AI in Education

Personalized Learning Paths

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Agenda

1. Introduction
2. Personalized learning
3. Design approach
4. Project execution plan
5. Derailment
6. Test validation
7. Potential risks and mitigation strategy
8. Current market design
9. Summary

Benefits of Education

- Increases income
- Reduces poverty
- Makes people healthier
- Raises crop yields
- Saves children's lives
- Fosters peace
- Boosts economic growth
- Promotes girls' and women's rights

Challenges in Current Education System

High pupil-to-teacher ratio

- 24:1 global average
- 40:1 in low-income countries

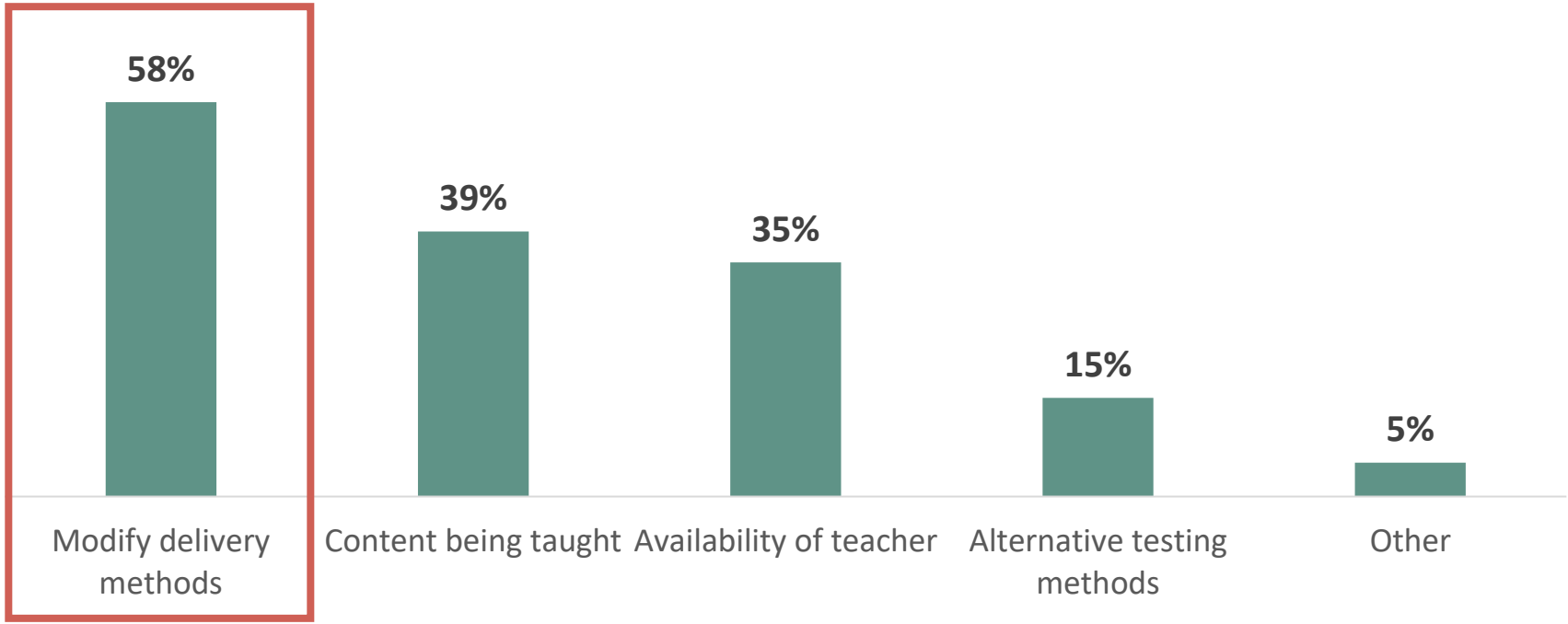
Lack of proper training for instructors

Inability to accommodate diverse learning needs and abilities

- “One size fits all”

