ENGAGING FUTURE MAKERS IN SCIENCE THROUGH VIDEOS ON TIKTOK

MY TIKTOK RESEARCH GROUP:
Ida Koskinen, Vilja Kämppi and Johannes Pernaa

PROF. MAIJA AKSELA
SCIENCE EDUCATION
DIRECTOR OF LUMA CENTRE FINLAND
FACULTY OF SCIENCE
UNIVERSITY OF HELSINKI
FINLAND
MAIJA.AKSELA@HELSINKI.FI
VISIT FINLAND:
https://www.visitfinland.com/
"Every teacher effects on society about 100 years: first as a teacher and then through her/his students."

New solutions and models from early childhood to universities in our LUMA ecosystem.

<table>
<thead>
<tr>
<th>Maija Aksela's background info</th>
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</thead>
<tbody>
<tr>
<td>Director of national LUMA Centre Finland</td>
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<tr>
<td>Professor of science education</td>
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<tr>
<td>A board member of math, physics and chemistry teacher education program (B.Sc.; M.Sc.)</td>
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<tr>
<td>Director of the Unit of Chemistry Teacher Education</td>
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<tr>
<td>50 % of working time in science education and 50 % in teacher education and its’ research</td>
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<td>Over 35 years in science education</td>
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<tr>
<td>Over 375 publications in science education</td>
</tr>
<tr>
<td>A member of Finnish UNESCO group</td>
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</tbody>
</table>

- Promoting education from 6 experiences:
  - (i) researcher in science (at the beginning of career)
  - (ii) 6 years math and science teacher at senior high school
  - (iii) 25 years teacher educator (math and science teacher program) and researcher in University of Helsinki
  - (iv) about 35 years in-service training
  - (v) about 20 years LUMA and science education work beside my job in teacher education
  - (iv) mom for two children (adults) and happy grandmother

A photo: The oldest LUMA lab, ChemistryLab Gadolin – a research and development centre at the Faculty of Science, University of Helsinki since 2008.
CONTENTS

1. LUMA Centre Finland: to build new solutions for sustainable future

2. An example of our research and development project: TikTok videos

TikTok videos: @kemianluokkagadolin
Joy of Science for all!

The philosophy behind the LUMA logo:

- **Together we are more!**
- Light in the middle is the light in students’ eyes when they are engaged in science.

LUMA is the brand for Finnish science education. It is abbreviated from “luonnontieteet, the Finnish word for natural sciences, and “matematiikka”, the Finnish word for mathematics. A means all subjects/all sciences.
THE MAIN AIM is

To engage children and young people – both girls and boys - from age 3 to 19 in science and teachers and future teachers at all levels in life-long professional development.
LUMA CENTRE FINLAND

for promoting math, science and technology education (since year 2013)

1. Central Finland LUMA Centre (University of Jyväskylä)
2. LUMA Centre Aalto (Aalto University)
3. LUMA Centre Lapland (University of Lapland)
4. LUMA Centre of Central Ostrobothnia (Kokkola University Centre Chydenius)
5. LUMA Centre of Ostrobothnia (University of Vaasa)
6. LUMA Centre of Southwestern Finland (University of Turku)
7. LUMA Centre of the University of Eastern Finland
8. Science Education Centre at the University of Helsinki
9. LUMA Centre of the University of Oulu
10. LUMA Centre Päijät-Häme (Lahti University Campus)
11. LUMA Centre Saimaa (Lappeenranta University of Technology)
12. LUMA Centre Åbo Akademi (Åbo Akademi University)
13. Tampere LUMATE Centre (University of Tampere)

- OVER 1 MILLION PARTICIPANTS 2014-1)
- TEACHER EDUCATION AND ITS RESEARCH INTEGRATED TO THE ACTIONS.
- ABOUT 100 ”LUMA-WORKERS” (mostly beside of their job in teacher education)

LUMA MOTTO: TOGETHER WE ARE MORE!
COLLABORATIVE SCIENCE EDUCATION AT THE UNIVERSITY OF HELSINKI SINCE 2003

New Solutions and Pedagogical Innovations for Teaching from Early Childhood Education to Universities

LUMA Finland – Together we are more

LUMA Finland - Together we are more

A new e-book (free of charge):

https://www.luma.fi/en/download/luma-finland-together-we-are-more/
LUMA CENTRE FINLAND

COLLABORATION IS A KEY FOR SUCCESS

INTERNATIONAL COLLABORATION

11 UNIVERSITIES

RESEARCH

STUDENTS

TEACHERS

EDUCATORS

RESEARCHERS

SCHOOLS

KINDERGARTENS

TEACHERS,

CHILDREN,

PUPILS,

STUDENTS

FAMILIES

MEDIA

LIBRARIES

ASSOCIATIONS:

E.G. OAJ

MUSEUMS

SCIENCE CENTRES

MINISTRY OF

EDUCATION

NATIONAL BOARD OF

EDUCATION

BUSINESS SECTOR

PARENTS,

GRANDPARENTS

ETC.

