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## *Assessment of children's digital courseware in light of developmentally appropriate courseware criteria*

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### **Abstract**

Developmentally appropriate courseware can play a crucial role in enhancing children's learning and development. Research studies have demonstrated that early childhood educators face major challenges in selecting and updating developmental courseware that supports young children's development. The primary purpose of this study was to assess children's digital courseware employed in Jordanian kindergartens in accordance with developmentally appropriate courseware criteria. A random sample of 57 courseware programs employed in both public and private kindergartens was assessed using 10 criteria for developmentally appropriate courseware. The findings suggest that the courseware implemented in Jordanian kindergartens exhibited a moderate degree of appropriateness. The courseware was the most developmentally appropriate in the areas of "technical features" and "clear instruction," while the real-work model and transformations were the least appropriate. Moreover, the findings revealed that children's courseware implemented in public kindergartens was more developmentally appropriate than those in private kindergartens. These findings and their implications were discussed.

### **Introduction**

In July 2003, the Jordanian Ministry of Education (MOE) launched an ambitious national initiative called Education Reform for the Knowledge Economy (ERfKE 1) to reform the educational system within the country, part of which concerned the provision and quality of early childhood education. The major government's aim from ERfKE 1 includes improving teaching and learning through new curricula, expanding kindergartens and creating more facilities for them, and training teachers in new methods, computer literacy and education strategies using information and communication technology (Kaga, 2007; MOE, 2008). One of subcomponents of ERfKE 1 focused on the integration of technology into all educational stages, including kindergarten.

The initial phase of ERfKE 1 ended in 2009, after 5.5 years of implementation. During that period, the MOE made great strides for applications of educational technology. The technology component was incorporated into the national kindergarten curriculum launched in 2004 (MOE & NCEA, 2004) and modified in 2006 (MOE, 2006).

After expanding the number of public kindergartens across the country, the MOE introduced computer into the kindergartens' environment as a fundamental corner alongside other educational corners (MOE & NCEA, 2004). In addition to the increase in the number of computers provided in

**Practitioner Notes**

What is already known about this topic

- The importance of developmentally appropriate courseware (DAC) has been documented.
- Previous review of the assessment of children's courseware based on different criteria has been examined in the context of different Western countries.
- A number of scales to assess the children's courseware have been designed.

What this paper adds

- The paper assesses the quality of children's courseware in a different country, Jordan, which is culturally different from the Western countries.
- This paper offers valuable insights and a critical review on the assessment of children's digital courseware.
- The paper examines differences of the quality of children's courseware in different settings (public vs. private kindergarten settings).

Implications for practice and/or policy

- Courseware companies should consider DAC criteria for complying with the Haugland Developmental Scale in producing, designing and updating their educational children's courseware.
- Kindergarten teachers should be encouraged to make informed decisions about available courseware in order to select children's courseware appropriately and wisely.
- Children's courseware should be designed by a panel of experts, comprised of teachers and people who are knowledgeable about computer design and its applications, as well as individuals who have a good understanding of children's development and learning.
- Future research is needed to identify the perceptions of teachers, parents, children and courseware designers regarding DAC.

the kindergartens, much educational courseware has emerged and is now in everyday practice. In 2004, the MOE implemented a courseware project called KidSmart in public kindergartens. After 5 years, the MOE computerized the modified version of its national kindergarten curriculum and produced a few supplementary digital courseware such as "Sesame Stories" and "Think First." In addition, the MOE provided kindergarten teachers with professional training programs to employ the digital courseware in an appropriate way. The implantation of the courseware was only limited to public kindergartens, while private kindergartens employ their own kindergarten curricula as well as their courseware.

Despite all progress made on computerizing the curriculum and expanding the use of courseware in the classrooms, the aforementioned courseware is still utilized without reviewing their suitability for young children. Moreover, many teachers from private and public kindergartens still use commercial courseware while teaching without critically evaluating them and appreciating their appropriateness for children (Ihmeideh, 2009). Therefore, there is a need to assess the appropriateness of courseware to young children's development and extend the quality of current courseware use in Jordanian kindergartens. The aim of this study is to investigate the appropriateness of young children's courseware being used in Jordanian kindergartens.