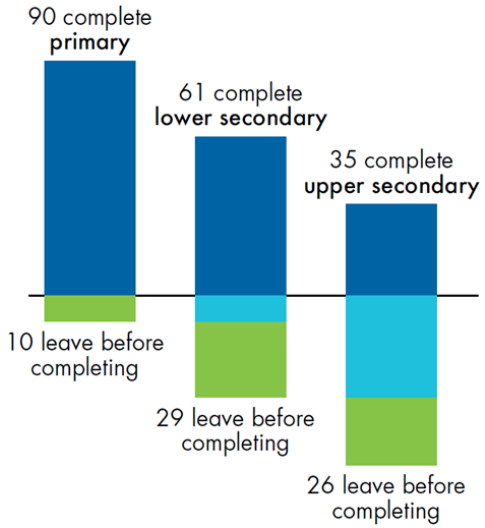
One-size Does Not Fit All

Students opinion on what needs to be changed in their classroom setting

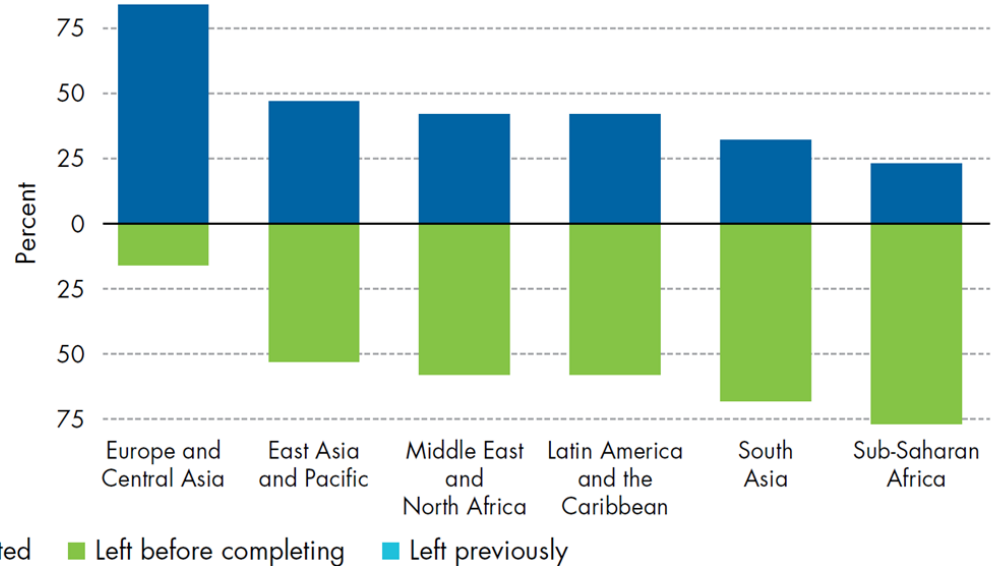


Current completion and attrition rates (percent)

a. Of 100 students who enter primary around the world . . .



b. But given disparate attrition rates across regions, upper secondary attainment varies greatly



Source: WDR 2018 team, using data from UIS (2017); UNESCO (2015)

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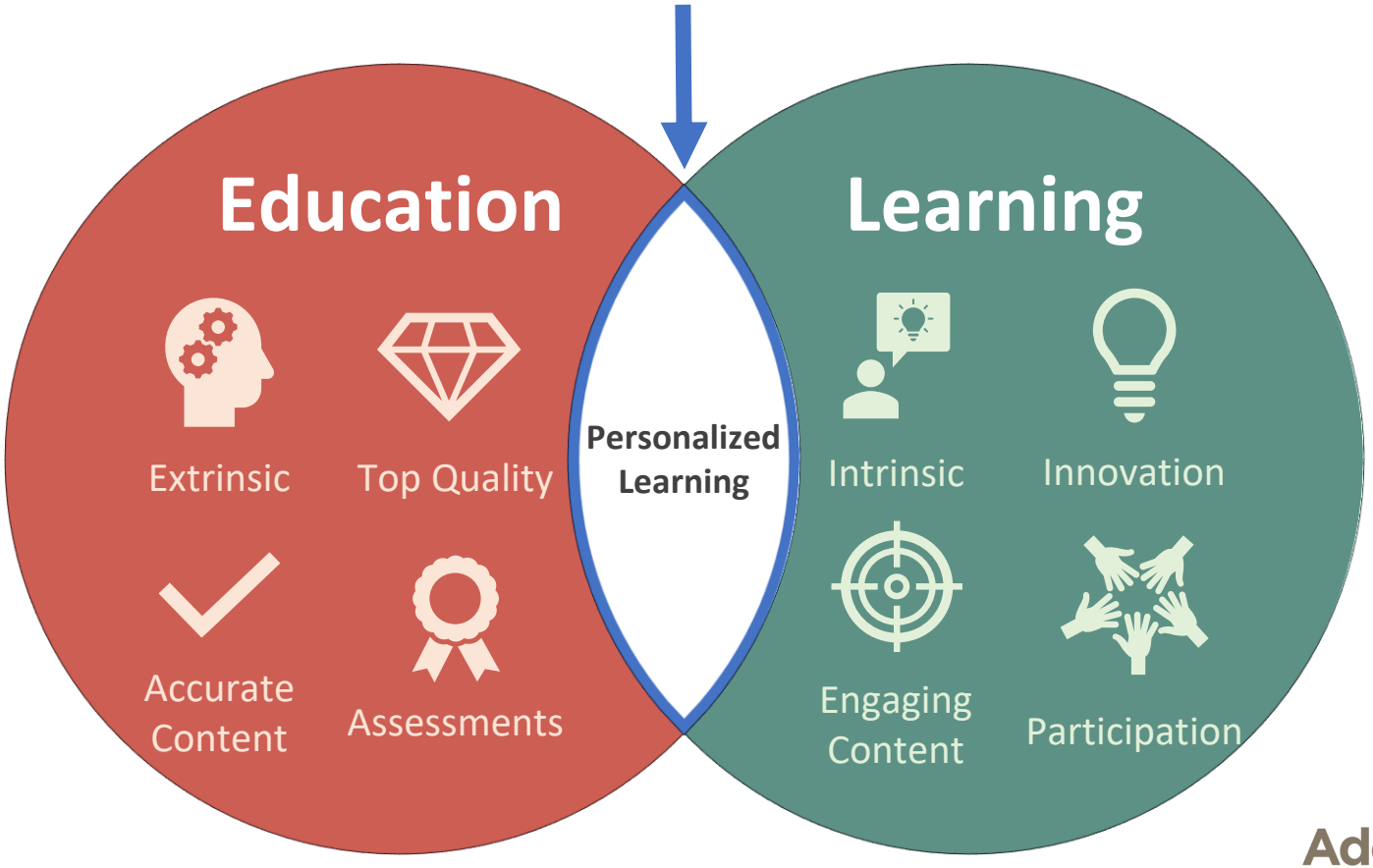
Personalized Learning



What is Personalized Learning?

System based on Artificial Intelligence (AI) and Big Data analytics

Identifying pace and path of individual learner

Provide targeted instruction aligned to specific needs and goals

Real-time feedback to teachers on their instructional strategies and students' understanding

Differentiated Pace

- Identify individual learner's pace
  - 'Fast' learner vs. 'Slow' learner
- Provide personalized due dates and deadlines

Differentiated Path

- Identify individual learner's path
- Provide personalized methods and resources
- Additional readings, app based learnings, hands-on activities, etc.

