PREP21

Preparing teacher students for 21st century learning practices
Ways of thinking and working

Developing a TPACK measurement instrument for 21st century pre-service teachers

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Challenges of ICT in Education

- Finland is falling behind in the use of ICT in education(EC, 2013; ISAB, 2010)
  - newly qualified teacher may still graduate without adequate pedagogical ICT skills
  - attitudes towards using ICT in education may be negative
- How today's teachers' skills and knowledge meet the demands of the 21st century?
  - →triggering the change
  - →improving pre-service teachers' competencies to use ICT in pedagogically meaningful way

→Need of assessment instrument(s) in Finland

Preparing teacher students for 21st century learning practices (PREP21)

- 2014–2017
- Three university consortium
  - UEF: ICT in Education (Knowledge and Attitudes)
  - JYU: collaborative problem solving skills
  - UO: strategic learning skills
- Longitudinal and cross-sectional
- Funded by the Academy of Finland (TULOS)

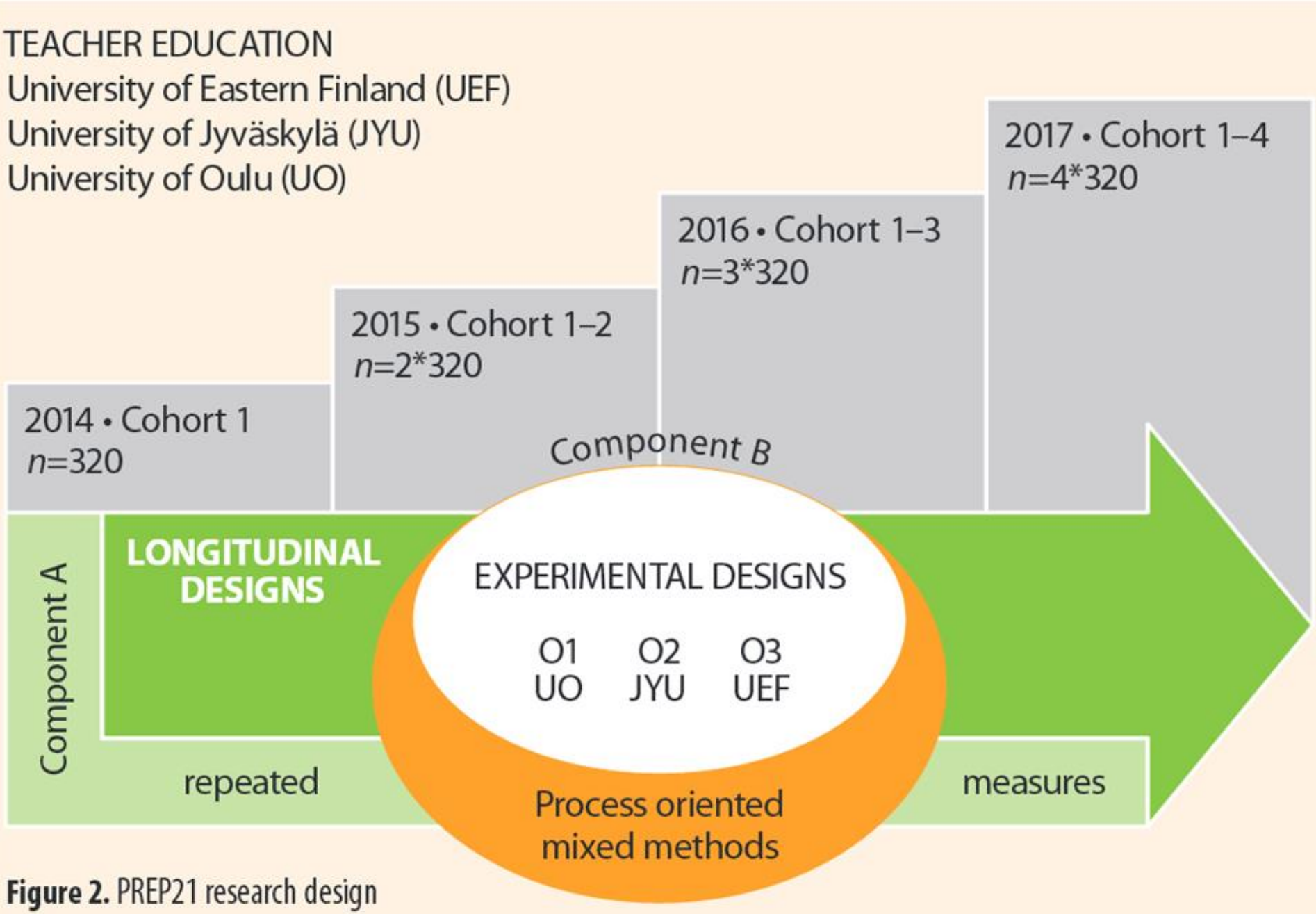
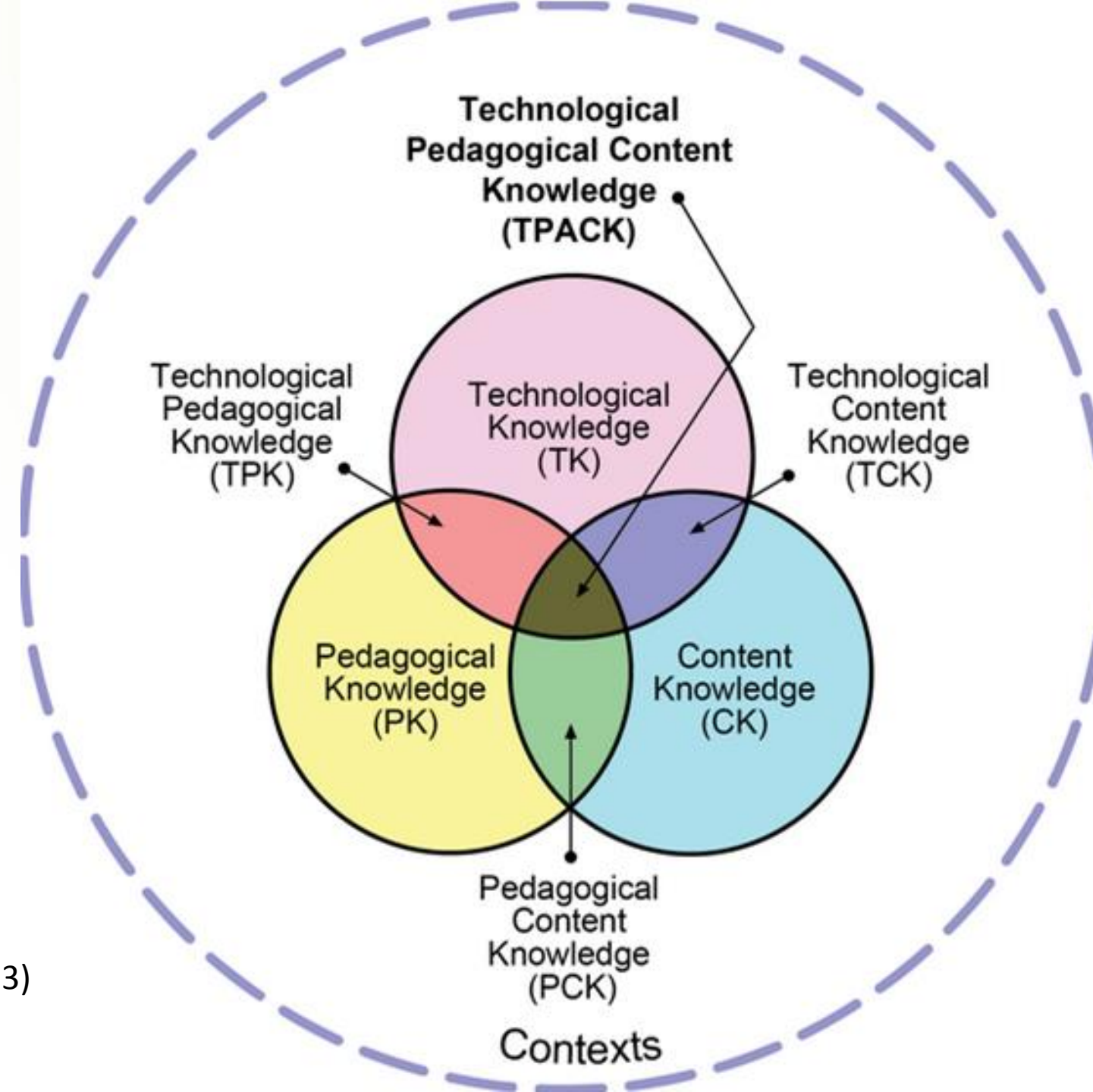
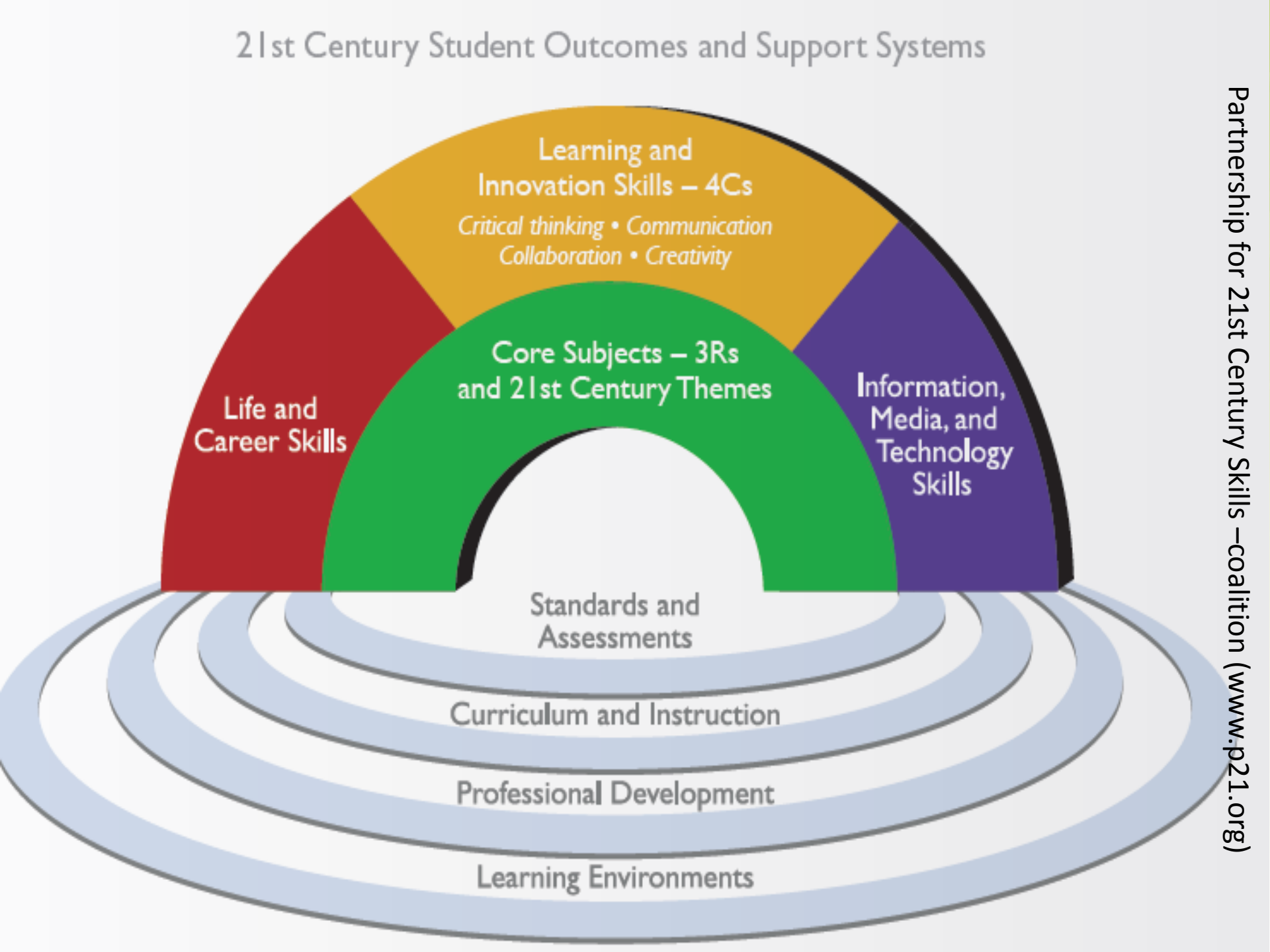


