The 2019-2024 Global Game-based Learning Market

Serious Games Industry in Boom Phase

Analysis by: Sam S. Adkins

Published August 1, 2019 by the Serious Play Conference
# Table of Contents

Table of Contents ................................................................. 2

List of Tables ........................................................................... 7
List of Figures ........................................................................... 15
About Metaari ................................................................. 17
About the Analyst ................................................................. 17
Metaari’s Definition of Serious Games ......................... 18
Executive Overview: Game-based Learning Goes Mainstream 20

Primary Catalysts Driving the Global Educational Games Market ........ 23
What You Will Find in This Report ........................................... 28
  Where are the Buyers? ......................................................... 30
  Top Buying Countries in Each Region ............................. 32
  Top Fifteen Countries with the Highest Growth Rates .......... 33
  Who are the Buyers? ......................................................... 34
  What are They Buying? ...................................................... 37
Sources of Data on the Global Game-based Learning Market .... 40
  Financial Statements of Publicly-traded Companies .......... 45

Analysis of the 2019-2024 Global Game-based Learning Market 48

The Catalysts Driving the Boom Phase of the Global Serious Games Market 48
  AI is a Game Changer: Rapid Adoption of AI in the Global Game-based Learning Industry ........................................................... 49
  Metaari’s Artificial Intelligence Array ...................................... 49
  Plug and Play AI-based Games: Pre-trained AI Models Come on the Market ...... 51
  Mixed Reality Learning in High Demand Across the Planet ....... 53
  Metaari’s Mixed Reality Immersion Spectrum ...................... 53
  Historic Levels of Venture Capital Flowing to Serious Game Developers . 56
  Alternative Sources of Funding for Game-based Learning Developers .......... 60

For More Information, eMail: research@metaari.com
Large Scale Global Distribution Agreements and M&A Activity Validate the Game-based Learning Market ................................................................. 62
Further Validation: Major M&A Activity Drives Global Distribution...... 75
Massive Global Consumer Demand for Mobile Serious Games for Kids... 80
Games for Children with Special Needs.................................................. 83
Language Learning Games................................................................. 86
Coding Games for Young Kids .......................................................... 88
Smart Robots Play Learning Games with Kids ...................................... 89
Brain Training Games for Kids: A New Revenue Opportunity for Developers...91
STEM Evolves into STEAM............................................................ 93
Social and Emotional Learning (SEL) Games Hit the Market .................94
Pre-Employment Assessment Games Gaining Rapid Adoption in the Corporate Segments .................................................................................... 98
Availability of Inexpensive and Easy-to Use Rapid Development Tools ... 99
Assembling Educational Games with Premade Components: A New Cottage Industry Emerges ................................................................. 100
Global Demand-side Analysis by Eight Buyer Segments (For All Seven Regions Combined) ................................................................. 101
Consumers......................................................................................... 103
The Three PreK-12 Sub-Segments ....................................................... 105
Preschools ....................................................................................... 108
Primary Schools ............................................................................... 111
Junior High and Secondary Schools ................................................... 114
Higher Education (Tertiary) ............................................................... 116
Federal Government Agencies ............................................................ 120
Local/ State/Provincial/Prefecture Government Agencies ................. 124
Corporations.................................................................................... 128
Global Demand-side Analysis by Seven Regions ............................... 132
Africa ............................................................................................... 133
Nigeria ............................................................................................ 137
South Africa ..................................................................................... 139
Kenya ............................................................................................... 142
Uganda ............................................................................................ 144
Morocco ........................................................................................... 145

For More Information, eMail: research@metaari.com
Metaari's 2019-2024 Global Game-based Learning Market

Tanzania ........................................................................................................ 147
Angola .......................................................................................................... 148
Ghana ........................................................................................................... 149
Senegal ........................................................................................................ 151
Rwanda ....................................................................................................... 152

Asia Pacific ................................................................................................. 153
Singapore .................................................................................................... 155
Australia and New Zealand Combined ..................................................... 158
China ........................................................................................................... 161
India ............................................................................................................. 169
Japan .......................................................................................................... 172
South Korea ............................................................................................... 174
Indonesia ..................................................................................................... 177
Tapping New Revenue Streams: High Growth Countries in Asia Pacific 179
Bangladesh ............................................................................................... 180
Myanmar (Burma) ...................................................................................... 182
Cambodia .................................................................................................. 184
Vietnam ....................................................................................................... 186
Nepal .......................................................................................................... 188
Thailand ..................................................................................................... 191
Malaysia .................................................................................................... 193

Eastern Europe .......................................................................................... 196
The Russian Federation ............................................................................ 197
Ukraine ...................................................................................................... 201
Ukraine is a Hub for Custom Game-based Learning Development Services 203
Georgia ....................................................................................................... 204
Kazakhstan ................................................................................................. 206
Belarus ........................................................................................................ 208
Azerbaijan ................................................................................................. 210

Latin America ............................................................................................. 212
Brazil .......................................................................................................... 214
Mexico ....................................................................................................... 220
Colombia .................................................................................................... 223
Argentina .................................................................................................... 225
Perú ............................................................................................................. 227

For More Information, eMail: research@metaari.com
Metaari's 2019-2024 Global Game-based Learning Market

Chile .......................................................................................................................... 229

The Middle East ........................................................................................................ 232
Learning Games in Arabic Hit the Market .............................................................. 235
Turkey ........................................................................................................................ 236
Israel .......................................................................................................................... 240
Egypt ......................................................................................................................... 243
The Kingdom of Saudi Arabia (KSA) ................................................................. 245
The United Arab Emirates (UAE) ......................................................................... 247
Jordan ......................................................................................................................... 250

North America ......................................................................................................... 252
Canada ....................................................................................................................... 253

Demand-side Analysis for the United States by Eight Buyer Segments ... 257
US Consumers ....................................................................................................... 258
US Preschools ......................................................................................................... 259
US Primary Schools ............................................................................................... 262
US Junior High and Secondary Schools ............................................................. 268
US Higher Education and Tertiary Institutions ............................................... 271
US Federal Government Agencies ..................................................................... 275
US Local and Statel Government Agencies ....................................................... 280
US Corporations .................................................................................................... 283

Western Europe .................................................................................................... 286
The United Kingdom (UK) ................................................................................... 290
Spain ......................................................................................................................... 296
France ...................................................................................................................... 300
Germany .................................................................................................................. 305
Italy .......................................................................................................................... 310
Poland ....................................................................................................................... 313
Romania ................................................................................................................... 316
The Netherlands .................................................................................................... 319
Belgium ..................................................................................................................... 325
Greece ....................................................................................................................... 327
Czech Republic ....................................................................................................... 330
Portugal .................................................................................................................... 333
Austria ....................................................................................................................... 335
Switzerland ............................................................................................................. 338

For More Information, eMail: research@metaari.com
Metaari's 2019-2024 Global Game-based Learning Market

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Nordic Cluster</td>
<td>342</td>
</tr>
<tr>
<td>Sweden</td>
<td>344</td>
</tr>
<tr>
<td>Norway</td>
<td>349</td>
</tr>
<tr>
<td>Finland</td>
<td>352</td>
</tr>
<tr>
<td>Denmark</td>
<td>356</td>
</tr>
<tr>
<td>Iceland</td>
<td>361</td>
</tr>
<tr>
<td>Worldwide Supply-side Analysis by Three Game-based Learning Products and Services</td>
<td>364</td>
</tr>
<tr>
<td>Quantifying the Revenue Opportunities: Metaari’s Pedagogical Framework for Game-based Learning</td>
<td>365</td>
</tr>
<tr>
<td>Packaged Games: Global Supply-side Analysis by Eleven Serious Game Types</td>
<td>366</td>
</tr>
<tr>
<td>Cognitive Learning Games and Brain Training Games</td>
<td>368</td>
</tr>
<tr>
<td>The Cognitive Spectrum: Carroll’s Three-Stratum Theory of Intelligence</td>
<td>372</td>
</tr>
<tr>
<td>Next-generation Brain Training Games Raise the Competitive Bar</td>
<td>376</td>
</tr>
<tr>
<td>Mental Training Apps for Athletes Hit the Market</td>
<td>377</td>
</tr>
<tr>
<td>Knowledge-based Educational Games</td>
<td>381</td>
</tr>
<tr>
<td>Skills-based Educational Games</td>
<td>384</td>
</tr>
<tr>
<td>Language Learning Games</td>
<td>385</td>
</tr>
<tr>
<td>Early Childhood Learning Games</td>
<td>387</td>
</tr>
<tr>
<td>Pre-Employment Assessment and Evaluation Games</td>
<td>393</td>
</tr>
<tr>
<td>Role-based Educational Games</td>
<td>396</td>
</tr>
<tr>
<td>Location-based Learning Games</td>
<td>400</td>
</tr>
<tr>
<td>The Three Modalities of Location-based Learning</td>
<td>402</td>
</tr>
<tr>
<td>Augmented Reality Educational Games</td>
<td>404</td>
</tr>
<tr>
<td>Virtual Reality Educational Games</td>
<td>406</td>
</tr>
<tr>
<td>VR-based Sports Mental Training Games Hit the Market</td>
<td>408</td>
</tr>
<tr>
<td>Assembling Reality: The Proliferation of Premade Gaming Component Marketplaces</td>
<td>409</td>
</tr>
<tr>
<td>Artificial Intelligence-based Educational Games</td>
<td>411</td>
</tr>
<tr>
<td>AI-based Language Learning Games in High Demand Across the Globe</td>
<td>412</td>
</tr>
<tr>
<td>Services: Global Supply-side Analysis for Custom Learning Game Development Services</td>
<td>415</td>
</tr>
<tr>
<td>Authoring and Delivery: Global Supply-side Analysis for Game-based Learning Tools and Platforms</td>
<td>418</td>
</tr>
</tbody>
</table>