**Theoretical background**

Successful experiences of pre-school children using computers depend on how computers are integrated into the classroom and which courseware programs are used (Dodge, Colker &

Heroman, 2010). Experimental research demonstrated that there was a significant impact on the learning of children who had been engaged in developmental courseware (Haugland, 1992). This highlights the critical importance of courseware selection for children.

As computers are increasingly present in pre-school settings nowadays, a wide range of educational children's courseware has emerged, inevitably with different aims and applications. Thus, the selection of children's digital courseware takes on even more importance (Buckleitner, 1999). The National Association for the Education of Young Children (NAEYC) stressed that early childhood educators need to make decisions about which courseware programs to use and how to integrate these programs into their classroom practice to ensure that the potential benefits for children are achieved (NAEYC, 2009).

Early childhood educational courseware needs to provide children with opportunities to explore and interact with knowledge and to work as members of a team (Nikolopoulou, 2007), as well as allow them to play and practice their creativity (Nikiforidou & Pange, 2010). According to Clements and Sarama (2003), the best courseware programs allow children to experiment, offer flexibility and control, and make concepts more concrete and meaningful. After assessing children's courseware, Nikiforidou & Pange (2010, 540) concluded that children's educational courseware needs to "allow children to repeat their activities and reflect on what they already know and be presented with effective feedback that encourages discovery rather than direction." In addition, children's courseware should be a source of entertainment. Bagla, Gupta and Kukreja (2011) emphasized the importance of courseware that successfully combines education and entertainment and stated that one key to providing children with a better learning experience lies in selecting such courseware.

Children's educational courseware needs to be selected and assessed for developmental appropriateness. Edwards (2005) pointed out that children benefit greatly from courseware that is developmentally appropriate.

### **Developmentally appropriate courseware**

The concept of developmentally appropriate courseware (DAC) derived from the definition of "developmentally appropriate practice" first articulated by NAEYC in 1986, which argued that young children should be exposed to learning experiences that are congruent with their development levels so as to help and support their learning (NAEYC, 2009). Developmental appropriateness takes into considerations children's developmental characteristics, abilities and interests in terms of three dimensions, including age, individual differences and cultural contexts (Rosen & Jaruszewicz, 2009). DAC provides children with opportunities for collaborative play, learning and creation (NAEYC, 1996). It also attracts children's curiosity, helps them reflect on their experiences and collaborate with others, and provides them a world they are eager to manipulate, experiment with and discover (Haugland, Bailey & Ruiz, 2002).

There is mounting evidence that DAC in the early childhood classroom has the potential to enhance young children's learning and development (Dodge *et al.*, 2010; Edwards, 2005; Haugland, 2000; Haugland & Ruiz, 2002; Haugland *et al.*, 2002). Many researchers have stressed the importance of providing young children with DAC during their learning (Haugland, 2005; Nikiforidou & Pange, 2010).

The view of developmental appropriateness dates back to the theories of pioneering early childhood educators such as Dewey, Vygotsky, Piaget and Erikson. For instance, Piaget (1962) believed that children construct their knowledge through interactions with the physical, social and cultural environments. He described a set of discreet stages through which children proceed, and explained also a set of processes that allow children to move from one stage to the next.

Piaget's theories can help the courseware developer to design more developmentally sound courseware. Piaget (1975) described children as innately gifted and active learners trying to understand the world rather than memorizing information. Piagetian theory highlighted that children learn best when actively engaged in their environment (Piaget, 1962). Thus, the developmental courseware needs to allow children to become actively engaged in the experience and have a degree of control over their environment (McCarrick & Li, 2007). Based on Piaget's cognitive theory, courseware must have the potential to considerate the existing learning and to nurture the active participation of the child (Piaget, 1962).

Piagetian theory influenced courseware developers by providing authentic context that reflected the way knowledge would be used in "real life." To make courseware more developmentally appropriate, courseware developers much follow "real-world" conventions and ensure that the information is shown in a natural and logical order (Solomon, 2011).

