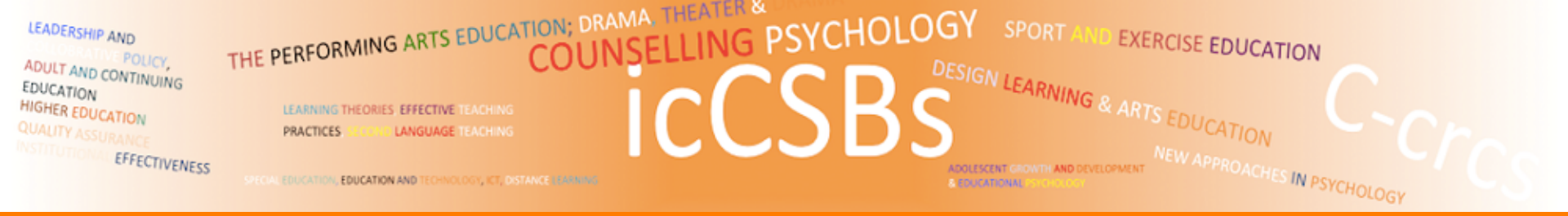

Broadening teacher training: playful learning in non-formal contexts for science and mathematics education

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Introduction

- Currently, new ways of learning to develop skills such as **creativity and scientific and mathematical thinking** are needed. Teachers must be prepared to face today's reality and engage with education in **non-formal contexts**.
- Work opportunities may arise if teachers in training begin to see themselves as **entrepreneurial professionals**. Toy libraries, farm-schools, cultural clubs, and museums offer alternatives to a traditional teaching career.

Methodology

- We undertook an approach to **educator training** in non-formal contexts, based on **playful learning** and specially focused on science and mathematics education. It was introduced as part of the higher education of pre-service kindergarten teacher. A key part was the visits to real contexts where non-formal education is offered (**field trips**): an interactive science museum, a toy library, and a private centre managed by an entrepreneur.

Methodology

- To know their perceptions after their training, we surveyed the participants regarding the usefulness of our approach for their future professional development.
- The survey included an open-ended query, giving the participants the opportunity to express their reflections.
- We used the technique of content analysis of the speech for qualitative analysis and added a quantitative analysis.

