, you will do and succeed" (U-A-39); "She is always confident about whatever she does, and she is always helpful to others" (U-A-01). The participants understood that self-confidence could be obtained when the youth are empowered, as one parent mentioned: "Once you empower him, he gets the confidence to solve his problems" (K-P-29). Another referred to problem solvers saying: "They are confident, ... they have a positive attitude that everything is possible, they have self-awareness and confidence" (T-K-06).

Overall, these skills were deemed significant by the key persons. It is paramount to note that the concepts entailed in the self-awareness skills are complex—even more so for people who use mostly local languages and who were interviewed in *Kiswahili* or

Table 5

Number of excerpts for each code identified as subskills of problem solving in Kenya, Uganda, and Tanzania by gender of the participants.

Category: Subskills Codes	Kenya (No. of excerpts)		Tanzania (No. of excerpts)		Uganda (No. of excerpts)	
	Female	Male	Female	Male	Female	Male
Communication: expressive	12	12	2	5	13	9
Communication: receptive	35	44	2	6	29	20
Guidance/ Counselling	29	33	25	32	76	54
Relationship skills	45	42	11	25	64	44
Self-confidence	6	22	18	12	17	7
Planning	2	5	0	3	6	8

other local languages. It is also significant that sometimes local languages do not even have a direct translation of these skills; this denotes the communitarian conception of the self, as opposed to the individualist view of the person that is prevalent in Western cultures.

Markedly, the codes of skills related to self-awareness such as self-confidence mainly emerged from women in Tanzania and Uganda, whereas in Kenya the same codes emerged from more men than women.

4.3. Dispositions

Dispositions can be defined as the person's inherent qualities of mind and character that influence their behaviour (Ennis, 1996). These are some aspects of a person's character that help enhance and nurture the exercise of a skill such as problem solving. Table 6 presents the frequency and percentage of dispositions as they emerged from the participants in the three countries.

The dispositions that emerged most frequently from the interviews were willingness to work hard, willingness to be corrected or to receive advice, responsibility, friendliness and kindness, passion, and patience, as shown in Table 7.

Some participants, especially in Tanzania and Uganda, mentioned the *willingness to work hard* as an important disposition to help youth solve problems. "Hard work" is considered crucial for someone to become a problem solver (U-A-22, U-A-39, U-K-13, U-K-20, U-K-24, U-K-27, U-K-28, U-P-09, U-P-26, U-P-29, U-P-36). According to them, a person's ability to resolve any challenge is dependent on their commitment and dedication. Problem solvers "dedicate themselves" (T-P-13) and have a strong "willingness to do things" (T-K-15), including deep respect for work (T-K-11), even if it is "manual labour" (T-K-04).

Participants also mentioned being *kind and friendly* as characteristics that problem solvers possess. They explained kindness as a way of making a person dealing with problems feel cared for. Society, especially in Kenya and Uganda, asks adolescents who are good problem solvers to help their peers, and this requires good relationship skills and a willingness to be open to others (T-K-07, T-P-03, T-P-10), to cooperate in a friendly and amicable way (T-A-29), to care for others (TK-07), and to readily forgive (T-A-29, T-P-13). The participants explained kindness as a way of making a person who faces problems feel at home. This is complemented by the desire to know more, as one participant mentioned: "Kind, having a desire to know more about issues" (K-A-36). Thus, a problem solver who is kind and friendly should be "approachable" (U-A-01, U-K-21, U-K-34, U-K-27) and "amicable" (U-K-27, U-P-36).

Responsibility as a disposition also emerged, implying that problem solvers can also meet difficult challenges head-on and make the right decisions. To the participants, this means that problem solvers "should not wait to be told what to do" (U-P-36), but rather "help in house chores" (U-K-03), "take care of family assets" (U-P-11), and "avoid bad peers" (U-K-31, U-P-12). "He knows his responsibilities; he has good study habits" (T-P-03). This disposition was mentioned by no more than 15% of respondents in any country.