Courseware designed for young children is expected to have different features from courseware designed for general use (Nikiforidou & Pange, 2010). It depends mainly on characteristics like movements, pictures and sounds (Childress, Lee & Sherman, 1999). In selecting courseware for children's use in classrooms, Haugland (2005) identified three main issues, which are considered very significant. These are as follows: (1) computer courseware needs to meet the goals identified by the school, district or state; (2) violence should be avoided; and (3) the developmental appropriateness of courseware is an essential consideration.

Because of the importance of providing children with DAC, educators and researchers began conducting systematic courseware evaluation efforts. For instance, Hohmann (1998) suggested five elements for good children's courseware program. They are content strength and multiple levels of challenge, attracting and holding children's attention; supportive use of feedback; avoiding bias, violence and inappropriate content; ease of use; and value.

Theoretically, Haugland (1997) provided a clear understanding of what constitutes a developmental courseware, consistent with the NAEYC's Guidelines for Developmentally Appropriate Practices (Bredekamp, 1986). Haugland (1997) designed a scale called "*The Haugland Developmental Software Scale*" to distinguish courseware that is developmentally appropriate for young children. This evaluation instrument has been designed based on the scale previously designed by the Haugland and Shade (1990). The courseware is scored using 10 criteria starting with "age appropriateness" and ending with "transformations." This evaluation scale is considered a valuable instrument for determining DAC and websites intended for pre-school-aged children. These criteria have been utilized in the current study to assess the educational children's courseware that is implemented in the Jordanian kindergartens' context.

Although most of the scale items were developed in 1997, the scale is still relevant to the current day and age and is the best choice for researchers to assess the children's courseware. This scale measures broad concepts such as age appropriateness, child in control, clear instructions, expanding complexity, independence, nonviolence, process orientation, real-world model, technical features and transformations. This, however, makes this scale broad enough to pertain to any children's courseware.

Different courseware has been assessed using this scale to measure their appropriateness for children (see Escobedo & Evans, 1997; Haugland, 2000, 2005; Haugland & Rui'z, 2002; Haugland *et al.*, 2002; Nikiforidou & Pange, 2010; Sherman, 1990). Nikiforidou & Pange (2010) evaluated children's courseware in Greece using the Haugland's (1997) scale for DAC. The courseware was evaluated by 45 in-service teachers, and results found that "technical features," including the use of mouse, quality of graphics and quality of video animation, were found to be the utmost importance, followed by independence, ease of use and clarity of instructions. Their

study concluded that all criteria complied with the Haugland Developmental Scale (1997) by entailing that early childhood courseware should be selected in a sensible and cautious way.

In 2000, 2002 and 2005, Haugland and her colleagues conducted several studies to identify the outstanding developmental courseware published in the USA. Using Haugland Developmental Scale (1997), thousands of developmental courseware have been identified (see Haugland, 2000, 2005; Haugland & Rui'z, 2002; Haugland *et al.*, 2002).

Escobedo and Evans (1997) conducted a study to assess children's preferences in relation to 13 items of courseware. In their study, developmentally appropriate ratings assigned by the published courseware methods are compared with the actual child selection. Results indicated that categories identified by The Haugland and Shade's (1990) scale, such as age appropriateness, open-endedness, child control or process orientedness, were present in the selected programs, although some of the titles identified by the scale as developmentally inappropriate were preferred by children.

Presently, numerous courseware programs designed for children are available in the market. They differ in type, purpose, application, usage and price. A few courseware programs are also available on the internet for free installation. It is a fact that all courseware for children is not developmentally appropriate. Willoughby and Wood (2008) revealed that there is no organizational agency that screens the quality and value of children's courseware to ensure that the claims in the courseware are what is available from the courseware. Thus, as Khalifa, Bloor, Middleton and Jones (2000) indicate, buying courseware unseen can pose a risk.

It is the responsibility of early childhood educators in general and teachers in particular to make a decision about which courseware is most suitable for children. "As more and more educational software applications flood the instructional marketplace, it will become increasingly important for teachers to learn how to filter the growing assortment" (Rader, 1997, 20). As many teachers lack of an understanding of DAC and have low or no confidence in their own computer skills, they purchase courseware without a set of criteria or guidelines for selecting courseware (Tsantis, Bewick & Thouvenelle, 2003). Teachers may benefit from a system of valid courseware criteria and ratings by some external body.