For More Information, eMail: research@metaari.com
Metaari’s 2019-2024 Global Game-based Learning Market

United States (US) Supply-side Analysis by Three Game-based Learning Products and Services ................................................................. 429

United States (US) Supply-side Analysis by Eleven Packaged Educational Game Types ................................................................. 430

  - Cognitive Learning Games and Brain Training Games in the US ........... 432
  - Knowledge-based Educational Games in the US ............................. 435
  - Language Learning Games in the US ............................................. 437
  - Skill-based Educational Games in the US ...................................... 439
  - Early Childhood Learning Games in the US .................................. 442
  - Assessment and Evaluation Games in the US ................................. 445
  - Role-based Educational Games in the US .................................... 447
  - Location-based Learning Games in the US .................................. 451
  - Augmented Reality Educational Games in the US ......................... 453
  - Virtual Reality Educational Games in the US ................................ 455
  - Artificial Intelligence Educational Games in the US .................... 457

United States (US) Supply-side Analysis for Custom Game-based Learning Development Services ......................................................... 461

United States (US) Supply-side Analysis for Game-based Learning Authoring Tools and Platforms ..................................................... 467

Index of Suppliers ........................................................................... 473

List of Tables

Table 1 - The 122 Countries across the Seven Regions Tracked by Metaari ....................................................................................... 30

Table 2 - 2019-2024 Global Game-based Learning Revenue Forecasts (in US$ Millions) ................................................................. 48

Table 3 - 2019-2024 Global Game-based Learning Market by Eight Buyer Segments (in US$ Millions) ................................................ 102

Table 4 - 2019-2024 Global Consumer Game-based Learning Revenue Forecasts (in US$ Millions) .................................................... 103

For More Information, eMail: research@metaari.com
Table 5 - 2019-2024 Global PreK-12 (All Three Sub-Segments Combined) Game-based Learning Revenue Forecasts (in US$ Millions) ......................................................... 106

Table 6 - 2019-2024 Global Preschool Game-based Learning Revenue Forecasts (in US$ Millions) ................................................................. 108

Table 7 - 2019-2024 Global Primary Schools Game-based Learning Revenue Forecasts (in US$ Millions) ......................................................... 111

Table 8 - 2019-2024 Global Secondary Schools Game-based Learning Revenue Forecasts (in US$ Millions) ......................................................... 114

Table 9 - 2019-2024 Global Higher Education Game-based Learning Revenue Forecasts (in US$ Millions) ......................................................... 116

Table 10 - 2019-2024 Global Federal Government Game-based Learning Revenue Forecasts (in US$ Millions) ......................................................... 120

Table 11 - 2019-2024 Global Local and State Government Game-based Learning Revenue Forecasts (in US$ Millions) ............................................. 125

Table 12 - 2019-2024 Global Corporate Game-based Learning Revenue Forecasts (in US$ Millions) ................................................................. 128

Table 13 - 2019-2024 Global Game-based Learning Revenue Forecasts by Seven Regions (in US$ Millions) ......................................................... 132

Table 14 - 2019-2024 Africa Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 133


Table 16 - 2019-2024 Nigeria Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 137

Table 17 - 2019-2024 South Africa Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 139

Table 18 - 2019-2024 Kenya Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 142

Table 19 - 2019-2024 Uganda Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 142

Table 20 - 2019-2024 Morocco Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 144

Table 21 - 2019-2024 Tanzania Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 147

For More Information, eMail: research@metaari.com
Table 22 - 2019-2024 Angola Game-based Learning Revenue Forecast (in US$ Millions) ......................................................... 148

Table 23 - 2019-2024 Ghana Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 149

Table 24 - 2019-2024 Senegal Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 151

Table 25 - 2019-2024 Rwanda Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 152

Table 26 - 2019-2024 Asia Pacific Game-based Learning Revenue Forecast (in US$ Millions) ......................................................... 153

Table 27 - 2019-2024 Asia Pacific Game-based Learning Revenue Forecast by Top Buying Countries (in US$ Millions) .......... 153

Table 28 - 2019-2024 Singapore Game-based Learning Revenue Forecast (in US$ Millions) ......................................................... 155

Table 29 2019-2024 Australia and New Zealand (combined) Game-based Learning Revenue Forecast (in US$ Millions) .......... 158

Table 30 - 2019-2024 China Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 162

Table 31 - 2019-2024 India Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 169

Table 32 - 2019-2024 Japan Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 172

Table 33 - 2019-2024 South Korea Game-based Learning Revenue Forecast (in US$ Millions) ......................................................... 175

Table 34 - 2019-2024 Indonesia Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 177

Table 35 - 2019-2024 Asia Pacific Game-based Learning Revenue Forecasts for the Seven Highest Growth Countries (in US$ Millions) ........................................................................ 179

Table 36 - 2019-2024 Bangladesh Game-based Learning Revenue Forecast (in US$ Millions) ......................................................... 180

Table 37 - 2019-2024 Myanmar Game-based Learning Revenue Forecast (in US$ Millions) ......................................................... 182

Table 38 - 2019-2024 Cambodia Game-based Learning Revenue Forecast (in US$ Millions) ......................................................... 184

For More Information, eMail: research@metaari.com
Table 39 – 2019-2024 Vietnam Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 186

Table 40 - 2019-2024 Nepal Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 188

Table 41 - 2019-2024 Thailand Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 191

Table 42 - 2019-2024 Malaysia Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 193

Table 43 - 2019-2024 Eastern Europe Game-based Learning Revenue Forecast (in US$ Millions) .................................................. 196

Table 44 - 2019-2024 Eastern Europe Game-based Learning Revenue Forecast by Top Buying Countries (in US$ Millions) ........... 196

Table 45 - 2019-2024 Russian Federation Game-based Learning Revenue Forecast (in US$ Millions) ............................................. 197

Table 46 - 2019-2024 Ukraine Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 201

Table 47 - 2019-2024 Georgia Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 204

Table 48 - 2019-2024 Kazakhstan Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 206

Table 49 - 2019-2024 Belarus Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 208

Table 50 - 2019-2024 Azerbaijan Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 210

Table 51 - 2019-2024 Latin America Game-based Learning Revenue Forecast (in US$ Millions) .................................................. 212

Table 52 - 2019-2024 Latin America Game-based Learning Revenue Forecast by Top Buying Countries (in US$ Millions) ........... 213

Table 53 - 2019-2024 Brazil Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 214

Table 54 - 2019-2024 Mexico Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 220

Table 55 - 2019-2024 Colombia Game-based Learning Revenue Forecast (in US$ Millions) .......................................................... 223
Table 56 - 2019-2024 Argentina Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 225

Table 57 - 2019-2024 Perú Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 227

Table 58 - 2019-2024 Chile Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 230

Table 59 - 2019-2024 Middle East Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 232

Table 60 - 2019-2024 Middle East Game-based Learning Revenue Forecast by Top Buying Countries (in US$ Millions) ........... 233

Table 61- 2019-2024 Turkey Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 236

Table 62 - 2019-2024 Israel Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 240

Table 63 - 2019-2024 Egypt Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 243

Table 64 - 2019-2024 Saudi Arabia Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 245

Table 65 - 2019-2024 United Arab Emirates (UAE) Game-based Learning Revenue Forecast (in US$ Millions) ................... 247

Table 66 - 2019-2024 Jordan Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 250

Table 67 - 2019-2024 North America Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 252

Table 68 - 2019-2024 Canada Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 253

Table 69 - 2019-2024 United States (US) Game-based Learning Revenue Forecast by Eight Buyer Segments (in US$ Millions) ........ 257

Table 70 - 2019-2024 US Consumer Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 258

Table 71 - 2019-2024 US Preschool Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 259

Table 72 - 2019-2024 US Primary School Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 262