SUPPORTING

NATIONAL CURRICULUM

and FUTURE CURRICULUM

HELSINGIN YLIOPISTO

HELSINGFORS UNIVERSITET

UNIVERSITY OF HELSINKI

Matemaattis-luonnontieteellinen tiedekunta
COLLABORATIVE DESIGN-BASED RESEARCH AS A FRAMEWORK

THEORETICAL PROBLEM ANALYSIS
- SCIENCE - LEARNING

EMPIRICAL PROBLEM ANALYSIS
GOALS FOR THE ACTIVITY

NEEDS
E.G. SURVEY FROM TEACHERS’ VIEWS
NATIONAL CURRICULUM

A PILOT MODEL AND TESTING IT (AN ITERATIVE DESIGN CYCLE) e.g. AT SPECIAL LUMA LABS IN UNIVERSITIES AND/OR SCHOOLS IN HELSINKI

RESULTS

PEDAGOGICAL INNOVATION(S)

A NEW WAY TO EDUCATE RESEARCH-ORIENTED AND REFLECTIVE TEACHERS FOR FUTURE
e.g. Edelson, 2002; Aksela, 2019 (LUMA2020 Program)

TOGETHER WE ARE MORE! (motto)

SCIENTIFIC PAPERS
TEACHER EDUCATION
E.G. MOOCS

EDUCATE RESEARCH-ORIENTED AND REFLECTIVE TEACHERS FOR FUTURE
**16 LUMA LABS**

- Founded v. 2008
- Collaboration between
  - University of Helsinki
  - Finnish chemistry industry
  - Pedagogical institutions
- Over 70,000 and 3,000 groups
- All school levels – free of charge
- Supporting Finnish national curriculum

**Study visits**
- Laboratory activities
- Molecular modeling
- **Scientist meetings**
- Department and campus tours

**Science clubs**

**Science camps**

**The oldest SCIENCE LAB: CHEMISTRYLAB GADOLIN**

- **Birthday parties**
- Science fairs
- In-service training
- Pre-service training
- Material development
- Material lending
- Webinars
- Academic research

**AS A PART OF TEACHER EDUCATION:**
FUTURE TEACHERS GUIDING GROUPS
TIK TOK

- TikTok is a worldwide mobile application, where users can browse and share short videos of 15-60 seconds (Newly up to 180 seconds)
- Depending on the video settings, the videos can publically be commented on, liked shared on TikTok and other platforms
- TikTok's algorithm decides what kind of content the user will see on their For You page – This is different from other social media platforms, where the user is in full control of what kind of content they decide to follow
- The age limit to use TikTok is 13 years (under parental supervision)
- The popularity of TikTok has increased during the pandemic (Escamilla-Fajardo et al., 2021)
PREVIOUS TIKTOK RESEARCH

• Using social media in teaching has been shown to hold a lot of possibilities, e.g., Improving communication and engaging (Greenhow & Lewin, 2013; Faizi et al., 2013)

• Hayes et al. (2020) conducted a questionnaire on the effect of chemistry related TikTok videos on learning and interest
  • It was concluded that videos significantly improve interest and learning

• Habibi & Salim (2021) found that experimental type videos are the most engaging of chemistry related videos
  • Engagement was measured quantitatively through the relations of likes, comments, shares and views

• According to Escamilla-Fajadro et al. (2021) TikTok promotes student motivation, creating an engaging learning environment
Fredricks et al. (2004) introduce three different levels of engagement:

1. **Behavioral engagement**
   - Participation and achieving an outcome

2. **Emotional/affective engagement**
   - Affective reactions such as interest, boredom, happiness etc.