Figure 2. PREP21 research design



(Koehler et al.,2013)



Partnership for 21st Century Skills –coalition (www.p21.org)

Challenges with TPACK assessment instruments

- Role of pedagogy
  - 21st century skills
- Psychometric qualities
  - Amount of measured areas (7?)
  - Theory meets empirical data (?)
- TPACK instruments for teacher education context
  - Reflective tool

Examples of different roles of pedagogy

- I know how to assess student performance in a classroom
- I can adapt my teaching based upon what students currently understand or do not understand
- I know how to organize and maintain classroom management

  (Schmidt et al., 2009).

- I am able to help my students to monitor their own learning.
- I am able to help my students to reflect on their learning strategies.
- I am able to plan group activities for my students.

  (Koh & Sing, 2011).

Methods

Two phases in the design process:

1) Study 1 (*N*=96)
   - 86 items
   - analysis – descriptive statistics
   - development for study 2
2) Study 2 (*N*=267)
   - 54 items
   - analysis – descriptive statistics, EFA
   - First version of TPACK-21 assessment instrument

Methods

TPACK-21 assessment instrument

- Six-point Likert-Type scale

1 = I need a lot of additional information about the topic

2 = I need some additional…

3 = I need a little additional…

4 = I have a some information about the topic

5 = I have good knowledge…

6 = I have strong knowledge…

Results: descriptives

	***M* (*SD*)**		**Skewness**		**Kurtosis**		**Cronbach α (95% CI)**	
	Study1	Study2	Study1	Study2	Study1	Study2	Study1	Study2
PK 21st	3.78 (.65)	3.21 (1.03)	-.45	-.27	.72	-.77	N = 94	N = 267
CK old	3.76 (.91)	2.98 (1.09)	-.57	.13	.69	-.68	.84 [.79, .89]	.93 [.92, .94]
CK 21st	3.79 (.79)	3.59 (1.09)	-.07	-.32	-.05	-.62	.88 [.84, .92]	.88 [.86, .90]
TK	3.74 (.96)	2.85 (1.23)	.30	.12	-.14	-.99	.89 [.85, .92]	.94 [.92, .95]
PCK 21st	3.69 (.74)	2.96 (1.04)	-.42	-.07	1.19	-.42	.85 [.79, .89]	.92 [.90, .94]
TCK 21st	2.61 (.91)	2.23 (1.05)	.10	.68	-.63	-.28	.87 [.82, .91]	.95 [.95, .96]
TPK 21st	3.72 (.80)	2.94 (1.12)	-.45	.03	.46	-.73	.83 [.76, .88]	.95 [.94, .96]
TPACK	3.42 (.81)	2.65 (1.05)	-.01	.11	-.67	-.82	.88 [.84, .91]	.89 [.87, .91]

Results: EFA

Principal Axis Factoring, oblique rotation, loadings < .40 cleared

TPACK did not load separately to the EFA.

→ Final version with 36 items.

Item	PK21st	CK old	CK 21st	TK	PCK 21st	TPK 21st	TCK 21st
PK1	,713						
PK2	,682						
PK3	,861						
PK4	,761						
PK5	,844						
PK6	,809						
PK7	,648						
CK1		,685					
CK2		,882					
CK3		,687					
CK4		,475					
CK5			-,720				
CK6			-,754				
CK7			-,863				
CK8			-,796				
CK9			-,829				
TK1				,796			
TK2				,999			
TK3				,899			
TK4				,677			
PCK1					,847		
PCK2					,815		
PCK3					,822		
PCK4					,769		
PCK5					,816		
PCK6					,701		
TPK1						-,506	
TPK2						-,658	
TPK3						-,938	
TPK4						-,845	
TPK5						-,798	
TPK6						-,697	
TCK1							-,536
TCK2							-,841
TCK3							-,832
TCK4							-,623
Eigenvalues	16.3	2.22	1.03	4.42	1.17	1.40	1.90
% of variance	45.28	6.15	2.85	12.27	3.25	3.87	5.27

Reflection – pre-service teachers and TPACK

- Difficulties with certain concepts
- Difficulties in separating areas of TPACK
- Statements too easy / too difficult

- Assessment instrument as a reflective tool
- Need for TPACK assessment instruments for different kinds of studies

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Example of TPACK-21 instrument

