Study of Ontological and Epistemological Worldviews of Science Teachers in the Digital Age

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May, 2016
ICT in Science Education

- Microcomputer Based Lab
- Network Collaboration
- Modeling and Simulation
- Mixed-Reality technology
- Mobile Computing
ICT in Science Education

• In comparison with the great success of ICT in all spheres of the life, integration of ICT in education seems to remain modest.

• Many researchers tend to believe that the main bottleneck of ICT integration into education stems from teachers’ lack of technological literacy.

• We assume that success of the ICT integration requires significant changes in teachers’ worldview.
SAMR Framework for Assessing ICT Integration in Science Education

Redefinition
Tech allows for the creation of new tasks, previously inconceivable

Modification
Tech allows for significant task redesign

Augmentation
Tech acts as a direct tool substitute, with functional improvement

Substitution
Tech acts as a direct tool substitute, with no functional change

Transformation
Enhancement
SAMR Framework for Assessing ICT Integration in Science Education

• We consider the **Redefinition** as the supreme, creative form of the understanding of technology in education

• Our hypothesis is that the changes of **teachers’ worldview** are vital for their understanding the role of technology in science education in its transformative stage (Modification/Redefinition)
Towards the Model of Studying Teachers’ Worldview

1. Components of Worldview and Corresponding Transformations of Digital Society
2. Epistemological and Ontological Worldviews
3. Worldviews Realist-Relativist approach
Components of Worldview and Corresponding Transformations of Digital society
Components of worldview

Self-conception
- Blurred distinction between reality and virtuality

Mutual interactions
- Blurred distinctions between human, machine, and nature

Conception of reality
- Reversal from information scarcity to information abundance

Transformations of Digital society

Floridi, 2014
Self Conception

A blurred distinction between reality and virtuality

Digital representations can be said to exist, and whether they can be said to be an extension of reality
Mutual interactions

A blurred distinction between human, machine, and nature

- Phenomenon of ubiquitous computing, embedded systems, and computer mediation of human activity (social networks, cloud computing)
- Redefinition of our environment through integration with technology, and the reevaluation of the nature of humanity through interaction with technology
Conception of reality

Shift from the scarcity of information to abundance of information

Changes in learning and understanding caused by the growing accessibility of information worldwide, as well as the ease of gathering and creating information.
Epistemological and Ontological Worldviews
Elements of worldviews

Epistemological
- Types of knowledge and ways of Knowing
- Justification of knowledge, knowing, and evidence
- Sources of knowledge and evidence

Ontological
- Beliefs about reality
- Beliefs about personal being

Schraw, 2013
Ontological Worldview

• Individual’s collective beliefs about the nature of reality and being

• Explicit and implicit beliefs, attitudes, and assumptions about the nature of reality and being in Digital Society
Epistemological Worldview

- Individual’s collective beliefs about the nature and acquisition of knowledge, and about the knowledge justification

- Explicit and implicit beliefs, attitudes, and assumptions about the informatisation of education
Worldviews
Realist-Relativist approach
Elements of worldviews

Epistemological
- Realist
- Relativist

Ontological
- Realist
- Relativist

Shadish's et al., 2002
### Ontology

<table>
<thead>
<tr>
<th>Realist</th>
<th>Relativist</th>
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<tbody>
<tr>
<td>• One underlying reality that is the same for everyone</td>
<td>• Different people have different realities</td>
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<tr>
<td>• Identifies specific ideas which reflect the ‘true’ and ‘fundamental’</td>
<td>• Teachers are collaborators, co-participants, and facilitators of learning who work to meet the individual needs of students</td>
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<tr>
<td>nature of reality</td>
<td>• Nature of ICTs is flexible, changing, and dependent on the user</td>
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<td>• Fundamental nature and role of ICTs has already been reflected in their early manifestations</td>
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## Epistemology

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<td>• Limited set of methods needed to instruct</td>
<td>• Variety of methods for learning and a wide range of potential learning goals</td>
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<tr>
<td>• Curriculum is fixed and permanent</td>
<td>• Curriculum is changing and student-centered</td>
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<td>• ICTs have a specific and fixed role in all aspects of their use</td>
<td>• ICTs have varying roles and uses in the modern classroom</td>
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Model for Studying Teachers’ worldviews
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Research Question

Which ontological and epistemological worldviews have the contemporary science teachers?
Sample

High school in-service science teachers from Tel Aviv area (n=15)
Data Collection

• Semi-structured interviews
• Repertory Grid Technique

Data Analyses

• Qualitative-constructivist content analysis
• Statistical analysis of qualitative data
Expected significance

• **Theoretical significance:**
  Contributes to the existing ontological and epistemological knowledge of integrating ICT into educational practice

• **Practical implications:**
  Effecting the teachers' professional growth
  Finding new ways to support the teachers’ training
Thanks!

- Prof. Ilya Levin
- Prof. Elite Olshtain
- Dr. Liat Josefsberg Ben-Yehoshua
- Ravit Inbar and postdoc colleges

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