Well-designed courseware full of attractive animation and high-quality sound and music may distract teachers from reviewing content and underlying objectives. Many courseware descriptions make it difficult to decide how a program actually functions (Haugland, 1997). Although many courseware programs are marketed as appropriate for young children, only a few courseware programs are developmentally appropriate. This present study is an attempt to evaluate children's digital courseware employed in Jordanian kindergartens to determine whether or not they are developmentally appropriate.

### **Digital courseware in Jordanian pre-school context**

National Jordanian kindergarten curriculum expects children to (1) have access to computers with a library of DAC, (2) have opportunities to make choices about some of their computer experiences, and (3) use the computer for more developmentally appropriate activities that match their learning (MOE & NCEA, 2004).

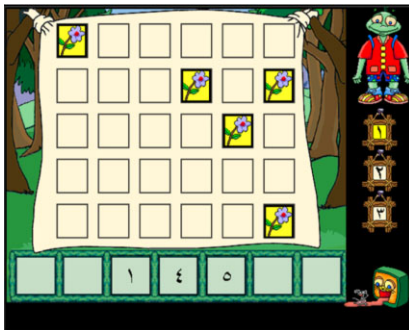
There are three different the types of courseware being utilized in Jordanian kindergarten. The first type is KidSmart courseware which has been translated into Arabic and adopted to Jordanian context, covers basic skills in math, science, creative writing and thinking. KidSmart courseware was installed in all public kindergartens, and teachers were trained on how to implement it in their classrooms. It is used also in some private kindergartens. The second type is national kindergarten curriculum courseware which is used in only public kindergartens. It is locally produced courseware as a result of the need to computerize all eight units included in the



Program Name: My Land "Arabic Letters"  
 Publisher: MOE and REDSOFT



Program Name: Millies's Math House  
 Publisher: EDMARK



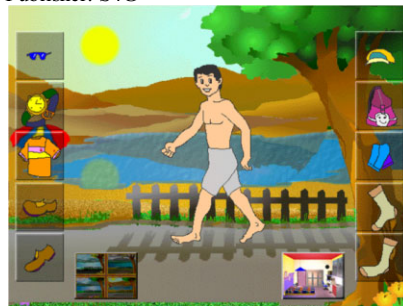
Program Name: Learn numbers with Tortoise  
 Publisher: Sham Future Center



ProgramName:Hamza4(Memory& matching)  
 Publisher: S4G



Program Name: My Daily Adhkar  
 Publisher: International Knowledge



Program Name: Aldawaleg (Four Seasons)  
 Publisher: Aldawaleg Company

Figure 1: Sample of children's courseware programs used in Jordanian kindergartens

curriculum into courseware (MOE, 2006). The third type is commercial children's courseware which is employed in the vast majority of private kindergartens and few public kindergartens. The sources of these commercial courseware were different; some of them were installed from the internet while others were purchased from the market by teachers. Examples of types of courseware being used in Jordanian kindergartens are presented in Figure 1.

One of the main aims of this present study is to identify the differences between the courseware that is employed in the public and the private kindergartens. As most kindergartens in Jordan are run by the private sector, the status of implementing children's courseware in the private kindergarten is relatively different from the public kindergartens. In the past decade, the MOE has taken

the initiative to provide government-funded kindergarten programs in certain remote regions. Although kindergartens are run mostly by the private sector, they are exclusively administered by the MOE.

Private kindergartens in Jordan do not have to follow the same prescribed national kindergarten curriculum and make use of its courseware. The MOE gives the opportunity for the kindergartens to have their own curriculum and supplemented resources, including courseware. This is because pre-school education is not compulsory for Jordanian children, and the technical supervision provided in kindergartens is quite limited. This flexible attitude of the MOE gave some private kindergartens permission to buy their own textbooks and courseware from the local market; others install them from websites.

It should be mentioned that the majority of courseware is not designed by a team of experts or specialists in the field of early childhood education. Buckleitner (1999) stressed that children's courseware needs to be carefully designed by persons who are knowledgeable in the way young children think. For these aforementioned reasons, it remains unclear whether the courseware provided in Jordanian kindergartens is developmentally appropriate for the target age.