Why is Personalized Learning Important?

Support individual learners to reflect on their achievements, strengths and weaknesses

Track students' progress throughout their learning journey

Predict individual student's requirements and help teachers plan supporting interventions

Improve current courses and curriculum to accommodate students' needs

Benefits & Challenges

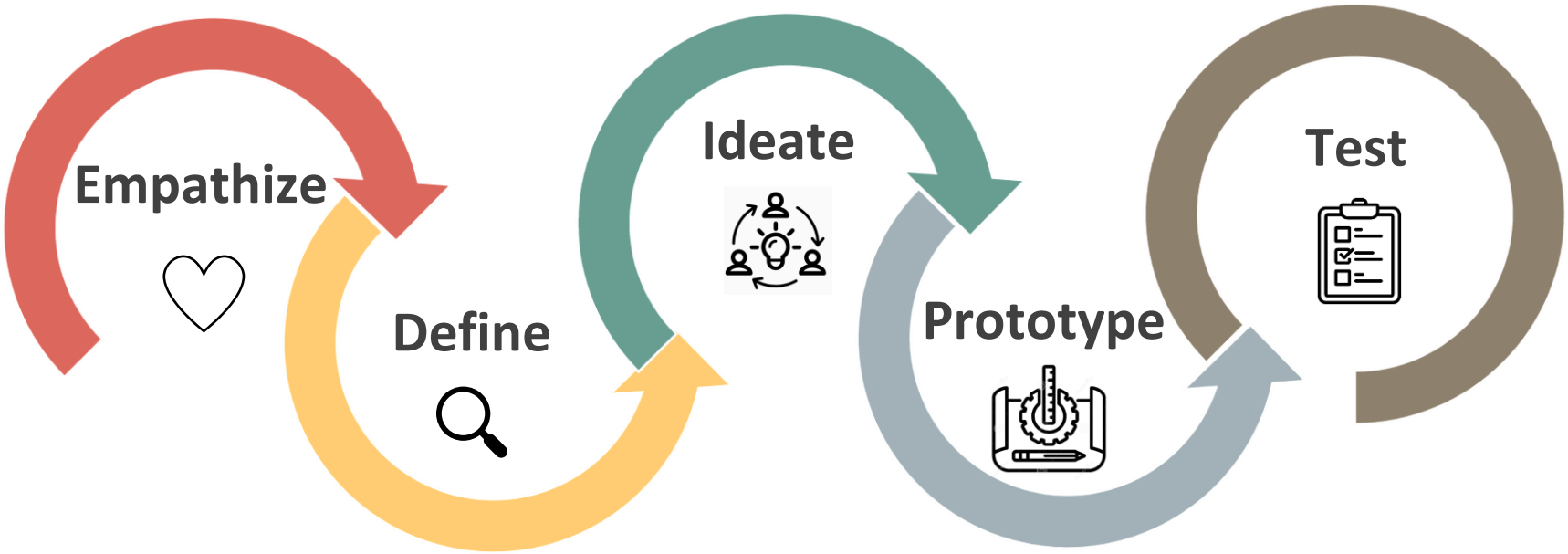
Benefits

- Real-time feedback to teachers and parents on student's performance
- Increase graduation rates
- Motivate students to learn
- Provide equality of education

Challenges

- Educating stakeholders
- Poor integration of data systems
- Time and funding required

Design Thinking



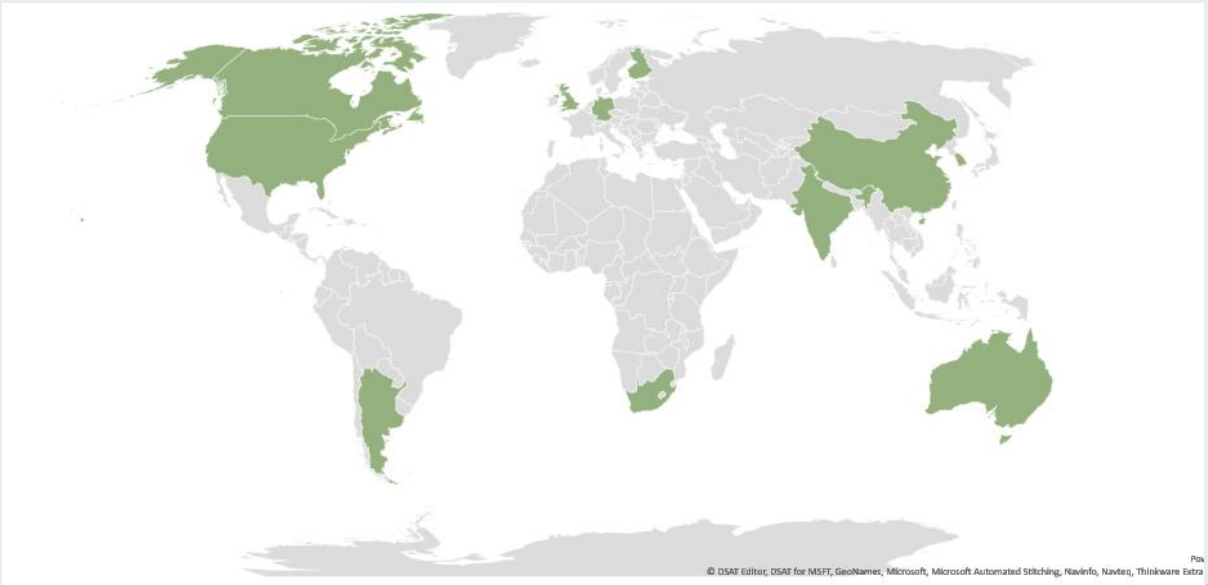
Project Scope

An intelligent system that provides real-time feedback to teachers on students' performance and understanding, thereby enabling them to adjust instruction to meet different student's learning needs

For better results and effective model, we decided to limit our initial implementation scope to high school students (grades 9-12)

Empathize

Conducted survey for stakeholders	Teachers, parents and students
Responses from 15 different countries	Canada, USA, India, UK, Australia, Argentina, Germany, China, etc.