For More Information, eMail: research@metaari.com
Table 75 - 2019-2024 US Federal Government Game-based Learning Revenue Forecast (in US$ Millions) .........................275
Table 76 - 2019-2024 US Local and State Government Game-based Learning Revenue Forecast (in US$ Millions) ............280
Table 77 - 2019-2024 US Corporate Game-based Learning Revenue Forecast (in US$ Millions) .............................................283
Table 78 - 2019-2024 Western Europe Game-based Learning Revenue Forecast (in US$ Millions) ..................................286
Table 79 - 2019-2024 Western Europe Game-based Learning Revenue Forecast by Top Buying Countries (in US$ Millions) ....287
Table 80 - 2019-2024 United Kingdom (UK) Game-based Learning Revenue Forecast (in US$ Millions) .............................290
Table 81 - 2019-2024 Spain Game-based Learning Revenue Forecast (in US$ Millions) .........................................................296
Table 82 - 2019-2024 France Game-based Learning Revenue Forecast (in US$ Millions) ..........................................................300
Table 83 - 2019-2024 Germany Game-based Learning Revenue Forecast (in US$ Millions) ..........................................................305
Table 84 - 2019-2024 Italy Game-based Learning Revenue Forecast (in US$ Millions) .................................................................310
Table 85 - 2019-2024 Poland Game-based Learning Revenue Forecast (in US$ Millions) .............................................................313
Table 86 - 2019-2024 Romania Game-based Learning Revenue Forecast (in US$ Millions) ...........................................................316
Table 87 - 2019-2024 Netherlands Game-based Learning Revenue Forecast (in US$ Millions) ......................................................319
Table 88 - 2019-2024 Belgium Game-based Learning Revenue Forecast (in US$ Millions) .............................................................325
Table 89 - 2019-2024 Greece Game-based Learning Revenue Forecast (in US$ Millions) ...............................................................328

For More Information, eMail: research@metaari.com
Table 90 - 2019-2024 Czech Republic Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 330

Table 91 - 2019-2024 Portugal Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 333

Table 92 - 2019-2024 Austria Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 335

Table 93 - 2019-2024 Switzerland Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 338

Table 94 = 2019-2024 Nordic Cluster Game-based Learning Revenue Forecast (in US$ Millions) ................................................................. 343

Table 95 - 2019-2024 Global Revenue Forecasts for Three Types of Game-based Learning Products and Services (in US$ Millions) ................................................................. 364

Table 96 - 2019-2024 Global Revenue Forecasts for Packaged Retail Game-based Learning (in US$ Millions) ................................................................. 367

Table 97 - 2019-2024 Global Forecasts for Game-based Learning by Eleven Game Types (in US$ Millions) ................................................................. 367

Table 98 - 2019-2024 Global Revenue Forecasts for Cognitive Learning Games and Brain Training Games (in US$ Millions) .................. 368

Table 99 - 2019-2024 Global Revenue Forecasts for Knowledge-based Educational Games (in US$ Millions) ................................................................. 381

Table 100 - 2019-2024 Global Revenue Forecasts for Skill-based Educational Games (in US$ Millions) ................................................................. 384

Table 101 - 2019-2024 Global Revenue Forecasts for Language Learning Games (in US$ Millions) ................................................................. 386

Table 102 - 2019-2024 Global Revenue Forecasts for Early Childhood Learning Games (in US$ Millions) ................................................................. 387

Table 103 - 2019-2024 Global Revenue Forecasts for Assessment and Evaluation Games (in US$ Millions) ................................................................. 394

Table 104 - 2019-2024 Global Revenue Forecasts for Role-based Educational Games (in US$ Millions) ................................................................. 397

Table 105 - 2019-2024 Global Revenue Forecasts for Location-based Educational Games (in US$ Millions) ................................................................. 400

Table 106 - 2019-2024 Global Revenue Forecasts for Augmented Reality-based Educational Games (in US$ Millions) ................................................................. 404

For More Information, eMail: research@metaari.com

Table 108 - 2019-2024 Global Revenue Forecasts for AI-based Educational Games (in US$ Millions) ........................................ 411

Table 109 - 2019-2024 Global Revenue Forecasts for Custom Game-based Learning Development Services (in US$ Millions) ....... 416

Table 110 - 2019-2024 Global Revenue Forecasts for Custom Game-based Learning Tools and Platforms (in US$ Millions) ........ 418

Table 111 - 2019-2024 United States (US) Revenue Forecasts for Three Types of Game-based Learning Products and Services (in US$ Millions) .......................................................... 429

Table 112 - 2019-2024 United States Revenue Forecasts for Packaged Retail Game-based Learning (in US$ Millions) ............. 430

Table 113 - 2019-2024 United States (US) Forecasts for Game-based Learning by Eleven Game Types (in US$ Millions) ............ 431

Table 114 - 2019-2024 United States (US) Revenue Forecasts for Cognitive Learning Games and Brain Training Games (in US$ Millions) ........................................................................ 432

Table 115 - 2019-2024 United States (US) Revenue Forecasts for Knowledge-based Educational Games (in US$ Millions) ...... 435

Table 116 - 2019-2024 United States (US) Revenue Forecasts for Language Learning Games (in US$ Millions) ................. 437

Table 117 - 2019-2024 United States (US) Revenue Forecasts for Skill-based Educational Games (in US$ Millions) ............. 439

Table 118 = 2019-2024 United States (US) Revenue Forecasts for Early Childhood Learning Games (in US$ Millions) ............. 442

Table 119 = 2019-2024 United States (US) Revenue Forecasts for Assessment and Evaluation Games (in US$ Millions) .......... 445

Table 120 - 2019-2024 United States (US) Revenue Forecasts for Role-based Training and Education Games (in US$ Millions) ....... 447

Table 121 - 2019-2024 United States (US) Revenue Forecasts for Location-based Training and Education Games (in US$ Millions) ...... 451

Table 122 - 2019-2024 United States (US) Revenue Forecasts for AR-based Training and Education Games (in US$ Millions) .......... 453
Table 123 - 2019-2024 United States (US) Revenue Forecasts for VR-based Training and Education Games (in US$ Millions) ............ 456

Table 124- 2019-2024 United States (US) Revenue Forecasts for AI-based Learning Games (in US$ Millions) ............................ 458

Table 125 - 2019-2024 United States Revenue Forecasts for Custom Game-based Learning Development Services (in US$ Millions) ........................................................................ 462

Table 126 - 2019-2024 United States Revenue Forecasts for Game-based Learning Tools and Platforms (in US$ Millions) .......... 467

List of Figures

Figure 1 - Longitudinal Data over Last Seven Forecast Periods: Five-year Compound Annual Growth Rates (CAGRS) for the Global Game-based Learning Market ........................................ 21

Figure 2 - Primary Catalysts Driving the 2019-2024 Global Game-based Learning Market ................................................................. 24

Figure 3 – 2019-2024 Game-based Learning Growth Rates by Seven Regions .................................................................................... 31

Figure 4 – Top Fifteen Countries with the Highest Growth Rates for Game-based Learning in the 2019-2024 Market ......................... 33

Figure 5 – 2019-2024 Global Game-based Learning Market by Eight Buyer Segments ........................................................................ 35

Figure 6 - 2019-2024 Global Game-based Learning Growth Rates by Three Products and Services ......................................................... 38

Figure 7 - 2019-2024 Global Forecasts for Game-based Learning by Eleven Game Types (in US$ Millions) ...................................................... 39

Figure 8 - Metaari’s Actionable Competitive Intelligence Methodology .......................................................................................... 41

Figure 9 – Metaari’s Artificial Intelligence (AI) Array ........................................ 50

Figure 10 – Metaari’s Mixed Reality Immersion Spectrum ........................................ 53

Figure 11 – Augmented Reality and Virtual Reality are Ideal for Specific Categories of Game-based Learning ........................................ 55

For More Information, eMail: research@metaari.com
Figure 12 – Global Trends Driving the Demand for Early Childhood Learning Games ................................................................. 81

Figure 13 – The Content Trench: Mobile Learning Games Concentrated in the Early Childhood Cohort ............................................. 103

Figure 14 - Metaari's Pedagogical Framework for Game-based Learning Products .............................................................................. 365

Figure 15 - Cognitive Fitness and Brain Training Games Grouped in Two Broad Categories .................................................................. 369

Figure 16 - Carroll’s Three-Stratum Theory of Intelligence ......................... 372

Figure 17 – The Proximity of Location-based Learning (LBL) .................... 401

Figure 18 – The Three Modalities of Location-based Learning (LBL) ................................................................................................. 403

Figure 19 – Twelve Specialized Types of Game-based Learning Authoring Tools ................................................................................. 419
About Metaari

Metaari (formerly Ambient Insight) is an ethics-based quantitative market research firm that identifies revenue opportunities for advanced learning technology suppliers. Metaari publishes quantitative syndicated reports that break out revenues by customer segment (demand-side analysis) and by product category (supply-side analysis). Our forecasts are based on our industry-leading learning technology taxonomy and our educational game framework.