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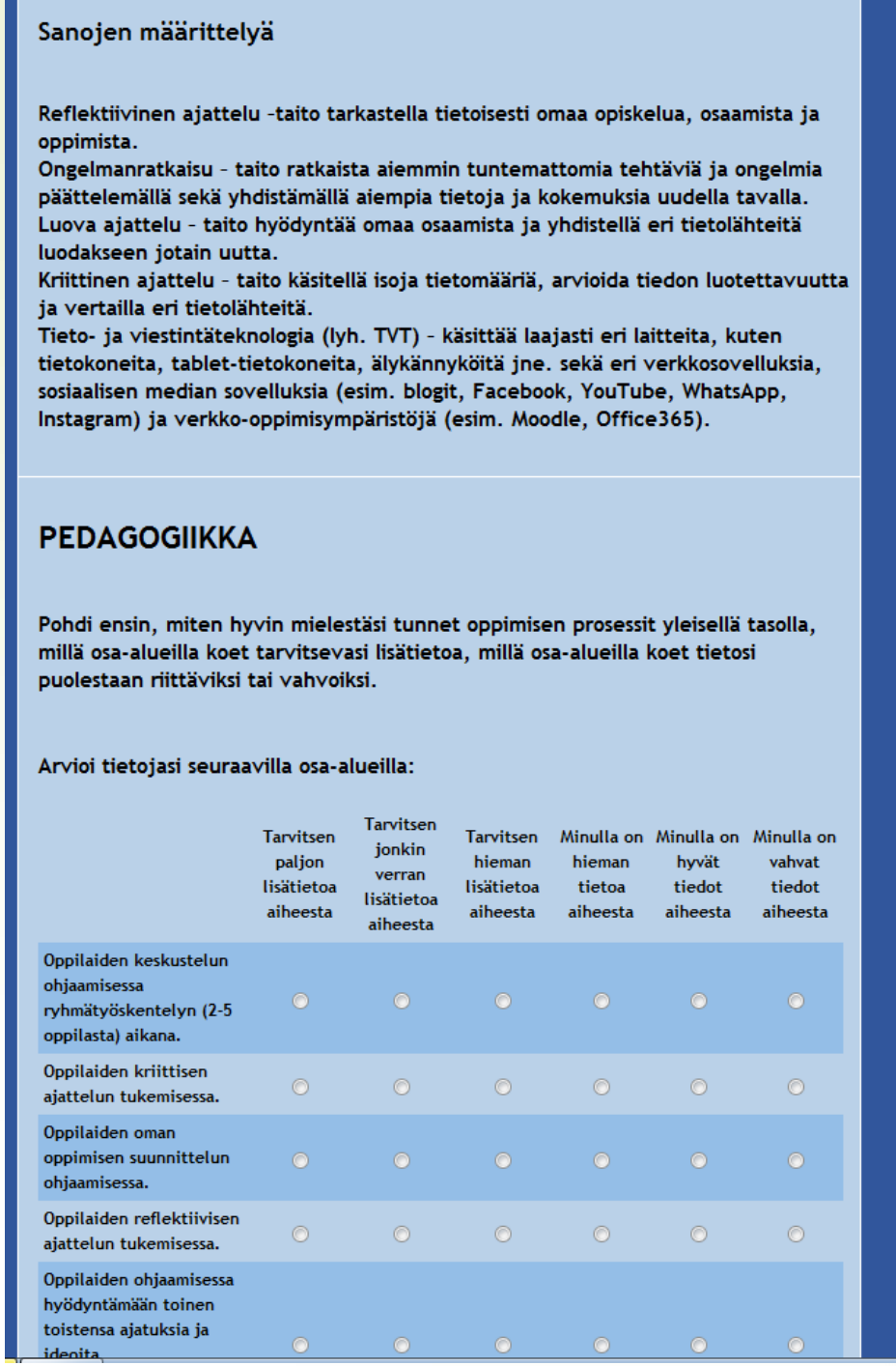