Willingness to be corrected or advised is another characteristic most often mentioned of a good problem solver. The problem-solving journey is never walked alone; some participants openly mention that to solve personal or family problems, it is necessary to listen to the advice of adults who are more experienced or mates who have stronger skills when it comes to facing certain challenges.

If I'm faced with a challenge, I will think about it first, relax my mind and then start identifying solutions with ease. I'm also open to seeking advice, maybe from my parents and teachers. Parents should also be open to the adolescents and be able to talk to them. (K-A-29).

Furthermore, problem solvers take the *time* necessary to understand the problem carefully before rushing to potentially regrettable conclusions. This aspect was mentioned by around 20% of Kenyans and Ugandans and by 7% of Tanzanians.

Generally, both men and women contributed equally to the codes that emerged as problem-solving dispositions. However, it is interesting to note that kindness and friendliness are particularly important to more women in all three countries, while patience/time is particularly important to more men.

4.4. Values

Values are highly relevant in the context of this study. Although the number of responses in this category falls below that of the process, subskills, and dispositions (Tables 8 and 9), participants explained how problem solvers are asked to serve their communities and how they respect the foundational values of the society to which they belong. Consequently, adolescents' behaviours are expected to be respectful of the other community members and their traditions.

Participants across various categories agree on the relative importance of respect for both the young and the elderly. In these participants' view, a problem solver is a wise person who cares for the community and loves the people, hence creating unity within

Table 6

Frequency and percentage of the codes identified as dispositions of problem solving in Kenya, Tanzania, and Uganda.

Category: Dispositions Codes	Kenya (Participants)		Tanzania (Participants)		Uganda (Participants)	
	Freq.	%	Freq.	%	Freq.	%
Kindness/Friendliness	24	30.00	6	10.91	34	35.79
Patience/Time	16	20.00	4	7.27	16	16.84
Positive Attitude	6	7.50			12	12.63
Responsibility	10	12.50	8	14.55	11	11.58
Willingness to work hard	6	7.50	14	25.45	34	35.79
Willingness to be corrected/ advised	16	20.00	11	20.00	34	35.79
Total participants	80		55		95	

Table 7

Number of excerpts for each code identified as dispositions of problem solving in Kenya, Uganda, and Tanzania by gender of the participants.

Category: Dispositions Codes	Kenya (No. of excerpts)		Tanzania (No. of excerpts)		Uganda (No. of excerpts)	
	Female	Male	Female	Male	Female	Male
Kindness/Friendliness	16	12	9	8	30	22
Patience/Time	7	13	2	7	15	14
Positive Attitude	3	3	0	0	7	9
Responsibility	4	7	10	9	10	2
Willingness to work hard	5	2	12	14	29	22
Willingness to be corrected/ advised	10	8	8	10	27	21

Table 8

Frequency and percentage of the codes identified as values and behaviours of problem solving in Kenya, Tanzania, and Uganda.

Category: Values and behaviours Codes	Kenya (Participants)		Tanzania (Participants)		Uganda (Participants)	
	Freq.	%	Freq.	%	Freq.	%
Confidentiality	8	10.00			6	6.32
Humility	8	10.00			6	6.32
Love	10	12.50	5	9.90	2	2.11
Respect	21	26.25	15	27.27	28	29.47
Trust/Honesty/Truth	12	15.00			5	5.26
Wisdom	7	8.75	6	10.91	4	4.21
Total participants	80		55		95	

Table 9

Number of excerpts for each code identified as values and behaviours of problem solving in Kenya, Uganda, and Tanzania by gender of the participants.

Category: Definition/Process Codes	Kenya (No. of excerpts)		Tanzania (No. of excerpts)		Uganda (No. of excerpts)	
	Female	Male	Female	Male	Female	Male
Confidentiality	4	5	0	0	7	4
Humility	6	3	0	0	5	1
Love	6	5	2	3	1	1
Respect	10	24	7	12	29	22
Trust or honesty	6	12	0	0	2	4
Wisdom	1	7	4	4	2	3

that community.