We track the learning technology markets in 122 countries. **We have the most complete view of the international learning technology market in the industry.** Metaari focusses solely on advanced learning technology research on products that utilize psychometrics, neuroscience, game mechanics, robotics, cognitive computing, artificial intelligence, virtual reality, and augmented reality.

About the Analyst

Sam S. Adkins is the CEO and Chief Researcher at Metaari. Sam has been providing market research on the learning technology industries for over twenty years and has been involved with digital training technology for over thirty-five years. Sam is an expert at identifying revenue opportunities for global learning technology suppliers.

Dubai, United Arab Emirates, 2013 (Photography by Tyson Greer)
Sam was a business development manager for Microsoft’s Training and Certification group. During his eight years at Microsoft, he managed the Advanced Knowledge Engineering team that built the world’s first commercial online learning business (The Microsoft Online Learning Institute). Prior to that, he was a Senior Instructional Designer at United Airlines.

Before United Airlines, Sam was the manager of the Instructional Animation and Graphics Lab at AT&T’s central computer-based training (CBT) facility for four years.

Sam Adkins and Tyson Greer founded Ambient Insight in 2004. Ambient Insight ceased operations in late 2016 and rebranded as a new company named Metaari that launched in January 2017.

"Ambient Insight has been in operation for twelve years and we have a well-respected brand and a very successful company," comments Adkins. "The global learning technology market has changed dramatically in the last few years and the new advanced learning products coming on the market essentially represent a 'brave new world' in education. We want to be an active part of this new world and launched our new company to focus on these incredible innovations."

Metaari's Definition of Serious Games

The definition of Game-based Learning in our taxonomy is based on the research published by Alessi and Trollip in their seminal work entitled, "Computer Based Instruction: Methods and Development."

Game-based Learning is defined as a knowledge transfer method that utilizes "game play" comprised of some form of competition (against oneself or others) and a reward/penalty system that essentially functions as an assessment method to quantify mastery.

All educational games are designed for behavior modification (a synonym for learning), pedagogical intervention, and/or cognitive remediation. The first two are well known but the third is relatively new.

Game-based Learning is quite different from gamification. In gamification, game-like features (like badges and points) are tacked onto traditional
education content. Gamified courses are not games, but legacy products with gaming artifacts.

We developed the first iteration of our industry-leading Pedagogical Framework for Game-based Learning Products in 2005. At that time there were only six distinct types of educational games on the market. Cognitive learning and brain training games were added to the framework in 2007. AR, VR, and AI-based educational games are very new to the market and are now part of the framework. A very new type of education game has just come on the market and is used for pre-employment assessment in the organizational segments.

The 2019 iteration of the Metaari's framework identifies eleven unique types of educational games, each with distinct revenue streams in specific buying segments.

It should be noted that Metaari does not categorize Game-based Learning as a subset of the overall video game industry, but rather as a distinct type of learning technology. Metaari does not analyze the Game-based Learning market in the context of the overall video game industry. We analyze Game-based Learning in the context of the global educational technology market.

For More Information, eMail: research@metaari.com
Executive Overview: Game-based Learning Goes Mainstream

The worldwide five-year compound annual growth rate (CAGR) for Game-based Learning products and services is a healthy 33.2% and revenues will more than quadruple to reach well over $24 billion by 2024. Global, regional, and country market conditions are now extremely favorable for serious game suppliers. *The worldwide educational game market is now in a boom phase; Game-based Learning is now mainstream.*

The US reclaimed its status as the top buying country in 2019 as market conditions in China weakened and the demand in the US entered a boom phase. China had overtaken the US in 2014, but fell back to second in the 2018-2019 timeframe. Because the US is the largest buying country in the world, this report includes a detailed revenue breakout for eight buying segments. It also includes a granular forecast for services, tools, and eleven educationl game types in the US.

*Metaari has revised our revenue forecasts for the global Game-based Learning market significantly upward from previous forecasts.* This is due to the impact of major global market catalysts that are creating very favorable market conditions for suppliers. Of the seven advanced learning technology products tracked by Metaari, Game-based Learning has the highest growth rate.

Revenues for Game-based Learning will more than double in all eight of the buying segments included in this report over the forecast period. Revenues *will more than quadruple in four of these buying segments* over the forecast period.

Yet, the market drivers are quite different in each segment. The revenues for Game-based Learning are heavily concentrated in the consumer segments across the globe and a detailed analysis of the consumer demand is included in the catalysts section.

The current five-year CAGR for the global Game-based Learning market is 33.2%, down slightly from the 37.1% for the last five-year period. This could be an anomaly, but more likely indicates that the market is now maturing. That said, growth rates above 30% for learning technology product types are quite rare.
The five-year CAGRs for educational games is directly correlated to the ongoing innovations that are being integrated into next-generation educational games including advances in psychometrics, neuroscience, augmented reality (AR), virtual reality (VR), and artificial intelligence (AI).

Rapid advances in artificial intelligence (AI) technology are having a profound impact on the global Game-based Learning market. Extraordinary products are now flooding the market. AI has fundamentally altered the competitive landscape of the serious games industry.

All technology products go through what is known as a product lifecycle characterized by revenue decline and product substitution (when buyers prefer newer products). Essentially, Game-based Learning has transformed (evolved) into a new type of advance learning technology and has effectively rebooted its lifecycle. As a product type, it has effectively leveled up.

This is an evidence-based quantitative report. This report identifies over 2,100 educational game developers competing in the 122 countries tracked by Metaari. Some have global distribution reach and are licensing third-
party games from developers across the planet. Dozens of global distribution and licensing agreements are identified in the report. What is interesting is the sheer size of the reach of these distribution deals. Game-based Learning products are now reaching hundreds of millions of new users.

M&A activity has intensified and large companies are "buying their way in" to the Game-based Learning market at an accelerating pace. This is clear evidence that the large companies now see significant revenue opportunities. The M&A activity is a solid validation of the product. Startups continue to come on the market at a steady rate and are attracting significant private investment and several have been snapped up by the large corporate companies.

- This report identifies the Game-based Learning companies and distributors that operate in specific countries and regions; it identifies the types of products and services they sell, their business and pricing models, and their primary buying segments.

- The report provides verbatim marketing messages from most of the companies identified in this report to show suppliers how their competitors articulate their value proposition. It identifies the investment funding totals for many of the suppliers cited in this report. Developers that have garnered private investment have obviously been successful at quantifying their value proposition.

- This report identifies specific buyers by company name and location providing suppliers with potential sales leads. This provides invaluable insight on the top buyers across the globe, the types of Game-based Learning products they buy, and the suppliers that are meeting the demand from these buyers.

This 2019-2024 report is the first Game-based Learning report in the world to provide global five-year forecasts for AI-based educational games. Metaari is now able to calibrate forecasts after collecting baseline data for three years.

This report includes the combined revenues for both mobile and non-mobile educational games. Due to the ubiquity of cross-platform and cross-device serious games and the inexorable migration to streaming, the distinction between mobile and non-mobile has become irrelevant.

For More Information, eMail: research@metaari.com
This report also includes a description of Metaari’s Mixed Reality Spectrum defined as immersion along a spectrum and also a description of our Artificial Intelligence Array that ranges from so-called "humans in the loop" to autonomous machine learning and deep learning methods. A great deal of innovation is now occurring in AI-based learning games and they are discussed in the section analyzing the catalysts.

This report also includes a description of Carroll’s Three-Stratum Theory of Intelligence, one of the most widely accepted models for categorizing cognitive abilities and intellectual processes in cognitive research. It is a schema for developing eight distinct types of cognitive learning and brain training games described in the supply-side analysis.

Due to the high demand in the US, a detailed demand-side analysis by eight buying segments and a supply-side analysis by eleven serious game types, custom educational game development services, and authoring tools and platforms is provided for the United States in this report. The US analysis identifies very distinct revenue opportunities for developers; the US is the most lucrative market for educational games on the planet and has regained the top ranking having overtaken China on the last two years.

Over 2,100 serious game suppliers operating in 122 countries across the globe are identified in this report to help suppliers locate domestic resellers, distributors, and partners.

**Primary Catalysts Driving the Global Educational Games Market**

There are eight primary convergent catalysts driving the global educational game market. They are convergent in the sense that they are all having an impact on the other catalysts. The catalysts include:

- Artificial Intelligence (AI) alters the competitive landscape
- Mixed Reality learning games in high demand across the planet
- Historic levels of private investment flowing to Game-based Learning companies across the planet
- Large scale global distribution agreements between serious game developers and global distributors
- Intense M&A activity as large companies acquire Game-based Learning firms validating the market
- The booming global consumer demand for mobile serious games
- The rapid uptake of Game-based Learning in the corporate segments across the globe

For More Information, eMail: research@metaari.com
The availability of inexpensive easy-to-use rapid development tools and the proliferation of online marketplaces selling premade digital 3D models, VR environments, and pre-trained AI models

Combined, these catalysts have created highly favorable market conditions that are contributing to a boom phase in the Game-based Learning market across all seven regions analyzed in this report. This report provides quantifiable and significant revenue opportunities for suppliers in specific buying segments and in particular regions and countries.