To the researcher's knowledge, no serious studies assessed early childhood educational courseware in Jordan. Due to a lack of current research on the assessment of children's courseware, this study was carried out to provide a research-based evaluation framework concerning the appropriateness of the courseware employed in Jordanian kindergartens. In addition, this study aimed to identify differences in children's courseware that are attributed to the type of kindergarten. This study also contributes valuable data and information to the literature on the field of developmental courseware. This is an important area of research as it will inform decision makers, curriculum designers and kindergarten teachers about the status of children's courseware in use. It is hoped to pave the way for more research in this particular field.

The research questions aimed to be answered in the context of this study are as follows:

1. To what extent does children's courseware employed in Jordanian kindergartens match DAC criteria?
2. In assessing the children's courseware in light of DAC criteria, are there significant differences between the courseware that is employed in public kindergartens and those used in private kindergartens?

## **Methods**

### *Population and sample*

The population of this study consists of all courseware that is employed in public and private kindergarten classrooms in the capital, Amman. A simple random sample of 89 kindergartens, representing 5% of the kindergarten population, was drawn from the established population frame. One courseware was selected from each kindergarten using the "lottery" random method (Cohen & Manion, 1994). The selection of courseware within the kindergarten was made out based on two criteria: (1) its relation to kindergarten curriculum and (2) its availability in different kindergarten settings. After direct visits to the kindergartens, only 57 courseware programs (out of 89) were collected to be assessed ( $n = 35$  from private kindergartens and  $n = 22$  from public kindergartens). Seven kindergartens decided not to take part in the study, while 25 kindergartens were excluded from the study because they do not implement courseware in their teaching practice.

### *Research instruments*

The Haugland Developmental Software's (1997) scale was utilized in this study to evaluate young children's early childhood courseware. This scale was designed by Susan Haugland in 1997 to



distinguish courseware that is developmentally appropriate for young children. This scale has been developed based on the work of the Haugland and Shade (1990). The scale is based on 10 criteria, namely, age appropriateness, child in control, clear instructions, expanding complexity, independence, nonviolence, process orientation, real-world model, technical features and transformations.

#### *Correcting the scale*

All items in the scale were answered on a 5-point scale, with 5 indicating “*outstanding*” and 1 indicating “*unsatisfactory*.” As value 3 formed the half of this scale, the half degree ranged between 2.50 and 3.49, representing the mean degree of the scale and falling within in the classification of “*satisfactory*.” Therefore, two classifications lower than “*satisfactory*” and two categories higher than “*satisfactory*” have been identified as follows: “*outstanding*” classification ranges between 4.00 and 5.00; “*good*” classification ranges between 3.50 and 3.99; “*poor*” classification ranges between 1.75 and 2.49; and “*unsatisfactory*” classification ranges between 1 and 1.74.

#### *The validity of the scale*

To test the validity of the scale, it was handed out to eight referees who are early childhood education and instructional technology professors working in two universities in Jordan. Their role was to confirm whether the content of the scale was accurate and adequate in terms of language clarity, to check the relevance of each item to the main domain in the scale, to provide any additional comments or corrections, and to indicate whether each item (in the scale) is considered to be a developmental courseware criterion and is suitable for the cultural background in Jordan. In light of their modifications, some items were added to the questionnaire; others were excluded and others were refined.

The researcher and two PhD candidates did a pilot study on five courseware programs. They randomly selected five courseware programs from the study population but were not among the actual sample of this study and assessed these courseware programs based on the DAC scale. The percentage agreement among the raters was 0.88.

#### *Data collection*

For the purpose of this study, the researcher recruited two PhD candidates to give their opinion on whether each courseware was developmentally appropriate. They were experts in child development pursuing their PhD degree at The World Islamic Sciences and Education University in Amman, Jordan. Their duties were to conduct direct visits to the kindergartens to collect the required courseware and to participate in data analysis. The research assistants visited the kindergartens, met the kindergarten principals, explained to them the aims of the study and assured them the data collected will be held in strict confidence. One educational courseware was collected from each kindergarten. After the completion of the data analysis stage, all courseware was returned to the kindergartens that participated in this study.