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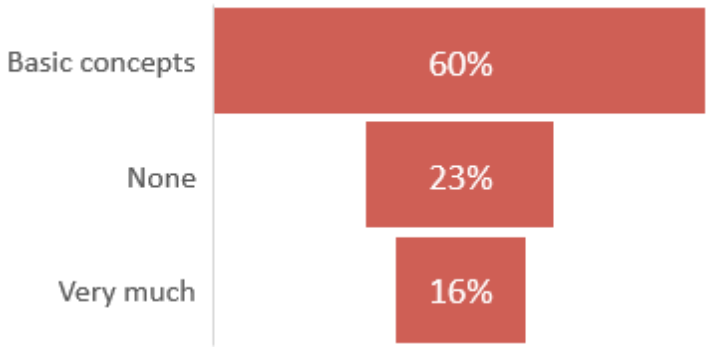
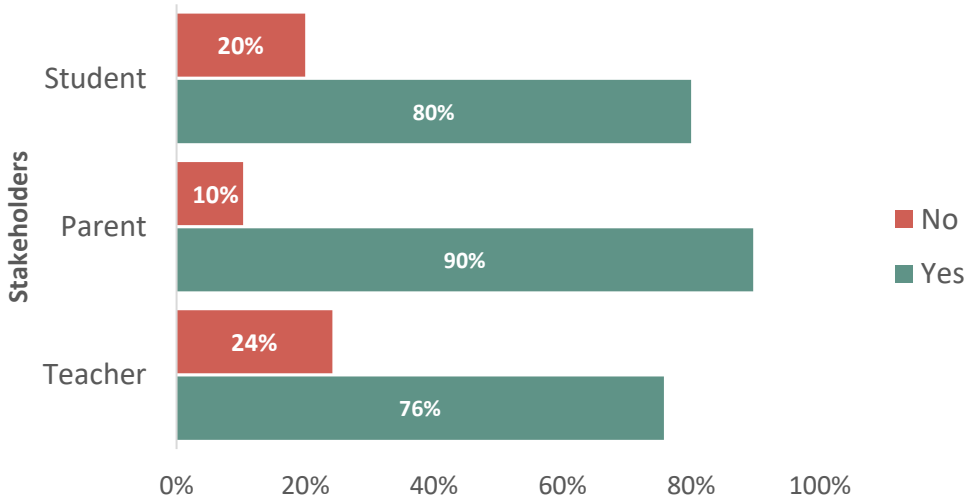
Stakeholders' Views

Knowledge about AI



Willing to learn about AI based personalized learning

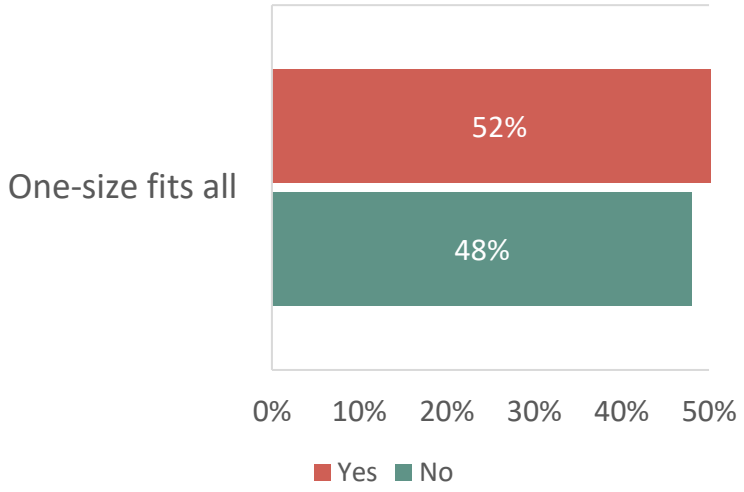


Stakeholders' Views

Current delivery methods used by teachers

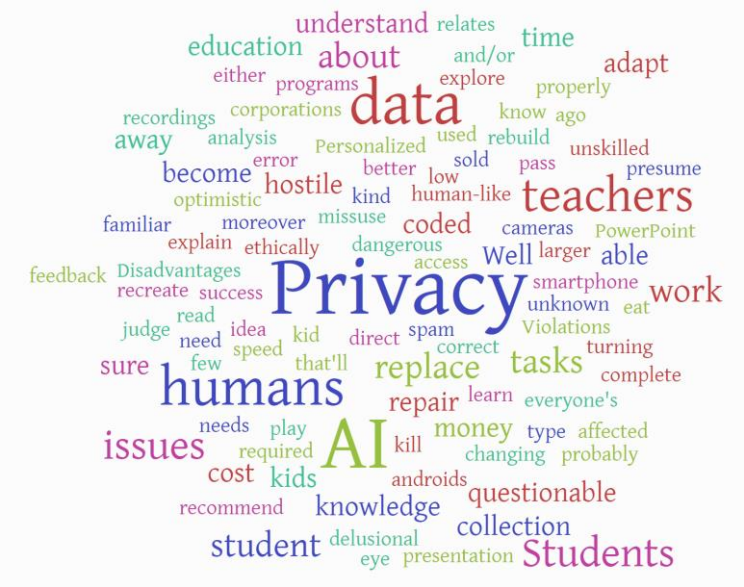
- Black/white/smartboard instructions
- Textbook, novel reading
- Presentations – students, guest speakers, seminars
- Group discussion and activities
- Research projects
- Labs
- ELearning – Khan academy, YouTube, GeoGebra, PhET, Podcasts