3. **Cognitive engagement**
   - Investment and effort in learning
OUR CASE STUDY

• The research is a case study, that is the first pilot version of a bigger scale research development process

• Running the TikTok account is a part of the operation of ChemistryLab Gadolin (Aksela et al., 2018)
  • ChemistryLab gadolin works as a non-formal learning environment
  • Due to the COVID-19 situation physical activities have been replaced by virtual and informal activities
  • The TikTok account is a part of VirtualGadolin, which, in turn, is an informal learning environment (Greenhow & Lewin, 2016)
OUR TIKTOK VIDEOS

• The account @kemianluokkagadolin was founded in February 2021
• The account has over 21 000 followers with 47 published videos
  - 78% female and 22% male
• The frequency and moments of uploads were decided based on earlier experience
  - 2 to 3 times a week, around 14-15 PM (with a few exceptions)
• The videos deal with, among other subjects, everyday chemistry, modern technology and sustainable development
• Some of the videos depict demonstrations, some DIY (Do it yourself) experiments and some theoretical explanations.
• Topical research topics are included in the videos to enforce the relevance of chemistry to the public
<table>
<thead>
<tr>
<th></th>
<th>Views (thousands)</th>
<th>Reached Audience (thousands)</th>
<th>Likes (per views) (thousands)</th>
<th>Comments</th>
<th>Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Story of a Gummy Bear</td>
<td>276,5</td>
<td>234,5</td>
<td>32,8 (11,9 %)</td>
<td>609</td>
<td>256</td>
</tr>
<tr>
<td>Dry Ice</td>
<td>230,7</td>
<td>206,9</td>
<td>13,3 (5,8%)</td>
<td>229</td>
<td>22</td>
</tr>
<tr>
<td>Dry Ice Part 2</td>
<td>203,7</td>
<td>182,4</td>
<td>13,1 (6,4%)</td>
<td>221</td>
<td>48</td>
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<tr>
<td>Sugar Rainbow Part 3</td>
<td>173,4</td>
<td>157,9</td>
<td>15,7 (9%)</td>
<td>83</td>
<td>23</td>
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<tr>
<td>Liquid Nitrogen Part 2</td>
<td><strong>409,5</strong></td>
<td>367,8</td>
<td>25,7 (6,3%)</td>
<td>371</td>
<td>167</td>
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<tr>
<td>Helium Balloons</td>
<td>310,6</td>
<td>282,6</td>
<td>31,2 (10%)</td>
<td>165</td>
<td>74</td>
</tr>
<tr>
<td>Extraction of Limonene</td>
<td>206,2</td>
<td>177,5</td>
<td>14 (6,8%)</td>
<td>89</td>
<td>12</td>
</tr>
<tr>
<td>Bioplastic in the Microwave</td>
<td>198,6</td>
<td>171,3</td>
<td>14,6 (7,3%)</td>
<td>175</td>
<td><strong>537</strong></td>
</tr>
<tr>
<td>Lava Lamp</td>
<td>161,8</td>
<td>135,5</td>
<td>15,9 (9,8%)</td>
<td>117</td>
<td><strong>690</strong></td>
</tr>
<tr>
<td>Microwave Cookies</td>
<td>235</td>
<td>190</td>
<td>20,3 (8,6%)</td>
<td>183</td>
<td>159</td>
</tr>
<tr>
<td>Dry Ice Part 4</td>
<td><strong>379,8</strong></td>
<td>340,6</td>
<td>30,8 (8,1%)</td>
<td>426</td>
<td>90</td>
</tr>
<tr>
<td>Slick Slime</td>
<td><strong>540,2</strong></td>
<td>459</td>
<td>44,4 (8,2%)</td>
<td>676</td>
<td><strong>1064</strong></td>
</tr>
<tr>
<td>Green Factory</td>
<td>274</td>
<td>253,6</td>
<td>17,4 (6,3%)</td>
<td>108</td>
<td>50</td>
</tr>
<tr>
<td>Slick Slime Part 2</td>
<td>135,5</td>
<td>119</td>
<td>12,5 (9,2%)</td>
<td>91</td>
<td>31</td>
</tr>
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Student-centered, societally-oriented and collaborative chemistry teacher education within learning communities has a central role for ESD and a brighter future for the upcoming generations.

SKILLFUL TEACHERS ARE IN THE KEY ROLE FOR CREATING THE BETTER WORLD FUTURE MAKERS

TOGETHER WE ARE MORE!

THANK YOU FOR YOUR ATTENTION!