Sanojen määrittelyä

Reflektiivinen ajattelu -taito tarkastella tietoisesti omaa opiskelua, osaamista ja oppimista.
Ongelmanratkaisu - taito ratkaista aiemmin tuntemattomia tehtäviä ja ongelmia päättelemällä sekä yhdistämällä aiempia tietoja ja kokemuksia uudella tavalla.
Luova ajattelu - taito hyödyntää omaa osaamista ja yhdistellä eri tietolähteitä luodakseen jotain uutta.
Kriittinen ajattelu - taito käsitellä isoja tietomääriä, arvioida tiedon luotettavuutta ja vertailla eri tietolähteitä.
Tieto- ja viestintäteknologia (lyh. TVT) - käsittää laajasti eri laitteita, kuten tietokoneita, tablet-tietokoneita, älykännyköitä jne. sekä eri verkkosovelluksia, sosiaalisen median sovelluksia (esim. blogit, Facebook, YouTube, WhatsApp, Instagram) ja verkko-oppimisympäristöjä (esim. Moodle, Office365).

PEDAGOGIIKKA

Pohdi ensin, miten hyvin mielestäsi tunnet oppimisen prosessit yleisellä tasolla, millä osa-alueilla koet tarvitsevasi lisätietoa, millä osa-alueilla koet tietosi puolestaan riittäviksi tai vahvoiksi.

Arvioi tietojasi seuraavilla osa-alueilla:

	Tarvitsen paljon lisätietoa aiheesta	Tarvitsen jonkin verran lisätietoa aiheesta	Tarvitsen hieman lisätietoa aiheesta	Minulla on hieman tietoa aiheesta	Minulla on hyvät tiedot aiheesta	Minulla on vahvat tiedot aiheesta
Oppilaiden keskustelun ohjaamisessa ryhmätyöskentelyn (2-5 oppilasta) aikana.	○	○	○	○	○	○
Oppilaiden kriittisen ajattelun tukemisessa.	○	○	○	○	○	○
Oppilaiden oman oppimisen suunnittelun ohjaamisessa.	○	○	○	○	○	○
Oppilaiden reflektiivisen ajattelun tukemisessa.	○	○	○	○	○	○
Oppilaiden ohjaamisessa hyödyntämään toinen toistensa ajatuksia ja ideoita.	○	○	○	○	○	○

Example of TPACK-21 instrument

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SISÄLTÖOSAAMINEN: YLI OPPIAINERAJOJEN

Nyt pohdi yli oppiainerajojen seuraavia sisältöosaamiseen liittyviä teemoja. Arvioi tietojasi seuraavien väittämien osalta:

	Tarvitsen paljon lisätietoa aiheesta	Tarvitsen jonkin verran lisätietoa aiheesta	Tarvitsen hieman lisätietoa aiheesta	Minulla on hieman tietoa aiheesta	Minulla on hyvät tiedot aiheesta	Minulla on vahvat tiedot aiheesta
Luovan ajattelun periaatteet.	○	○	○	○	○	○
Ryhmässä (2-5 henkilöä) tapahtuvan ongelmanratkaisun periaatteet.	○	○	○	○	○	○
Reflektiivisen ajattelun periaatteet.	○	○	○	○	○	○
Yhteisöllisen oppimisen periaatteet.	○	○	○	○	○	○
Kriittisen ajattelun periaatteet.	○	○	○	○	○	○

Edellinen Seuraava

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Future steps

- Continuum of TPACK-21 measurement instrument development (e.g., AERA, APA, NCME, 2014)
- Following the TPACK development of pre-service teachers
- Influence of attitudes towards TPACK (TPB; Valtonen et al., 2015)
- Quasi-experimental designs

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Technological Pedagogical Content Knowledge (TPACK)

Table 1 TPACK areas of measurement

Area of measurement	Acronym	Explanation
Content knowledge	CK	Central theories and concepts of the field with knowledge including the nature of the knowledge and means of inquiry.
Pedagogical knowledge	PK	Knowing the processes and mechanisms of learning and ways to support and guide students' learning process.
Technology knowledge	TK	Knowing the possibilities and constraints of different technologies and abilities to use technologies available. Also, technology knowledge refers to the interest regarding the development of new technologies.
Pedagogical content knowledge	PCK	How teacher can facilitate certain students learning of certain contents, what kind of learning environments, activities, collaboration etc. are needed.
Technological pedagogical knowledge	TPK	Knowledge of how different pedagogical approaches can be supported with different technologies. TPK refer to a general knowledge concerning the possibilities of technology in education
Technological content knowledge	TCK	Knowledge of how technology is used within certain discipline like math or history

(Koehler et al.,2013)