Teachers' opinion on current delivery methods

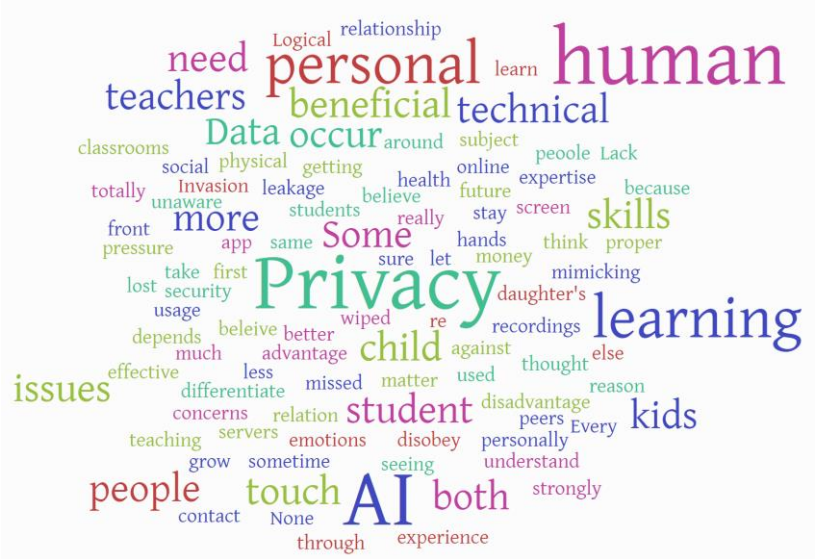


Stakeholders' Concerns

Word cloud from teachers' survey

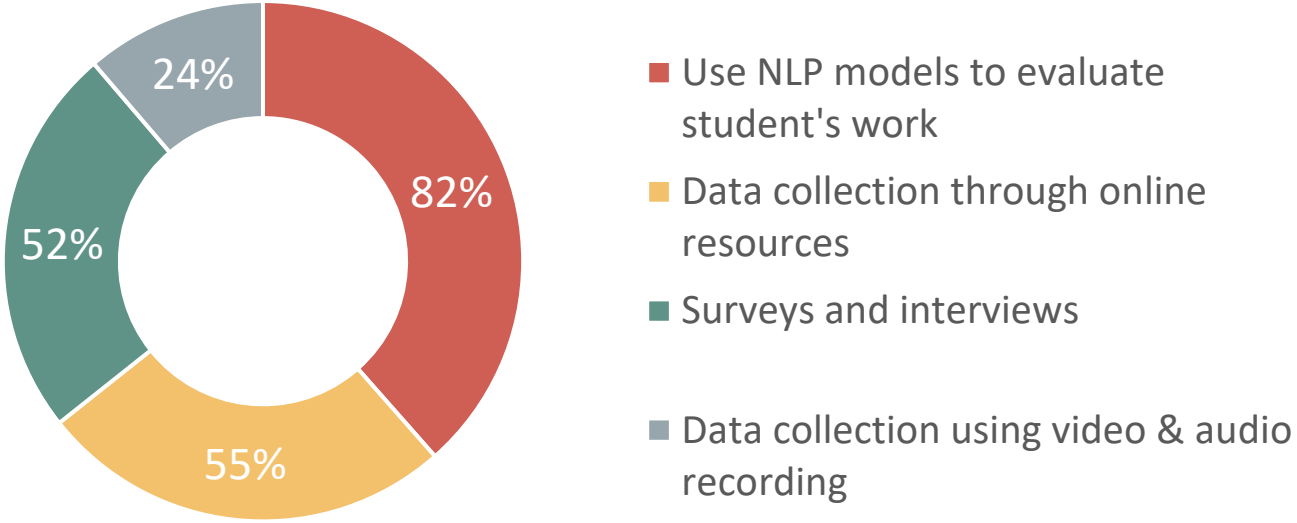


Word cloud from parents' survey

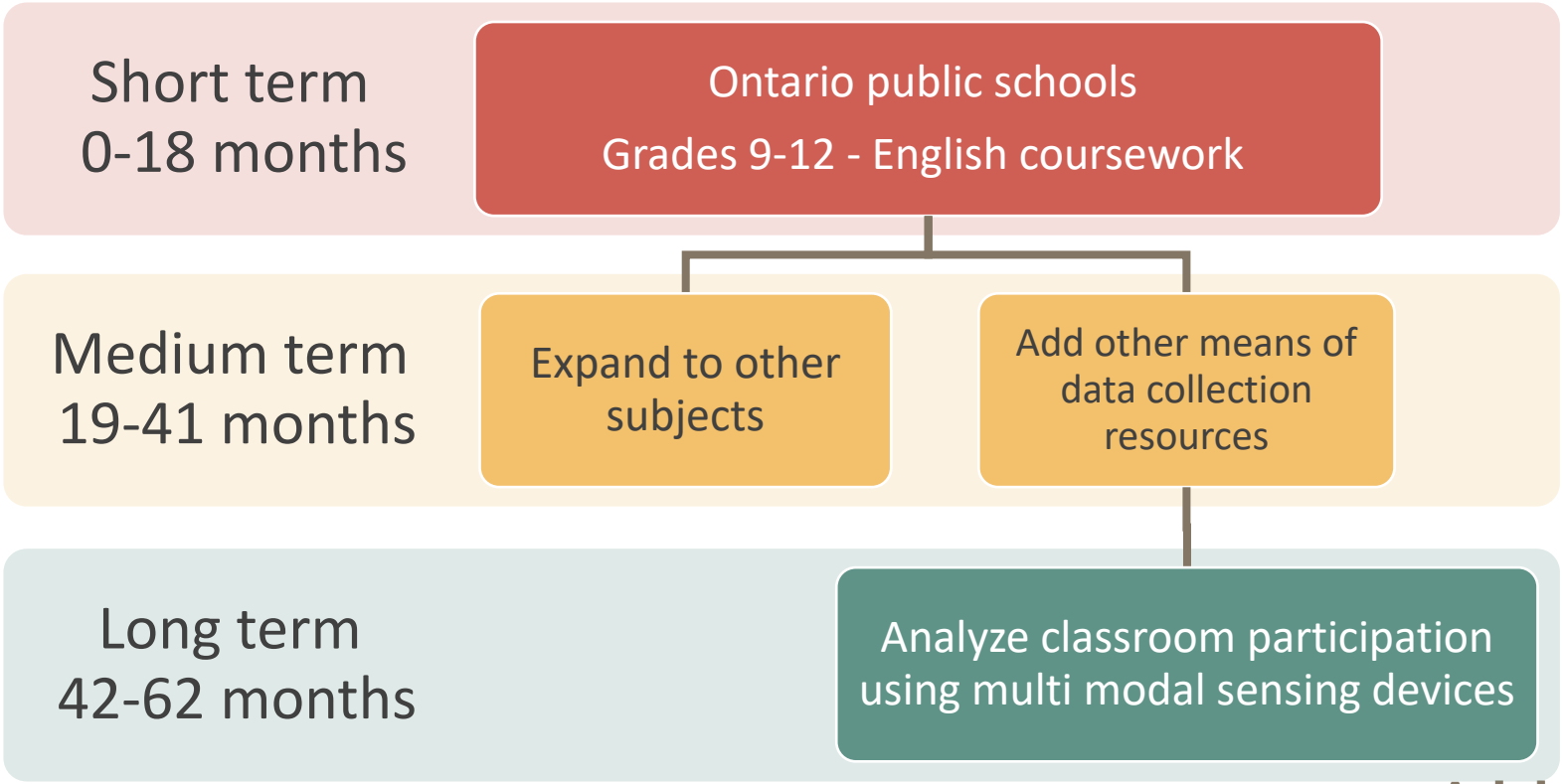


Stakeholders' Likability on AI methodology

AI methodology and likeability by Teachers



Project Plan

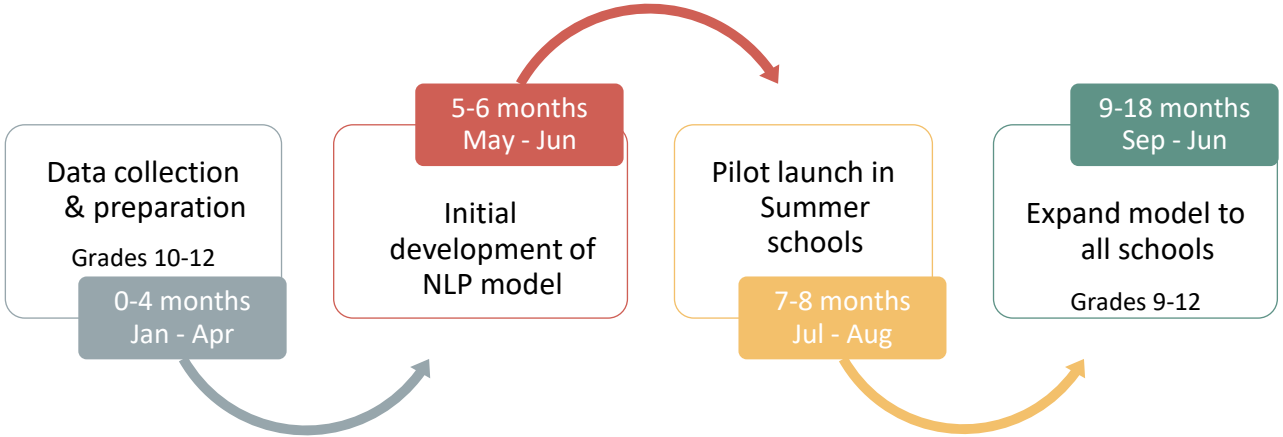


Source: https://www.osstf.on.ca/en-CA/services/career-exploration/working-in-ontario/ontario-school-boards.aspx

Short Term

Plan of execution

- Natural Language Processing (NLP) methodologies to evaluate students' performance in English course
  - Students registered in Ontario public school system
  - Writing quality and content knowledge



Source: https://www.statista.com/statistics/449711/public-school-graduates-in-canada/

Short Term

Resources needed

- Sufficient Funding
- Access to students' coursework
- Technical resources and expertise