The Kenyan and Ugandan participants also cited confidentiality as important in problem solving. According to the participants, this means keeping secrets about other people's problems. As one of them said, "She is good at keeping secrets" (U-K-10). Given the strong emphasis that the participants place on the fact that a good problem solver helps the community deal with challenges and come up with viable solutions, a person who cannot be discreet runs into problems with other community members and is not trusted. Issues of *trust* came out as a value in Kenya. Someone mentioned: "He seeks guidance, he expresses himself to those he can trust" (K-A-29). Specifically, participants referred to the fact that good problem solvers must be trustworthy: they do not spread what has been shared with them.

Parents, mostly in Kenya and Uganda, identified *Love* and *Humility*, as other important traits of problem solvers. As one participant noted, "This boy is humble, and he is not always involved in fights, he is ever quiet, he is even easier when it comes to sending him somewhere. I find him easier to deal with" (U-P-03). A caring or loving person would find solutions to problems especially if there is a conflict between different parties. As one parent put it: "Listening to both parties when it's a conflict between two. As a parent we should love for adolescents to be open" (K-P-14).

Values are predominantly mentioned by the parents, who hold love, respect, and wisdom as important ideals that the problem solver should demonstrate. Furthermore, men's contributions to the codes that emerged as behaviours and values are most apparent in Tanzania and Kenya, while in Uganda the codes emerged from more women. For instance, respect is mostly identified by men in both Tanzania and Kenya, but in Uganda respect is more often cited by women.

5. Discussion

The literature review on problem-solving skills conceptualises this skill as a procedure that involves concrete steps in the process of dealing with challenges (Care & Griffin, 2017; Csapó & Funke, 2017). This might include the identification and exploration of the problem for further understanding; the definition and correct representation of the problem; exploration of the viable alternatives and

planning for a solution; and eventually, implementation of the solution and monitoring the effects of what was implemented (Bransford & Stein, 1993). Some of these steps were not highlighted by the participants of this study. Tanzanians did not elaborate much on identifying and choosing the best solution to a problem, nor did they mention the need to monitor the impact of the chosen solution.

On the other hand, a communitarian view of the self emerges clearly from the analysis of the data of this study. While the literature reviewed chiefly focuses on the cognitive aspects of the skill area, some studies incorporate the social-skill component (Care & Griffin, 2017; Chang et al., 2004; O'Neil et al., 2003) though these do not report on aspects such as asking for advice when faced with a challenge or helping community members solve their problems. The local conceptualisation of this skill focuses heavily on these aspects. This unique aspect could be interpreted as a way of delegating one's responsibilities to others, but that would be a misrepresentation of what is instead a key cultural aspect of East African societies (Giacomazzi, 2021). In this cultural context, the personal identity is more communitarian than individualistic (Boyd & Nowell, 2014; Garrett et al., 2017; McMillan & Chavis, 1986). Moreover, the interviews suggest a lifestyle that is highly intertwined with the individual's community of belonging, whether it is the school for youth, the family, or the extended family for adult participants. This aspect frequently recurs in the results, and it constitutes one of the most unique aspects of the analysis of the contextualised meaning of problem-solving skills in East Africa. From this perspective, it is interesting to see how problem solving is viewed as a skill that aims to resolve conflicts between people and build unity within the community. On the one hand, participants were reporting to compare the identified solutions related to the problems with more experienced people or with peers. On the other hand, this might promote a tendency to conform, engendering loss of assertiveness and personal choice. Hunter & Riger (1986) underscored this risk; thus, the need to encourage adolescents to foster relationships with people that also enable their personal freedom to grow and who respect their decisions (McMillan & Chavis, 1986).

The strong sense of community belonging, typical of most African cultures (Giacomazzi et al., 2022), permeates the local conceptualisation of problem solving. Specifically, in defining this skill, participants suggest that good problem solvers readily ask for advice and that they are receptive to the suggestions of the most experienced community members. At the same time, a good problem solver shows proficient guidance skills and excellent interpersonal and communication skills. It is noteworthy that most of the quotes regarding the skills that enhance the problem-solving abilities of youths are also related to the social aspects of life (Care & Griffin, 2017; Csapó & Funke, 2017).