Figure 2 - Primary Catalysts Driving the 2019-2024 Global Game-based Learning Market

There are also secondary catalysts such as the global rollouts of very fast 5G networks and the impending implementation of the so-called Internet of Things (IoT). Since national commercial networks won't be operational in most countries until 2020-2021, it is too soon to analyze the tangible impact of 5G on the serious games industry. There are also potential secondary catalysts like blockchain that could impact the industry in the next five years.

The serious game industry is in a period of profound innovation (if not outright disruption); this is the root of the booming market. The most significant innovation is the integration of AI into educational games.

For More Information, eMail: research@metaari.com
These AI innovations are exponential in the sense that they are not small incremental linear innovations common to traditional products; they are fundamentally new types of learning products. AI enables true personalized learning. New AI-based serious games "learn" and adapt to individuals.

These AI innovations coincide with the extraordinary advances in augmented reality (AR), virtual reality (VR), and location-based Mixed Reality. The innovations are also rooted in the advances being made in child development, psychometrics, neuroscience, behavioral science, cognitive learning, and educational psychology.

New findings from these disciplines are now being incorporated into extraordinary learning games for children with special needs. Psychometrics are the foundation of the new wave of pre-employment assessment games that are in very high demand in the corporate segments across the planet.

The flood of technology and science advances are having a dramatic impact on the Game-based Learning industry. Developers are releasing stunningly beautiful (and profitable) immersive learning experiences. There is a growing body of empirical clinical evidence on the effectiveness of these new educational games. The value propositions are compelling and empirical data on effectiveness gives developers a major competitive advantage over legacy learning technologies like eLearning.

AI-based educational products have just come on the market in the last three years and they are having a major impact on the learning technology industry since they enable true personalized and adaptive learning. There are now hundreds of AI-based educational games on the market.

Metaari has been compiling baseline revenues for AI-based learning games for several years and is now able to calibrate five-year forecasts for this learning game type. This is the first report in the industry that has been able to make five-year forecasts for AI-based learning Games.

Mixed Reality learning games are now in high demand across the planet being driven by the rapid innovation in AR and VR and the falling prices of Mixed Reality devices. Inexpensive, easy-to-use, rapid development tools are now on the market allowing developers to get to market quickly. This report breaks Mixed Reality learning games into two revenue forecasts: augmented reality learning games and virtual reality games.
Private investments made to serious game suppliers reached historic highs in 2016, 2017, and 2018. Over $1.7 billion in funding flowed to educational game companies across the planet in 2016 and 2017 combined. In stark contrast, $2.25 billion was invested in Game-based Learning companies in 2018 alone.

What is interesting about the investment patterns is that most of the funding is going to companies that develop specific types of educational games designed for particular demographics.

Investors were particularly attracted to developers making specific types of serious games for young children. Investment is flowing to companies that develop early childhood learning games, STEM games for the younger grades, and games designed to teach young people coding.

Investors were also pouring money to startups that develop assessment and evaluation games for the corporate segment. The 2018 Game-based Learning investment patterns are analyzed in the detailed section on the catalysts. That section also identifies several funding sources including governmental agencies that fund game development.

Large-scale distribution agreements between Game-based Learning companies and global distribution partners are a major catalyst accelerating the adoption of serious games by billions of new buyers across the planet and a major variable contributing to the spike in global revenues for serious games in the booming global market.

Dozens of large-scale global distribution agreements are cited in the section analyzing the global catalysts. This provides suppliers with blueprints on distribution partnership agreements and isolates potential partners in specific countries and regions; it also identifies very large revenue opportunities for serious game developers. The recent slew of major distribution agreements is one of the variables contributing to the boom phase of the market.

A major trend that is validating the market is the growing number of acquisitions being made by very large companies that are essentially "buying their way in" to the Game-based Learning market. Large companies rarely try to invent new markets and almost always wait until a product starts generating major revenues before they enter the market. The entry of the large companies in the educational Game industry is a clear validation of the market.
In 2017 and 2018, the consumer demand for mobile early childhood learning games spiked and spread to almost every country on the planet, even in developing economies. Many developing economies are mobile-only countries where web access is overwhelmingly a mobile experience. This is sometimes called the post-PC era characterized by the majority of people in a country leapfrogging PCs altogether.

Corporations were once resistant to the use of games for training and education. The perception (mostly true as recently as five years ago) was that training games were expensive, complicated, and time-consuming to develop.

This is no longer true; the growth rate for Game-based Learning in the corporate segments across the globe is very high at a breathtaking five-year compound annual growth rate of 47.5%, the highest growth rate of all the buying segments.

Corporations are buying very specific types of learning games. The learning games in the highest demand in the corporate segment are pre-employment evaluation and assessment games and business simulation games. Corporations buy packaged games from developers and pay the developers to create custom versions. Many developers also license their authoring tools to clients. This report identifies twelve types of specialized authoring tools and corporations buy four of them.

- An analysis of all the game types that are now in high demand in the corporate segments across the planet are included in the demand-side section that includes a detailed analysis of the corporate demand in the US.

- Startups that develop these new corporate-facing games continue to come on the market and are attracting the attention of private investment firms. Over 80 of these companies are cited in this report and investment totals for each company are also cited.

Until recently, educational game development required very expensive and complex proprietary development platforms. It is no longer true in the educational games industry. Between 2016 and 2018, a range of new rapid educational game development tools came on the market and new tools continue to come on the market. They are relatively inexpensive and designed for non-technical people.
These new tools include gameplay templates, "blocks" of interactivity, knowledge transfer models, so-called behavior packs based on AI, and Mixed Reality content libraries that support rapid development. Sixty-one new Game-based Learning authoring tool companies are identified in this report.

A major catalyst enabling the development of cost-effective serious games in very short time frames is the proliferation of online marketplaces selling premade digital 3D models, virtual environments, and pre-trained AI models designed to be customized by developers. Over fifty of these companies are discussed in this report. A description of their inventories and pricing models is also provided.

**What You Will Find in This Report**

There are five sections in this report: a detailed analysis of the global catalysts, a deep-dive of Metaari’s Game-based Learning Pedagogical Framework, a demand side-analysis by seven regions, a demand-side forecast for eight buying segments, and a supply-side analysis for products, services, and eleven pedagogically distinct education game types.

- The US is the largest buying country in the world, and this report includes a detailed revenue breakout for eight buying segments. It also includes a granular forecast for services, tools, and eleven education game types in the US.

The demand-side analysis breaks out five-year revenue forecasts for seven international regions and by eight buying segments. Five-year forecasts are provided for seven regions: Africa, Asia Pacific, Eastern Europe, the Middle East, Latin America, North America, and Western Europe. Five-year forecasts are provided for the top buying countries in each region (49 in all).

The demand-side analysis includes five-year forecasts for eight buying segments: consumers, three academic sub-segments (preschools, primary schools, and secondary schools), tertiary & higher education institutions, local/state/provincial/prefecture government agencies, federal government agencies, and corporations & businesses. A global analysis for all regions combined and a detailed analysis of the US supply-side is included in this section.
This report includes a detailed description of Metaari's Pedagogical Framework for Game-based Learning Products that identifies eleven schemas used to design Game-based Learning products.

The framework was derived by reverse engineering high-demand commercial products. **The framework provides suppliers with a product roadmap to tap addressable revenue streams for specific types of Game-based Learning products.**

Each educational game type has very clear revenue opportunities and clear demographic (and regional) demand. The serious game types are categorized in Metaari’s Pedagogical Game-based Learning Framework.

The supply-side analysis also includes five-year forecasts for custom educational game development services, and authoring tools and platforms. A global analysis for all regions combined and a detailed analysis of the US demand-side is included in this section.

Until recently, most educational games on the market were built with commercial gaming engines, mostly Unity and Unreal Engine. Those are general-purpose engines and their revenues are not included in this report.

However, revenues for packaged retail educational games built with those tools are included. Dozens of new authoring tools designed exclusively to create game-based learning have come on the market since 2016 and those revenues are forecast in the supply-side section. This report identifies twelve types of specialized learning game authoring tools.

Metaari uses standard exchange rate and inflation/deflation variables in our predictive analysis and the impact of these fluctuations are baked into the forecasts. Metaari temporarily suspends tracking the learning technology market in countries undergoing severe socioeconomic challenges and restarts the monitoring once the conditions stabilize.