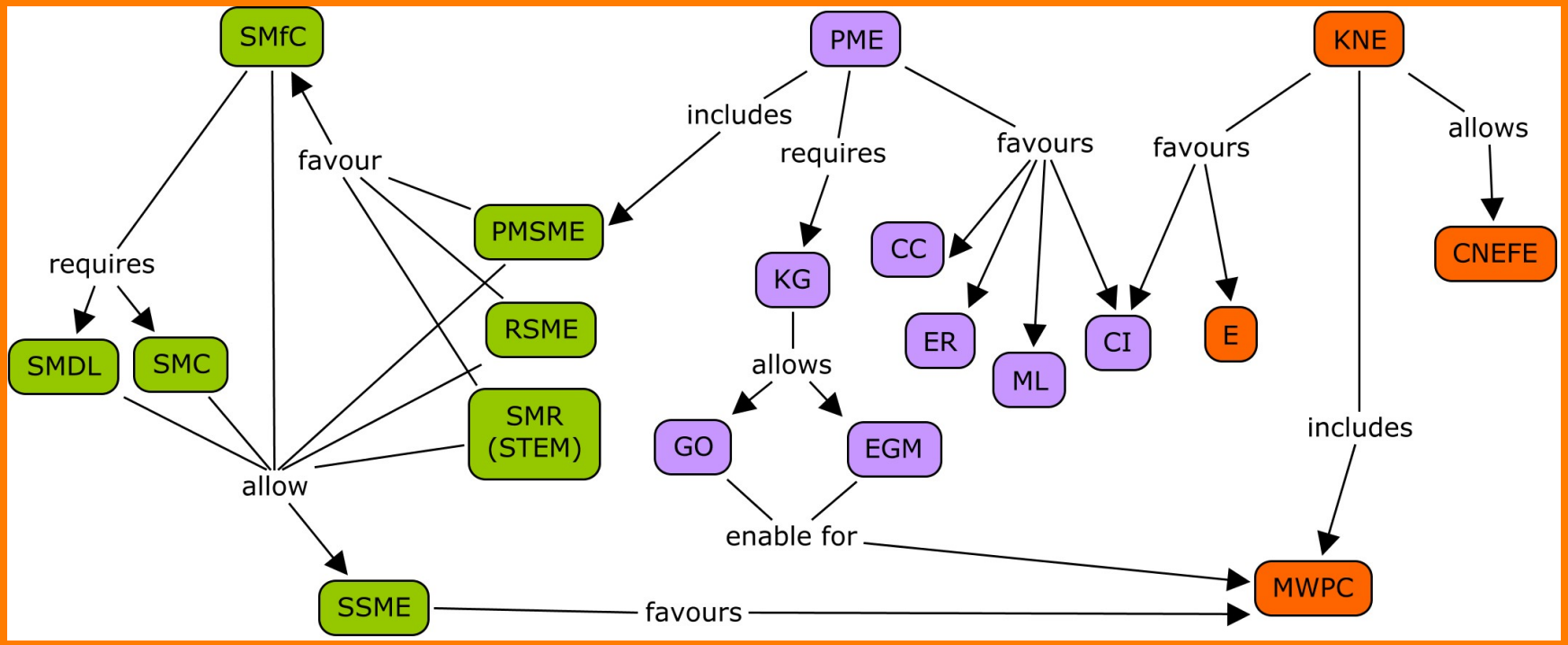
Results

- The analysis revealed the emergence of units of meaning (**emerging subcategories**), grouped into **categories** and interrelated. The most frequent category was that related to non-formal education, although it brings together the fewest number of subcategories.
- Especially meaningful subcategories are: relations between science and mathematics, self-confidence as science and mathematics educators, children's creativity, and entrepreneurship.

Results

Code	Category	Frequency (%)
SME	Science and mathematics education	26
Code	**Subcategory**	**Frequency (%)**
SMfC	Science and mathematics for children	3
SMDL	Science and mathematics in daily life	5
SMC	Scientific and mathematical contents	3
SMR (STEM)	Relations between science and mathematics (science, technology, engineering and mathematics)	3
PMSME	Playful methodology for science and mathematics education	8
RSME	Resources for science and mathematics education	3
SSME	Self-confidence as science and mathematics educators	3
Code	**Category**	**Frequency (%)**
PL	Playful learning	54
Code	**Subcategory**	**Frequency (%)**
PEM	Playful educational methodology	3
KG	Knowledge about games	8
GO	Game organization	5
EGM	Educational games manufacture	18
ER	Educational resources	10
CC	Children's creativity	3
ML	Motivation to learn	3
CI	Continuous innovation	5
Code	**Category**	**Frequency (%)**
NE	Non- formal education	56
Code	**Subcategory**	**Frequency**
KNE	Knowledge of non-formal education	31
CNEFE	Connection between non-formal education and formal education	3
MWPC	Management and working in a toy library	21
E	Entrepreneurship	3

Results



Interrelationships among the subcategories emerging from the reflections of the teachers in training. Subcategories shown in the same colour are joined into a **category**. Green, violet, and orange correspond to **science and mathematics education, playful learning, and non-formal education**, respectively

Implications for policy/Practice

- We ask: Are future teachers prepared to educate the next generations in today's world, in which new ways of learning to develop skills such as creativity and scientific and mathematical thinking are already needed?
- We aim to broaden teacher training during their higher education at the university, concerning non-formal contexts and paying special attention to science and mathematics education.

Implications for policy/Practice

- To know their perceptions after their training, we surveyed the participants regarding the usefulness of our approach for their future professional development.
- In this changing world, an approach to teacher training concerning non-formal contexts, based on playful learning and specially focused on science and mathematics education, is worthwhile

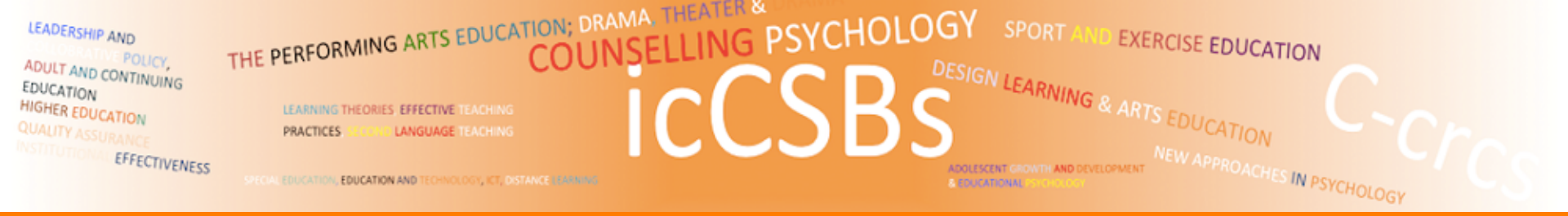
Conclusion

- In general terms, we can state the participants perceived the approach as being quite useful for their professional future.
- We studied the reflections of the teachers in training after the development of our approach, following the qualitative-interpretive technique of content analysis of the speech. The results of the qualitative analysis provided the emergence of 19 units of meaning (subcategories).

Conclusion

- The study of the interrelationships among these units of meaning revealed the existence of 3 joined cores (categories) interrelated. Those cores are:
  - Science and mathematics education
  - Playful learning
  - Non-formal education

  and around them the discourse of the educators in training was articulated.



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