Most of the literature reviewed discusses extensively the skills necessary to navigate the process of problem solving, but it is highly unusual to find articles that clarify the factors that influence the success of the problem-solving process (Binkley et al., 2012; Care & Griffin, 2017; Csapó & Funke, 2017; Rahman, 2019). The cognitive factors mainly include thinking and reasoning skills and predicting possible outcomes. The affective factors are related to self-confidence and willingness to approach the problem as well as patience or perseverance (Sağır, 2011; Valtonen et al., 2021; Walker, 2003). These elements are also considered crucial by the participants in this study, although they pay greater attention to elements of adaptation to communal life and social skills. Some researchers also highlight these attributes as important (Altun, 2003; Sağır, 2011): a problem solver is "compassionate, generous, persevering, benevolent, altruistic and sympathetic, thus demonstrating attitudes like being kind, empathic, respectful, honest, trusting, and keeping promises (the value of human dignity)" (Altun, 2003, p. 580). Similarly, the findings of this study show that the effective problem solver should be responsible for their actions and respectful of the values and traditions of the community.

6. Conclusions

The comparison of the findings of the contextualisation studies on problem-solving skills in the three countries shows significant similarities and only minor differences. It emerges that the search for solutions to a problem or a challenge is the final step in a structured process. Although sometimes implicit, the steps of this process in the three countries surveyed are: identification of the problem, understanding the causes and consequences of the problem, asking for community members' advice and opinions about the problem, evaluating the possible solutions, and adopting the best one. Subskills, dispositions, and values linked to problem solving are apparently influenced by understanding the self as being part of a community. In the context it is apparent that the social component of problem solving is key and highly intertwined with the cognitive component which is usually prominent in the literature. Overall, the communitarian approach to problem solving, supported by the institutions available in each community and fuelled by values such as confidentiality, love, and trust, emerges as the most unique premise in the contextualised understanding of problem solving in East Africa.

The results of this study aim to make a significant contribution to the available evidence and to provide guidance to the implementation of curricula reform in sub-Saharan Africa. The contextualised skill structure of problem solving highlighted the connections between this concept and the set of traditional beliefs and values in this region. These findings contribute to paving the way for pedagogical strategies for the enhancement of problem-solving skills that better respond to the local concept of self as part of a community. Moreover, this study supported the notion that problem solving ability was composed of subskills, values, and dispositions to engage in the act of problem solving. These elements could be fostered by instructional strategies and a learning environment that promote perseverance, hard work, collaboration, and teamwork amongst students. A student-centred nurturing classroom environment that emphasises process over product could positively influence these factors. Participatory and scaffolding pedagogical strategies implemented by teachers would help students to enhance their problem-solving competency while respecting the local set of cultural beliefs.

By documenting effective educational practices that appear to help the nurturing of problem-solving skills at the classroom level, future research might offer important insight into the kinds of innovations that could generate lasting change in Africa's educational systems.

CRedit authorship contribution statement

Mauro Giacomazzi: Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Mónica Fontana:** Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Purity Ngina:** Investigation, Writing – original draft, Writing – review & editing. **John K. Mugo:** Conceptualization, Project administration, Investigation, Writing – review & editing.

Data Availability

Data will be made available on request.