We have done this in the past for countries like Egypt and the Côte d'Ivoire (The Ivory Coast), but restarted the tracking when the conditions normalized in those countries. We have currently suspended tracking in Venezuela and Yemen.
Where are the Buyers?

Metaari tracks the learning technology markets in 122 countries across seven regions. While there can be similarities in buying behavior across countries, they are usually confined to a particular buying segment. In general, however, the buying behavior is quite different in each country.

Table 1 - The 122 Countries across the Seven Regions Tracked by Metaari

<table>
<thead>
<tr>
<th>Number of Countries Analyzed in Each Region</th>
<th>Countries Analyzed in this Report by Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Countries in Africa</td>
<td>Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Côte d'Ivoire (The Ivory Coast), the Democratic Republic of Congo (DRC), Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Tunisia, Uganda, Zambia, and Zimbabwe</td>
</tr>
<tr>
<td>21 Countries in Asia Pacific</td>
<td>Australia, Bangladesh, Cambodia, China (including Hong Kong and Macao), India, Indonesia, Japan, Laos, Malaysia, Mongolia, Myanmar (Burma), Nepal, New Zealand, Pakistan, the Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, and Vietnam</td>
</tr>
<tr>
<td>15 Countries in Eastern Europe</td>
<td>Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Moldova, the Russian Federation, Serbia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.</td>
</tr>
<tr>
<td>18 Countries in Latin America</td>
<td>Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Perú, Uruguay, and Venezuela (Metaari has suspended analyzing Venezuela during the current financial crisis in that country.)</td>
</tr>
<tr>
<td>12 Countries in the Middle East</td>
<td>Bahrain, Egypt, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Turkey, and the United Arab Emirates (UAE), (Metaari has suspended analyzing Yemen during the current political crisis in that country)</td>
</tr>
<tr>
<td>2 Countries in North America</td>
<td>Canada and the United States</td>
</tr>
<tr>
<td>24 Countries in Western Europe</td>
<td>Austria, Belgium, Bulgaria, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, and the United Kingdom</td>
</tr>
</tbody>
</table>

Africa has the fastest growing middle class demographic on the planet. This means there is a growing amount of discretionary spending in the region.

This report provides five-year forecasts for Game-based Learning products for seven regions: Africa, Asia Pacific, Eastern Europe, Latin America, the Middle East, North America, and Western Europe. The regional forecasts

For More Information, eMail: research@metaari.com
for each region are for all countries in that region combined and there are 49 stand-alone country forecasts for the top buying countries in each region.

**Figure 3 – 2019-2024 Game-based Learning Growth Rates by Seven Regions**

All the regions have growth rates above 25%. Western Europe now has the highest growth rate for Game-based Learning at 47.2% followed by Eastern Europe and Africa at 42.2% and 41.3%, respectively.

Asia has "the lowest" growth rate of 27.0% being dampened by the flat revenues in China but bolstered by the booming demand in developing Southeast Asia countries. North America is now a mature market but still has a growth rate at 35.2%. The market has been reenergized by the booming demand for assessment games in the corporate segment.

The revenues for Game-based Learning are heavily concentrated in the Asia Pacific region and North America over the forecast period. In the 2019 market, Asia Pacific and North America combined accounted for 77% of all global revenues. The two regions will still account for 52% of all global revenues by 2024.

Eastern Europe has a healthy growth rate of 42.8% and while the revenues in the 2019 market are relatively low, by 2024 the revenues for serious
games in the region will more than quadruple during the forecast period. The Middle East has a robust growth rate of 36.2% and Latin America has a healthy growth rate of 30.1%.

**Top Buying Countries in Each Region**

Five-year forecasts are provided in this report for the top buying countries in each region. Additionally, a five-year forecast is provided for five of the six countries in the Nordic Cluster combined. *Five-year forecasts are included for 49 countries. Those countries have the highest revenues in their respective regions.* It also includes a forecast for Australia and New Zealand combined and for the five countries in the Nordic cluster combined. Country forecasts are provided for:

- Nigeria, South Africa, Kenya, Senegal, Rwanda, Morocco, Angola, Tanzania, Ghana, and Uganda in Africa
- China, India, Japan, South Korea, Australia and New Zealand (combined), Singapore, Indonesia in Asia Pacific (forecasts are also included for the fastest growing markets in Asia Pacific including Bangladesh, Myanmar, Cambodia, Vietnam, Nepal, Malaysia, and Thailand)
- The Russian Federation, Ukraine, Georgia, Kazakhstan, Belarus, and Azerbaijan in Eastern Europe
- Brazil, Mexico, Colombia, Argentina, Perú, and Chile in Latin America
- Turkey, Israel, Egypt, Saudi Arabia, Jordan, and the United Arab Emirates (UAE) in the Middle East
- Canada and the United States in North America
- The United Kingdom (UK), Spain, France, Germany, Italy, Poland, the Netherlands, Belgium, Portugal, Austria, Switzerland, and for five countries combined in the Nordic Cluster (Sweden, Norway, Finland, Denmark, and Iceland) in Western Europe

In the 2019 market, the US retook their position as the top buying country. China overtook the US in 2014. Yet, market conditions in China are shifting rapidly due to new strict regulatory policies, increased pricing pressures, consolidation, and pronounced commoditization, particularly in the consumer segment. The US is now back in the top position.

Demand is very high and unit sales are high in China, but suppliers are increasingly competing on price (against very large competitors with
deep pockets that can afford to drop prices as they consolidate the market) effectively keeping the revenues flat. On top of that, the government has issued strict guidelines and regulations making it quite difficult to get a game to market, particularly for non-domestic companies. The inhibitors in China are discussed in detail in the China section.

The growth rate for educational games is now slightly negative-to-flat at -0.3% in China in stark contrast to the robust growth rate of 50.5% in the US.

**Top Fifteen Countries with the Highest Growth Rates**

Uganda has the highest Game-based Learning growth rate at a breathtaking 58.8% despite having relatively low revenues. Seven of the top fifteen countries with the highest growth rates for Game-based Learning are in Africa including Uganda, Morocco, Nigeria, Kenya, South Africa, Tanzania, and Angola. All seven have growth rates well above 40%.

**Figure 4 – Top Fifteen Countries with the Highest Growth Rates for Game-based Learning in the 2019-2024 Market**

The countries in the Nordic Cluster are all thriving hubs of Game-based Learning innovation and the demand is very high in all five countries. The growth rate for all five countries combined in the cluster is 51.4%.

For More Information, eMail: research@metaari.com
Of the 122 countries that were analyzed for this report, twelve countries have growth rates over 50% and fifty-three countries have growth rates above 40%.

Revenues in countries with over 50% growth rates will spike over eight times during the forecast period. Countries with growth rates over 40% will surge over five times over the forecast period.

Both the Netherlands and the US are very mature Game-based Learning, but they are both hubs for extraordinary innovations; *both countries are experiencing a resurgence in demand for educational games.*

Three countries in Eastern Europe were in the top fifteen: Azerbaijan, Belarus, and Georgia. Three countries in the Asia Pacific region made it in the top fifteen: Cambodia at 49.8%, Bangladesh at 46.2%, and Vietnam at 42.8%.

**Who are the Buyers?**

There are eight Game-based Learning buying segments analyzed in this report: consumers, three academic sub-segments (preschools, primary schools, and secondary schools), tertiary & higher education institutions, federal government agencies, provincial/state/prefecture & local government agencies, and corporations & businesses. This report breaks out the global revenues for each of these segments and provides a detailed breakout by these segments for the US.

The corporate segment has the highest growth rate for learning games at a breathtaking 47.5%. There are two catalysts driving the growth in the corporate segment: the rapid uptake of psychometric job candidate evaluation games and the continued adoption of business simulation games.

Revenues will more than double in all eight global buying segments over the forecast period and *will surge more than six times in the corporate buying segment.* Yet the market drivers are unique to each segment. For example, the corporate demand is being driven by the booming demand for pre-employment assessment and evaluation games; the corporate segment has the highest growth rate out of all eight segments at a breathtaking 47.5%.

By 2024, the consumer Game-based Learning market will essentially be a commodity market; volume sales and revenues will be very high but unit
prices will decline. In a commodity market, suppliers tend to compete on price. That said, the demand in the consumer segments across the globe is very high and the revenues for Game-based Learning will be heavily concentrated in the consumer segment throughout the forecast period.

Commodity markets create ideal conditions for merger and acquisition (M&A) activity as suppliers consolidate to maintain revenue streams. This is already occurring for early childhood learning games and mobile cognitive fitness games. **Figure 5 – 2019-2024 Global Game-based Learning Market by Eight Buyer Segments**

![Bar chart showing the revenues for Game-based Learning market by buyer segments over the forecast period.](image)

The revenues for Game-based Learning will spike over five times in four of the eight buying segments over the forecast period.