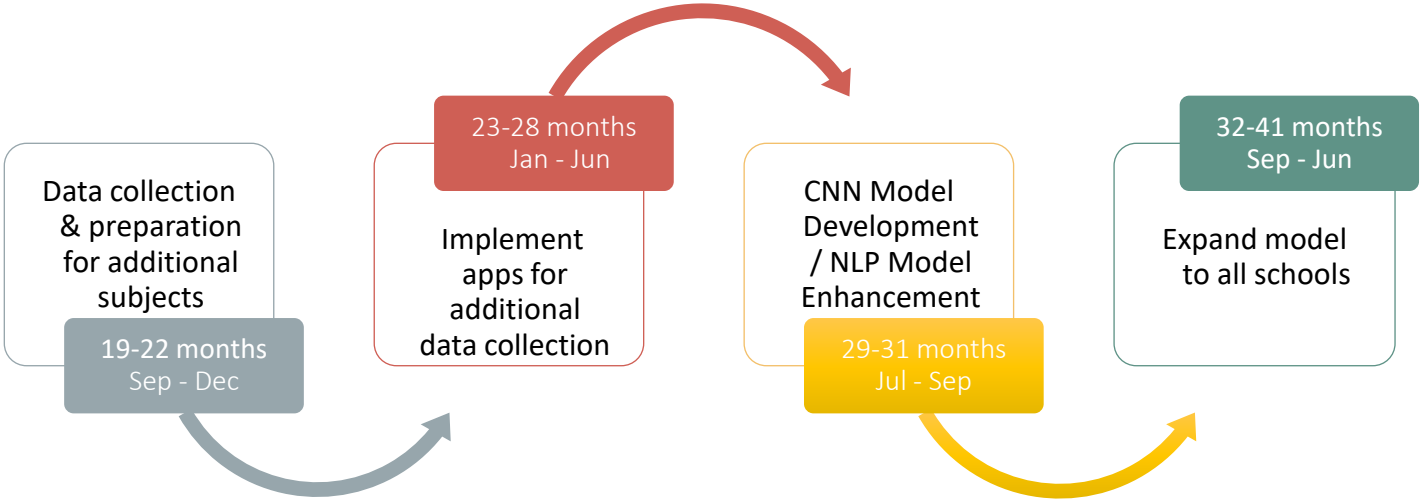
Expected outcome

- Strengths & Weaknesses
- Learner’s Progress throughout years of education
- Trust and Confidence in model

Medium Term

Plan of execution

- Additional subjects will be added in NLP methodologies to evaluate students' coursework
- Introduce additional data collection techniques
    - "Plickers" "MasteryConnect" and "Nearpod" mobile apps for data collection



Medium Term

Resources needed

- Technical resources
  for development and integration
- Partnership with EdTech companies
- Sufficient Funding

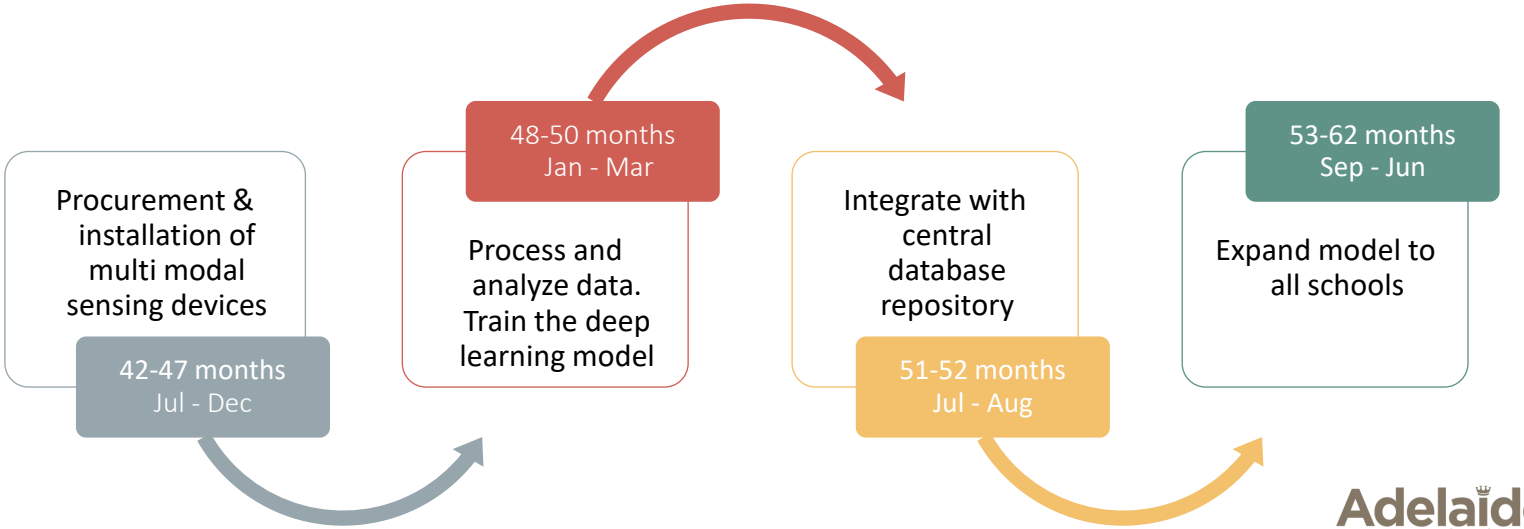
Expected outcome

- Comprehensive feedback
- Learning paths across
  different subjects
- Data repository for future reference
  and model development

Long Term

Plan of execution

- Capture vocal expressions, facial movements and body gestures
- Install multi-modal sensing devices: cameras & microphones
- Initially launch to 25 Ontario public schools



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Long Term

Resources needed

- Sensing devices
  - Cameras, microphones, monitoring room
- Experts to analyze teachers and students' engagement patterns
- Sufficient Funding

Expected outcome

- Real-time feedback for a more effective, present and emotionally-intelligent educator
- Engaged students and feedback to educator on engagement success