References

- Altun, I. (2003). The perceived problem solving ability and values of student nurses and midwives. *Nurse Education Today*, 23(8), 575–584. [https://doi.org/10.1016/S0260-6917\(03\)00096-0](https://doi.org/10.1016/S0260-6917(03)00096-0)
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGaw, & E. Care (Eds.). *Assessment and teaching of 21st century skills* (pp. 17–66). Springer.
- Boothby, N., Mugumya, F., Ritterbusch, A. E., Wanican, J., Bangirana, C. A., Pizatella, A. D., Busi, S., & Meyer, S. (2017). Ugandan households: A study of parenting practices in three districts. *Child Abuse and Neglect*, 67, 157–173. <https://doi.org/10.1016/j.chiabu.2017.02.010>
- Boyd, N. M., & Nowell, B. (2014). Psychological sense of community: A new construct for the field of management. *Journal of Management Inquiry*, 23(2), 107–122. <https://doi.org/10.1177/1056492613491433>
- Bransford, J. D., & Stein, B. S. (1993). *The ideal problem solver: A guide for improving thinking, learning, and creativity*. Freeman.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Bronfenbrenner, U. (1986). *Ecology of the family as a context for human development: Research perspectives. Adolescents and Their Families: Structure, Function, and Parent-Youth Relations*, 22, 723–742. <https://doi.org/10.1037//0012-1649.22.6.723>, 6.
- Care, E., & Griffin, P. (2017). Assessment of collaborative problem-solving processes. In B. Csapó & J. Funke (Eds.). *The nature of problem solving* (pp. 227–243).
- Chang, E. C., D'Zurilla, T. J., & Sanna, L. J. (2004). *Social problem solving: Theory, research, and training* (Eds.). American Psychological Association. <https://doi.org/10.1037/10805-000>.
- Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, 49(4), 219–243. <https://doi.org/10.1080/00461520.2014.965823>
- Csapó, B., & Funke, J. (2017). *The nature of problem solving: Using research to inspire 21st century learning* (Eds.). OECD. <https://doi.org/10.1787/9789264273955-en>.
- Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. D.C.: Heath & Co Publishers.
- Duffy, M. E. (1987). Methodological triangulation: A vehicle for merging quantitative and qualitative research methods. *Image: The Journal of Nursing Scholarship*, 19(3), 130–133. <https://doi.org/10.1111/j.1547-5069.1987.tb00609.x>
- Ennis, R. H. (1996). Critical thinking dispositions: Their nature and assessability. *Informal Logic*, 18(2–3), 165–182. <https://doi.org/10.22329/il.v18i2.2378>
- Fischer, A., & Neubert, J. C. (2015). The multiple faces of complex problems: A model of problem solving competency and its implications for training and assessment. *Journal of Dynamic Decision Making*, 1(1), 1–14. <https://doi.org/10.11588/jddm.2015.1.23945>
- Fleischer, J., Buchwald, F., Leutner, D., Wirth, J., & Rumann, S. (2017). Analytical problem solving: Potentials and manifestations. In B. Csapó & J. Funke (Eds.). *The nature of problem solving*. OECD.
- Flick, U. (1992). Triangulation revisited: Strategy of validation or alternative? *Journal for the Theory of Social Behaviour*, 22(2), 175–197. <https://doi.org/10.1111/j.1468-5914.1992.tb00215.x>
- Flick, U. (2014). *The Sage handbook of qualitative data analysis*. SAGE Publications. <https://doi.org/10.4324/9780203093801.ch12>
- Garrett, L. E., Spreitzer, G. M., & Bacevice, P. A. (2017). Co-constructing a sense of community at work: The emergence of community in coworking spaces. *Organization Studies*, 38(6), 821–842. <https://doi.org/10.1177/0170840616685354>