#### *Data analysis*

The researcher held three meetings with his research assistants to help them understand the scale items and be familiar with it as well as to practice how to assess a number of courseware in accordance with the DAC criteria. Three assessors, including the researcher himself, the first research assistant and the second research assistant, assessed each courseware. Each assessor rated all 57 courseware programs separately. Then, the percentage of agreement between the researcher and each research assistant was calculated. The percentage agreements between the researcher and the first and second research assistant were 94% and 91% respectively. This high level of agreement showed that there was a high degree of reliability in this assessment.

Moreover, the researcher utilized descriptive statistics including means and standard deviations for each item in the scale and the average of all categories. In addition, the *t*-test for the independent

sample was used to see if differences existed in children's courseware based on the type of kindergarten variable.

## Findings

### *DAC as applied to children's courseware*

As shown in Table 1, the mean value for the total scale was satisfactory (3.09), representing a moderate degree of appropriateness. The most developmentally appropriate category found in children's courseware was "technical features." This category, falling within the classification of "outstanding," had the highest mean score 4.31, followed by the "clear instruction" category with a mean score of 3.67 and classified as "good." Next, the categories "nonviolence" and "process orientation" had mean scores of 3.48 and 3.46 respectively, falling within the "satisfactory" classification. Real-world model was ranked as the least developmentally appropriate in children's courseware with a mean score of 1.95, followed by "transformations" category with a mean score 2.07; both of these categories were classified as "poor."

Table 2 displays the results for the 10 categories in which the courseware was assessed in accordance with the DAC criteria. The table illustrates that the most developmentally appropriate categories were those related to the technical features category, which was classified as "outstanding" with a mean of 4.66, revealing that the "courseware runs quickly and installs easily." With regard to the "clear instruction" category, the results show that the most developmentally appropriate criterion found in courseware was "providing directions accompanied with visual prompts," which was classified as "good" with a mean of 3.86. Regarding the "nonviolence" category, the findings shown in Table 2 indicate that the most developmentally appropriate criterion found in the courseware was "demonstrating positive social values," which was also categorized as "good" with a mean of 3.71.

Furthermore, "building on what child already knows" was found to be the most DAC criterion in the category of "expanding complexity," categorized as "satisfactory" with a mean of 3.01. However, criteria related to "real-world model" and "transformations" were found "poor" when they were applied to the courseware, reflecting developmental inappropriateness. The criteria in these categories that obtained the lowest scores were "applying to real world problems" and "giving children opportunities to change objects and situations over and over," with mean scores 1.89 and 1.96, respectively, falling within the category of "poor."

### *Differences in children's courseware due to the type of kindergarten*

To examine the differences in children's courseware that are due to the type of kindergarten variable, the independent-samples *t*-test was utilized. As shown in Table 3, the results of the *t*-test

Table 1: The mean, standard deviation and rank of the categories included in the DAC criteria scale

No.	Category	Mean	Standard deviation	Rank
1	Age appropriateness	3.16	1.11	5
2	Child in control	3.03	0.86	6
3	Clear instructions	3.67	1.11	2
4	Expanding complexity	2.96	0.98	7
5	Independence	2.81	0.55	8
6	Nonviolence	3.48	0.92	3
7	Process orientation	3.46	0.91	4
8	Real-world model	1.95	0.56	10
9	Technical features	4.31	0.65	1
10	Transformations	2.07	0.61	9
	Total	3.09	0.29	

Table 2: The mean, standard deviation and rank of the items included in each category in the DAC scale