The PreK-12 segments are broken out by the three sub-segments because the buying behavior and the user demographics are quite different in each cohort. The demand is being driven by data showing that games in preschool can accelerate the transfer of both developmental abilities and basic academic skills.

Games have been proven to be quite effective at teaching young children social and emotion learning (SEL) skills. The large for-profit preschool chains (particularly in the US and China) are the top buyers of educational games for preschoolers. They license games from commercial Game-based Learning companies.

For More Information, eMail: research@metaari.com
The types of games used in the primary and secondary sub-segments are very different as they map to scaffolding curricula. For example, STEM games are more common in middle school and high school programs.

Several recent trends could greatly accelerate the adoption (and the revenues) of serious games in the academic segments. Perhaps the most significant catalyst is Microsoft's entry in the serious games industry when they launched their Minecraft: Education Edition in November 2016. In just one year, they had over two million licensed users across the planet. Microsoft continues to add resource packs (coding and chemistry are the latest) making the platform more attractive to the academic segments. By June 2019, they had over 40 million teacher licenses across 115 countries.

There are other major trends impacting the uptake of Game-based Learning in the global PreK-12 sub-segment:

- One of the most successful Game-based Learning suppliers in the PreK-12 segments across the planet is Norway's Kahoot!. In January 2019, they reported that they had surpassed 90 million users. They claim their game is being played by more than half of all US-based PreK-12 students (45 million students). Kahoot! claims to be the fastest growing learning brand in the world with a 75% year-over-year growth rate.

- In June 2018, Roblox launched their Roblox Education program, which is a Game-based Learning platform. The bundle is free for educational institutions and includes lesson plans. “The curriculum is available now and includes everything educators need to teach kids, ages 10 and up, technical and entrepreneurial skills on Roblox, such as step-by-step tutorials, handouts, lesson guides, and more. Roblox’s roots have always been steeped in STEM education.” Roblox had over 90 million active users by June 2019. In June 2019, they reported that they had "reached more than 650,000 students worldwide through its education initiatives in 2018, and it expects to more than double that number in 2019."

- Ubisoft's Assassin’s Creed is one of the most popular games in the gaming industry. Their Assassin's Creed Origins game was released in late 2017 and sold over 1.5 million copies in the first week. In February 2018, Ubisoft launched their new (non-violent) Discovery Tour by Assassin’s Creed: Ancient Egypt game that is "a new educational and entertaining tool which lets anyone explore the
entire interactive 3D recreation of Ancient Egypt." The game "is a unique experience at the intersection of entertainment and learning. As both a game and a learning tool, it is quite a unique asset for teachers to integrate as part of their history classes." According to Ubisoft "Discovery Tour by Assassin’s Creed: Ancient Egypt a completely new type of edutainment tool.'"

- A major trend driving the adoption of VR-based games in the PreK-12 segment is the availability of so-called VR classroom kits that include headsets, chargers, routers, carts and most importantly, packaged educational content. This has created a growing distribution channel for development companies that partner with the kit companies.

The growth rate for serious games in the higher education and tertiary segment is a healthy 15.4%. Business simulation games that incorporate role playing are now common in sales, finance, business, and marketing programs in higher education institutions across the planet. The demand for business simulation games is quite high in all the developed countries.

The buying behavior in the two government segments analyzed in this report is similar in that games are used for civilian employees, military personnel, public safety employees, and first responders. Agencies hire developers to create custom games for various civic initiatives.

The growth rate for Game-based Learning in the federal government agencies across the planet is 29.4% and 32.8% in the local and state government agencies. The growth rates are essentially on par for the two segments. Yet, there are unique buying patterns in both segments and they are discussed in great detail in the demand-side analysis.

**What are They Buying?**

This report forecasts revenues for three types of Game-based Learning products and services: packaged retail games sold by unit or by subscription, custom educational game development services, and tools and platforms designed to create and deliver serious games.

Packaged retail games distributed on tangible media (DVDs) are declining rapidly in developed countries and console suppliers are moving to streamed products. Once 5G networks become ubiquitous across the planet

For More Information, eMail: research@metaari.com
by 2020-2021, streaming will be the dominant delivery method. Game executives are already predicting the end of the console.

**Figure 6 - 2019-2024 Global Game-based Learning Growth Rates by Three Products and Services**

The growth rate for custom content development services is quite high at 47.5% and revenues will spike over seven times over the forecast period. There is a vibrant (and growing) cottage industry of custom Game-based Learning developers across the planet.

The major buyers of custom services are corporations and government agencies although tertiary institutions (particularly business schools) also hire developers to create custom learning games. Corporate-facing custom developers tend to specialize in specific industry verticals. Government-facing developers tend to be very specialized.

The growth rate for Game-based Learning authoring tools and platforms is a robust 39.3%. Revenues will surge over five times over the forecast period. Dedicated Game-based Learning tools are relatively new on the market but new specialized rapid authoring tools continue to come on the market at a rapid pace. This report identifies over 70 new Game-based Learning tool companies.
 Suppliers are bringing authoring tools to the market designed for specific demographics, buying segments, and verticals. For example, tools designed to create educational games for museums and tourist venues are specialized for those verticals. Specialized tools are also available now for pre-employment assessment and evaluation games used in the organizational segments.

There are highly-specialized authoring tools designed to create games for children. And of course, the tools used to author AR, VR, and AI-based learning games are quite unique and very new on the market. There are at least twelve specialized types of learning game authoring tools and they are identified in this report.

The five-year compound annual growth rate for packaged retail games is 31.7%. Revenues for packaged retail educational games (for all eleven types combined) will nearly quadruple over the forecast period. The vast majority of revenues for Game-based Learning will be derived from packaged games throughout the forecast period.

Figure 7 - 2019-2024 Global Forecasts for Game-based Learning by Eleven Game Types (in US$ Millions)

Free-to-play educational games are found in the market but in-app advertising is rare compared to the non-educational game types. Parents are
particularly hostile to advertising in early childhood learning games. Almost all of the free-to-play educational games are basic mods and derive revenues from in-app sales of premium versions and add-ons.

This report identifies eleven distinct types of serious games as categorized in Metaari's Pedagogical Framework for Game-based Learning. Five-year revenue forecasts for each game type are provided for the global market combined.

*The educational game framework provides suppliers with a precise method of tapping specific revenue streams and a concise instructional design specification for the development of pedagogically-sound and profitable educational games.*

One of the eleven game types is AI-based serious games. Metaari is now able to establish baseline revenues after tracking this game type for several years. Five-year forecasts are included for AI-based educational games in this report.

**Sources of Data on the Global Game-based Learning Market**

Metaari principals are competitive intelligence experts that have been tracking the global learning technology industry since 1998 and the global Game-based Learning market since 2002; we have published an updated worldwide serious game market forecast report every year since 2007. We have the most detailed and comprehensive data on the global serious game competitive landscape in the industry.

Our primary data sources include our predictive analysis data repository (mapped to our learning technology taxonomy developed in 2005 and updated annually), our serious game pedagogical framework, and a vast amount of longitudinal data collected since 1998 on over 5,000 suppliers (including over 2,100 Game-based Learning companies) across 122 countries. We have tracked the investments made to learning technology companies since 1998 and publish a whitepaper on global investment patterns every year.

Secondary data sources include: trade agencies, trade associations, financial reports, press releases, news articles, investment disclosures, merger & acquisition (M&A) disclosures, game and Mixed Reality news portals, and academic budget statements.
These data are then cross correlated with country-specific variables that include: population, socio-economic factors, technology distribution, broadband penetration, device sales, and education policies. Metaari generates actionable competitive intelligence by mapping the competitive landscape, performing supply-side and demand-side analyses, and by compiling data from a wide spectrum of information broadly classified as leading and lagging indicators.

**Figure 8 - Metaari's Actionable Competitive Intelligence Methodology**

There are several analytics firms that track the top selling mobile apps in the major app stores in countries across the planet. All of them have an education category and it is easy to identify the top selling educational apps (which varies from country to country).

One of the best global sources of information on mobile educational games is the App Annie portal, which includes rankings for the top 100 best-selling and top grossing education apps for over 100 countries and has separate breakouts for iOS and Android. The rankings provide invaluable insight on what consumers are buying in each of the 100 countries.

The online game marketplaces are excellent sources of information on the best-selling educational games. They all have a category for education and

For More Information, eMail: research@metaari.com
related categories like travel, space, and family games. The commercial stores rank the best-selling educational games providing developers with real-world insight on the games that are successful.

- WEARVR operates a VR experience marketplace. They have several categories related to learning including educational, architecture, travel, exploration, marine life, and space. They rank the top best-selling educational apps. One of the most popular VR apps according to WEARVR is DinoTrek developed by Geomedia and HIVE VR.