- Giacomazzi, M. (2022). Soft skills assessment and enhancement: A call for contextualisation. *GILE Journal of Skills Development*, 2(1), 5–8. <https://doi.org/10.52398/gjsd.2022.v2.i1.pp5-8>
- Giacomazzi, M. (2021). Defining critical thinking in Uganda: A constructionist grounded theory study. In A. La Marca, G. Moretti, & I. Vannini (Eds.), *La ricerca educativa e didattica nelle scuole di dottorato in Italia* (pp. 29–50). Pensa MultiMedia Editore s.r.l.
- Giacomazzi, M., Fontana, M., & Camilli Trujillo, C. (2022). Contextualization of critical thinking in sub-Saharan Africa: A systematic integrative review report. *Thinking Skills and Creativity*, 43, 100978. <https://doi.org/10.1016/j.tsc.2021.100978>
- Gibbs, G. (2018). *Analyzing qualitative data* (2nd ed.). SAGE Publications.
- Goodnow, J. J., Young, B. M., & Kvan, E. (1976). Orientation errors in copying by children in Hong Kong. *Journal of Cross-Cultural Psychology*, 7(1), 101–110. <https://doi.org/10.1177/2F002202217671008>
- Greiff, S., Holt, D. V., & Funke, J. (2013). Perspectives on problem solving in educational assessment: Analytical, interactive, and collaborative problem solving. *Journal of Problem Solving*, 5(2), 71–91. <https://doi.org/10.7771/1932-6246.1153>
- Greiff, S., Wüstenberg, S., & Funke, J. (2012). Dynamic problem solving: A new assessment perspective. *Applied Psychological Measurement*, 36(3), 189–213. <https://doi.org/10.1177/0146621612439620>
- Guerra, N., Modecki, K., & Cunningham, W. (2014). Developing social-emotional skills for the labor market: The PRACTICE model. *Policy Research*, (7123). Working Paper/Issue November <http://hdl.handle.net/10986/20643>.
- Heto, P. P.-K., Odari, M., & Sunu, W. (2020). Kenya's 2017 basic education curriculum framework: A comprehensive review. *Journal of Interdisciplinary Studies in Education*, 9, 192–210. <https://doi.org/10.32674/jise.v9i1S1.1853>. SI.
- Hicks, M. J. (1991). *Problem solving in business and management: Hard, soft and creative approaches*. Springer.
- Hunter, A., & Riger, S. (1986). The meaning of community in community mental health. *Journal of Community Psychology*, 14(1), 55–71. [https://doi.org/10.1002/1520-6629\(198601\)14:1<55::AID-JCOP2290140106>3.0.CO;2-D](https://doi.org/10.1002/1520-6629(198601)14:1<55::AID-JCOP2290140106>3.0.CO;2-D)
- KICD. (2017). *Basic education framework* (p. 145). Kenya Institute of Curriculum Development.
- Leutner, D., Fleischer, J., Wirth, J., Greiff, S., & Funke, J. (2012). Analytische und dynamische Problemlösekompetenz im Lichte internationaler Schulleistungsvergleichsstudien. *Psychologische Rundschau*, 63(1), 34–42. <https://doi.org/10.1026/0033-3042/a000108>
- Liem, G. A. D., Martin, A. J., Anderson, M., Gibson, R., & Sudmalis, D. (2014). The role of arts-related information and communication technology use in problem solving and achievement: Findings from the programme for international student assessment. *Journal of Educational Psychology*, 106(2), 348–363. <https://doi.org/10.1037/a0034398>
- Low, M., Botes, V., Rue, D. Dela, & Allen, J. (2016). Accounting employers' expectations: The ideal accounting graduates. *Journal of Business Education & Scholarship of Teaching*, 10(11), 36–57. <http://www.ejbest.org>.
- Luria, A. R. (1976). *Cognitive development: Its cultural and social foundations*. Harvard University Press.
- McMillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology*, 14(1), 6–23. [https://doi.org/10.1002/1520-6629\(198601\)14:1<6::AID-JCOP2290140103>3.0.CO;2-I](https://doi.org/10.1002/1520-6629(198601)14:1<6::AID-JCOP2290140103>3.0.CO;2-I)
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). SAGE Publications.