No.	Category/item	Mean	Standard deviation	Rank
Category 1: age appropriateness				
1	Has realistic expectations for child's skills and age level	3.17	1.19	1
2	Uses age-appropriate methods	3.03	1.51	3
3	Responds to children with different developmental levels	3.28	1.14	2
Category 2: child in control				
4	Child controls the level of difficulty	3.08	0.93	2
5	Child decides the flow and direction of the activity	2.94	1.20	4
6	Child can escape and return to the main menu anytime	2.84	1.11	5
7	Child sets the pace and have ample time to reflect or discuss what they are exploring	3.01	0.85	3
8	Child can explore and experiment without fear of making mistakes	3.26	0.99	1
Category 3: clear instructions				
9	Provides verbal instructions (sounds)	3.71	1.26	4
10	Provides simple and precise directions	3.63	1.17	3
11	Provides directions accompanied with visual prompts	3.68	1.31	1
12	Includes picture choices which make options clear to children	3.64	1.15	2
Category 4: expanding complexity				
13	Begins with child's current skill levels and builds on what child already knows	3.01	1.24	1
14	Has multiple challenge levels, moves easily to more complex concepts in a meaningful manner	2.77	0.92	3
15	Teaches powerful ideas (concepts/knowledge that children can internalize and apply to new situations or problems)	2.92	1.23	2
Category 5: independence				
16	Child can use the program independently	3.01	0.55	1
17	Adult supervision is not needed after initial exposure	2.61	0.977	2
Category 6: nonviolence				
18	Contains no violent objects, characters or actions	3.24	0.95	2
19	Demonstrates positive social values (ie, the importance of caring, cooperation, communication, sharing, expressing feelings, friendship and family)	3.71	1.17	1
Category 7: process orientation				
20	Stimulates Intrinsic motivation (the desire to explore, experiment and discover) not external rewards	3.40	0.96	2
21	Process engages more than the product	3.52	0.92	1
Category 8: real-world model				
22	Uses concrete and realistic models of objects and items in the child's world	2.05	0.91	1
23	Objects are in realistic proportions to each other (eg, the scale and color)	1.92	0.72	2
24	Applies to real-world problems	1.89	0.81	3
Category 9: technical features				
25	Has simple and easy-to-use icons	4.14	0.78	4
26	Uses quality animation, graphics, colors and sound effects	4.19	0.81	2
27	Runs quickly	4.66	0.66	1
28	Speed of courseware keeps child's interest	4.15	0.77	3
29	Installs easily	4.66	0.66	1
30	Saves children's work	4.07	0.82	5
Category 10: transformations				
31	Gives children opportunities to change objects and situations over and over	1.96	0.96	2
32	Teaches children about hidden processes (ie, sun and water on plant growth)	2.17	0.63	1

Table 3: The differences between the type of kindergarten (public and private) in the assessment of children's courseware

Category	Type of kindergarten	No.	Mean	Standard deviation	t	p
Clear instructions	Public	22	4.4773	0.64508	5.249	.000*
	Private	35	3.1643	1.05361		
Expanding complexity	Public	22	3.5758	0.82412	4.258	.000*
	Private	35	2.5810	0.87948		
Nonviolence	Public	22	3.9545	0.65300	3.314	.002*
	Private	35	3.1857	0.95552		
Total	Public	22	3.2713	0.17751	6.167	.000*
	Private	35	2.8867	0.25602		

\*Significant at the  $p < .05$  level.

showed that there were statistically significant differences at  $\alpha < 0.05$  in children's courseware that are attributed to the type of kindergarten. These differences were noticed only on three categories, namely, clear instruction, expanding complexity and nonviolence, and on the total in favor of courseware employed in the public kindergartens, while there were no significant differences due to the type of kindergarten in the remaining categories. That means that courseware utilized in the public kindergartens was more developmentally appropriate in the three abovementioned categories than those used in the private kindergartens.

## Discussion

The findings of the study indicated that the children's courseware used in kindergartens represented a moderate value of appropriateness. The mean value of the scale was (3.08), representing the average level of the scale, which was described in this study as satisfactory. This could be due to the fact that much attention has been paid recently in Jordan to the courseware and its applications and that there is a wide range of courseware available on the market from many sources. This kind of competition among companies can lead to more DAC. However, this result reflected the fact that the children's courseware employed was not in the higher levels of the scale (described as "outstanding" and "good"). This raises a question about the quality of the courseware. In the view of Grant *et al* (2012), successful learning via technology depends on the quality of the courseware. Haugland (2005) stressed that providing young children with high-quality courseware that is developmentally appropriate is a necessary consideration. Indeed, the courseware for young children should be of the highest possible quality and should reflect a high level of appropriateness.