- The largest online game store is Valve's Steam. One of their category tags is education and they rank the top selling educational games. They also have a list of "new and trending" educational games. They have a category tag for exploration and one for "family-friendly" and the majority of those games are educational.

- Microsoft's Windows Store has a games section that includes education as a category. They rank the top paid educational games. They also have a category for family and kids that is mostly comprised of educational games for children. The rankings include both PC and console games.

Telecoms and mobile network operators (MNOs) operate app stores and Mobile Learning value-added services (VAS) in almost every country in the world and identify their VAS revenues in their financial reports. They also identify the best-selling content. The mobile network operators (MNOs) and the third-party publishers that provide the Mobile Learning VAS learning content usually report the number of subscribers and the MNOs always identify the price of the subscriptions. Revenues are relatively easy to calibrate, yet, due to subscriber churn, the calibrations have to be done on an on-going basis.

It is important to note that sales rankings are dynamic and continually change. At best, they are snapshots of the current market. The rankings can change quickly. Portals like App Annie keep track of previous rankings to show how fast an educational game is climbing (or falling) in the charts. That said, certain types of serious games tend to rank high in the top best-selling educational game rankings: *early childhood learning games are bestsellers in every country in the world.*

There are information portals dedicated to digital games that include coverage of educational games. Gamasutra, Gamesindustry.biz ("The
resource for people who make and sell games"), and PocketGamer.biz are good examples.

The annual Ed Games Expo event in the US is an exhibition venue for educational companies that have been awarded Small Business Innovation Research (SBIR) grants from the government. The event highlights the educational game companies (and the games they submitted) that were awarded grants, and in that sense, a good source of competitive intelligence. There were over 100 serious game developers that exhibited at the fifth annual event in January 2019.

There are now dozens of portals across the planet that aggregate global news and information on VR and AR including the Virtual Reality Reporter, Next Reality, VRFocus, UploadVR, Haptical, VR World, The Virtual Report.biz, Hypergrid Business Review, Digital Bodies, and Road to VR. They all cover and review educational products as part of their coverage.

There are two major global trade associations for the AR and VR industries: The VR/AR Association and the Augmented Reality for Enterprise Alliance (AREA).

The VR/AR Association (VRARA) is "an international organization designed to foster collaboration between innovative companies and people in the virtual reality and augmented reality ecosystem that helps develop industry standards, connects member organizations, and promotes the services of member companies."

There are VRARA chapters all over the world. As of June 2019, there were chapters in 58 cities across the globe including 31 (up from 24 in 2018) in North America, 20 in Europe, 19 in Asia Pacific (up from 12 in 2018), and two in the Middle East. These chapters provide "hyperlocal" information on the AR/VR markets in their areas.

VRARA had 24 working committees that focus on specific verticals. The committees are comprised of member companies that compete in specific verticals. There are working committees for education, training, healthcare, tourism, aerospace, and architecture/engineering/construction (AEC).

Training and education companies make up the majority of these committees. Each committee has a web page with links to companies competing in those verticals. It is a good way to gather competitive
intelligence on Mixed Reality Learning suppliers operating in specific verticals.

The Augmented Reality for Enterprise Alliance (AREA) had 65 company members in June 2019. They have published the world’s first standard functional specifications for augmented industrial applications and their documentation places a great emphasis on the application of AR for training and real time performance and decision support. Their site includes information restricted to members but a wide range of market-related content available to the public.

Another good source of information is the Virtual Reality Venture Capital Alliance (VRVCA). "Formed in 2016, the VRVCA is a close-knit membership comprised of 47 of the top Virtual Reality Investors in the world. We believe that VR is a transformative technology that will revolutionize entire industries. We are working tirelessly to ensure that the VR startups today get the resources they need."

In December 2016, Google, HTC, Oculus, Samsung, Sony, and Acer launched the Global Virtual Reality Association (GVRA). "This group believes in VR’s immense global potential and the opportunities ahead – it will change the landscape of education, training, healthcare, and design, among many other areas." The group disseminates regional VR research reports.

An organization with a large amount of data on the European market is the European Games Developer Federation (EGDF). "The European Games Developer Federation represents games studios based in Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Norway, Malta, Poland, Romania, Spain, Sweden, The Netherlands, Turkey and the United Kingdom, which together employ over 40,000 people." The association publishes detailed reports on the markets in each country including an analysis of the demand for Game-based Learning in the region.

The Serious Games Network (SEGAN) is a pan-European network that "connects teachers, students, researchers and professionals interested in Serious Games." SEGAN is funded by the European Union.

The International Game Developers Association (IGDA) is "the largest non-profit membership organization in the world serving all individuals who create games." One of their goals is "connecting worldwide game developers at all stages of their careers to peers with shared interests and goals through a global network of over 150 Chapters and Special Interest
Groups (SIGs)." Three of their SIGs are related to Game-based Learning: Learning, Education, and Games (LEG), Game Education, and Serious Games.

Companies often report their revenues during mergers and acquisitions and when they obtain private investment. Investment activity is a good source of competitive intelligence for the global learning technology industry. Metaari considers investment activity as a leading indicator. Companies and investors often report annual revenues at the time of funding.

Investments made to Game-based Learning companies in the last few years have picked up momentum and the investment patterns are a good source of data on the types of companies attracting funding and the regions where they operate. An analysis of the annual investment activity surrounding Game-based Learning suppliers is included in the analysis of the global catalysts.

The Nordic Cluster is a vibrant hub of serious game development and companies are attracting significant investments. An analysis of the Nordic Cluster is provided in the Western Europe section of the demand-side analysis.

Financial Statements of Publicly-traded Companies
A very clear indicator of the vibrant global Game-based Learning is the growing number of IPOs being filed. The financial statements of these publicly-traded companies are a good source of revenue data for serious games.

- UK-based Frontier Developments filed for an IPO on the London Stock Exchange in July 2013. They are a developer of role-playing simulation games including Zoo Tycoon, Planet Coaster, and Jurassic World Evolution. They generated $44.8 million in their 2018 fiscal year. They obtained $23.2 million in funding from China's Tencent in July 2017. They launched their most educational virtual world called Planet Zoo in 2019. It is a very realistic virtual learning game about animals.

- Ireland's VR Education Holdings (the holding company of the subsidiary Immersive VR Education) filed their IPO in March 2018. They are known for selling some of the world's most popular VR-based educational games including the Apollo 11 game. They sold
over 120,000 copies of the game generating over $1.2 million for the game since 2016. The game was included on the new Oculus Go stand-alone headset that launched in May 2018. The company reported annual revenues of $705,670 in 2017 and $809,469 in 2018, a 15% annual increase.

▪ Shoal Games is also publicly traded and acquired the popular kid content network KIDOZ in late 2018. KIDOZ had over 50 million children using their platform at the time of the acquisition and was generating $9.6 million in annual revenue. Shoal rebranded as KIDOZ in early 2019.

▪ Vobling was acquired for $5.5 million by Sweden's Bublar Group in October 2018. Bublar is a publicly-traded AR/VR game development studio. "The AR/VR market is growing rapidly. Through this acquisition, we strengthen our gaming studio with state-of-the-art knowledge, production resources and the ability to capture opportunities from the corporate market."

▪ Australia's KNeoMedia trades on the Australian Stock Exchange (ASX). They sell a game-based platform called KneoWorld for special needs students and in their latest financial statements reported large licensing agreements with the New York City Department of Education. They opened a subsidiary in the Philippines in late 2018. Florida's Department of education approved the product in April 2019. They generated $410,000 in their fiscal 2018 year that ended in June 2018.

▪ China's Liulishuo (Lingo Champ) went public on the NYSE in September 2018. The developed an AI-based English language learning platform that uses a proprietary AI engine. In May 2018, they reported that for the first quarter of 2019, "Net revenues were RMB253.3 million (US$37.7 million), a 161.7% increase from RMB96.8 million for the first quarter of 2018. Approximately 1.1 million paying users purchased the Company’s courses and services for the first quarter of 2019, compared with approximately 552,000 paying users for the first quarter of 2018."

▪ In late 2018, South Korea's SmartStudy announced that they would file for an IPO in South Korea by early 2020. The company is one of the major early childhood learning game developers in the world.
Canada's Spin Master is a publicly-traded global toy company that acquired two of the world's most popular early childhood learning game developers in April 2016: Toca Boca and Sago Mini. Sago was a Canadian subsidiary of Toca. Spin Master does report revenues for the subdivision that the two learning games reside in.

Helsinki's Kuuhubb is a publicly listed mobile serious game developer "targeting the female audience with bespoke mobile experiences." They trade on the Toronto Stock Exchange (TSX). In November 2018, they reported that they generated $20.8 million in revenues in their 2018 fiscal year. They have garnered $22.3 million in investment since they launched in 2014.