- Muthivhi, A. E. (2013). Development of verbal thinking and problem-solving among TshiVenda-speaking primary school children. *Perspectives in Education*, 31(2), 22–32.
- NCDC Uganda. (2019). *Lower secondary curriculum*. National Curriculum Development Centre.
- Newell, A., & Simon, H. A. (1972). *Human problem solving*. Prentice-Hall.
- Novick, L. R., & Bassok, M. (2005). Problem solving. In K. J. Holyoak & R. G. Morrison (Eds.). *The Cambridge handbook of thinking and reasoning* (p. 858). Cambridge University Press <http://books.google.com/books?hl=fr&lr=&id=znbkHaC8QeMC&pgis=1>.
- O'Neil, H. F., Chuang, S. H., & Chung, G. K. W. K. (2003). Issues in the computer-based assessment of collaborative problem solving. *Assessment in Education: Principles, Policy and Practice*, 10(3), 361–373. <https://doi.org/10.1080/0969594032000148190>
- Rahman, M. (2019). 21st century skill “problem solving”: Defining the concept. *Asian Journal of Interdisciplinary Research*, 2(1), 64–74. <https://doi.org/10.34256/ajir1917>
- Robertson, S. L. (2005). Re-imagining and rescripting the future of education: Global knowledge economy discourses and the challenge to education systems. *Comparative Education*, 41(2), 151–170. <https://doi.org/10.1080/03050060500150922>
- Rogoff, B. (1990). *Apprenticeship in thinking: Cognitive development in social context*. Oxford University Press.
- Rogoff, B. (2003). *The cultural nature of human development*. Oxford University Press.
- Rogoff, B., Dahl, A., & Callanan, M. (2018). The importance of understanding children's lived experience. *Developmental Review*, 50, 5–15. <https://doi.org/10.1016/j.dr.2018.05.006>
- Rotherham, A. J., & Willingham, D. (2009). 21st century skills: The challenges ahead. *Educational Leadership*, 67(1), 16–21. <https://eric.ed.gov/?id=EJ855079>.
- Sağır, S. U. (2011). Research on problem solving skills of teacher candidate. *E-Journal of New World Sciences Academy Education Sciences*, 6(4), 2482–2494.
- Schraw, G., Dunkle, M. E., & Bendixen, L. D. (1995). Cognitive process in well-defined and ill-defined problem solving. *Applied Cognitive Psychology*, 9, 523–538. <https://doi.org/10.1002/acp.2350090605>
- Sikoyo, L. (2010). Contextual challenges of implementing learner-centred pedagogy: The case of the problem-solving approach in Uganda. *Cambridge Journal of Education*, 40(3), 247–263. <https://doi.org/10.1080/0305764X.2010.509315>
- Sternberg, R. J., & Frensch, P. A. (1991). *Complex problem solving: Principles and mechanisms* (Eds.) (1st ed.). Psychology Press. <https://doi.org/10.4324/9781315807546>.
- Suarta, I. M., Suwintana, I. K., Sudhana, I. F. P., & Hariyanti, N. K. D. (2017). Employability skills required by the 21st-century workplace: A literature review of labour market demand. *Advances in Social Science, Education and Humanities Research*, 102, 337–342. <https://doi.org/10.2991/ictvt-17.2017.58>
- Thomas, J., & Harden, A. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8, 1–10. <https://doi.org/10.1186/1471-2288-8-45>
- Treffinger, D. J., & Isaksen, S. G. (2005). Creative problem solving: The history, development, and implications for gifted education and talent development. *Gifted Child Quarterly*, 49(4), 342–353. <https://doi.org/10.1177/001698620504900407>
- Valtonen, T., Hoang, N., Sointu, E., Näykki, P., Virtanen, A., Pöysä-Tarhonen, J., et al. (2021). How pre-service teachers perceive their 21st-century skills and dispositions: A longitudinal perspective. *Computers in Human Behavior*, 116, Article 106643. <https://doi.org/10.1016/j.chb.2020.106643>
- Vygotsky, L. S. (1965). Psychology and localization of functions. *Neuropsychologia*, 3, 381–386.
- Walker, D. P. (2003). *Enhancing problem-solving disposition, motivation and skills through cognitive apprenticeship*. North Carolina State University.
- Webb, P., & Treadwell, D. F. (2006). Using exploratory talk to enhance problem-solving and reasoning skills in grade-7 science classrooms. *Research in Science Education*, 36(4), 381–401. <https://doi.org/10.1007/s11165-005-9011-4>
- Willis, S. L. (1996). Everyday problem solving. In J. E. Birren, K. W. Schaie, R. P. Abeles, M. Gatz, & T. A. Salthouse (Eds.). *Handbook of the psychology of aging* (pp. 287–307). <https://doi.org/10.1002/9781118521373.wbeaa145>.
- Zembski, S., & Ulewicz, R. (2020). Usefulness of problem based learning in preparing engineers for industry 4.0: Literature review. *Quality Production Improvement-QPI*, 2, 117–130. <https://doi.org/10.2478/cqpi-2020-0014>