Validate the Impact

Track individual students' progress

Conduct stakeholders' satisfaction Survey

Derailment

- Inability to meet educational standards
- Lack of funding
- Privacy and Security concerns
  - Violation of *MFIPPA* and *Education Act* in Ontario's public schools
  - Stakeholders' concerns with data privacy
  - Fear of new technology
- Poor technology and expertise
  - Incorrect design
  - Poor data quality and quantity
  - Internal team incompetence

Source: https://www.ipc.on.ca/wp-content/uploads/2019/01/guide-to-privacy-access-in-ont-schools.pdf

- Design and learning biases in Algorithm

- Stakeholders adaption to AI
- Viruses, spyware, other malware
- Data breach
- Financial Funding
- Technical Resources
- Time Constraint
- "Machines taking over"
- Low personal engagement
- How much data is too much data?
- Data Privacy

Risk Mitigation

Performance

- Proper Training and Testing of the AI model

Security Framework

- Real-time monitoring of the system
- Limited access
- Proper Training and Testing of the AI model

Control

- AI model is assistant to the teacher

Ethical

- Informed Consent and Transparency

Economical

- Budget allocation

Societal

- Stakeholder awareness

Current Market Designs

Computer-aided teaching

- Rule-based AI or Decision Trees
- Initial challenges with cost and scalability
- Fast growth of AI in education today

Market Solutions

- **Century Tech:** AI enabled individual pathways containing micro-lessons called ‘nuggets’
- **Bakpax:** Using computer vision to grade assignments and provide collective insights
- **Squirrel AI:** AI powered adaptive education provider or “AI tutor”
- **U-Sky:** Edtech company offering a Personalized Learning Platform
- **Hanwang Education:** Using facial recognition to take roll call and assess attention levels

Idea Distinction

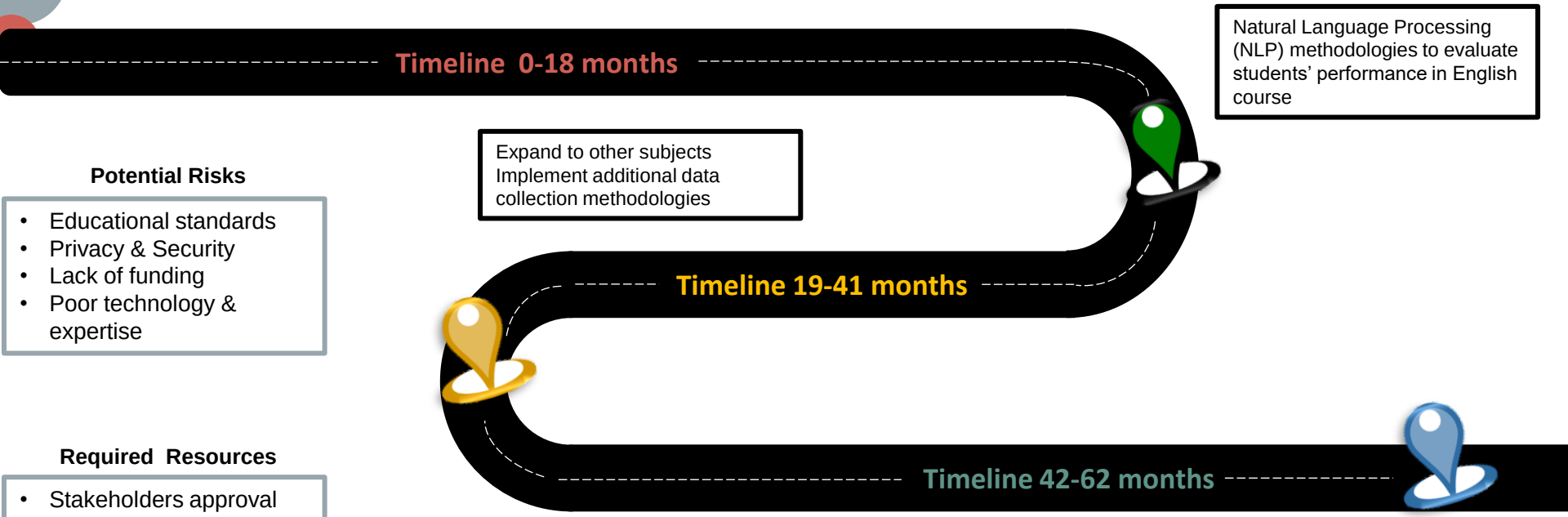
Adaptive vs Personalized

- Current designs are all focused on adaptive learning
  - What the students know and don’t know
  - Heavy emphasis on pace
- We are focused on personalized learning experience
  - Focused on pace and path
- Different use case for video cameras in classroom
  - Track emotions and facial cues to monitor the delivery of content and understanding levels

Summary

- Education is a basic human right
- Currently, education is a systematized approach for acquiring knowledge and skills
- Learning is a natural desire to develop an understanding for something
- Personalized learning is the ability to identify individual learner's strengths and weaknesses and increase their desire to learn
- Our AI-based personalized learning system provides real-time feedback such that teachers can allocate differentiated path and pace for individual learner

Summary



Potential Risks

- Educational standards
- Privacy & Security
- Lack of funding
- Poor technology & expertise

Required Resources

- Stakeholders approval
- SME availability
- Funding
- Partnership with EdTech companies
- Sensing devices

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Summary


Timeline 0-18 months
(NLP) methodologies to evaluate students' performance in English course
Timeline 19-41 months
Multi modal sensing devices - To capture the teacher and student's vocal expression, facial movements and body gestures
Expand to other subjects
Implement additional data collection methodologies
Timeline 42-62 months

THANK YOU

Team Adelaide 2020 MMAI

Appendix

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