The category found to be the most developmentally appropriate in children's courseware was "technical features." This finding was not surprising as the strength of most courseware that was assessed was in this category. The category of technical features was the only one described in the results as "outstanding" among all scale categories. This result may be attributed to the fact that most courseware included in this study is designed by courseware designers, who have strong knowledge in the technical aspects of the courseware, such as sound, animation, graphics, colors and other technical features related to installation and speed. This finding is similar to the work of Nikiforidou and Pange (2010) as the category of "technical features" which has been divided into three subcategories—graphics, video and animation quality, and the mouse use—was considered to be crucial as it ranked first among the DAC criteria.

Despite its importance to the courseware, the overemphasis on technical concerns, as Locakard, Abrams and Many (1997) argued, could not increase the courseware's appropriateness. This may call for the need for educational experts to work together with courseware designers in producing courseware for children. Buckleitner (1999) emphasized that graphics and style of music could have an influence on how children react to a courseware product.

Based on the analysis, there was another important component in the children's courseware that is related to "clear instruction," which was found to have the second rank, described as "good." In fact, the awareness that children learn in a different way from adults has increased among courseware designers, and many companies have begun producing courseware with simple instruction accompanied with auditory and visual prompts.

While all courseware needs to have clear instructions, courseware designed for children needs to pay particular attention to this element. This is because children benefit from courseware that provides them with simple and careful directions, verbal instructions, and direct directions accompanied with visual prompts (Haugland & Wright, 1997). This is important as an opening menu that requires reading would not be beneficial for pre-school children due to their limited ability in reading (Buckleitner, 1999). Based on Vygotsky theory of the benefits of early computer use, courseware should be designed to provide an appropriate amount of assistance such as verbal feedback and instructions (Schetz, 1994).

The findings indicated that the "nonviolence" and "process orientation" categories were found to be under "satisfactory." Violence was not present in most of the assessed courseware, and this is because of the negative effect of violence on children's behaviors (Ferguson, 2007).

In this context, Haugland (2005) considered that avoiding violence from children's courseware was a very important issue in selecting DAC. The aim of most courseware is to maximize profit, but producing courseware that contains violence would not be beneficial for most courseware companies. Violence is glaringly obvious in electronic games compared to courseware. Nonviolence and process orientation categories with a satisfactory degree of appropriateness reflected the fact that learning needs for children are taken into account by designers in producing courseware.

A poor degree of appropriateness was found in categories related to "real-world models" and "transformations" as they were the least developmentally appropriate criteria. This is because these criteria require individuals who have a good understanding of children's cognitive development and how children think and view their world. Indeed, children must learn how the world works, and their courseware should include concrete representations of objects found in meaningful settings. They should also allow children to repeatedly alter objects to discover how different elements impact the world they live in (Haugland & Wright, 1997).

This poor degree of appropriateness may be because developers lack this knowledge, or they may think that these skills are not on a child's developmental level. Courseware publishers may be more concerned about the technical aspects and the clear instruction of their product. They may avoid tackling the elements related to children's cognitive development and may not have the background to consider them. In the view of Haugland (1997), children's courseware is often selected based on the perspectives of publishers and advertising but may not reflect the developmental needs of children.

The findings have also revealed statistically significant differences at  $\alpha < 0.05$  in children's courseware between courseware employed in public kindergartens and that employed in private kindergartens. The differences were noticed in only three categories and in the total and were found in favor of those employed in the public kindergartens. This means that the courseware implemented in public kindergartens was more developmentally appropriate than those implemented in private kindergartens in these categories. This result might be justified in light of the MOE's recent interest in integrating technology into pre-school education. The ministry provides its public kindergartens with computers and courseware. The well-known children's courseware application called "KidSmart" and the courseware designed by the Regional Center for Development Educational Software were only implemented in public kindergartens. This courseware has been designed by experts who have backgrounds in child development and learning. However, private kindergartens do not employ these courseware programs. Instead, much traditional and commercial courseware

was found in these kindergartens. This may explain why private courseware implemented in private kindergartens was founded less developmentally appropriate.

### **Limitations of the study**

These results are limited by three factors. First, teachers' and children's assessments of the courseware were not part of this study. Second, only one instrument, Haugland's (1997) scale, was utilized to assess children's courseware; the use of data collected from other measures would probably provide different results. Third, no attempt was made to investigate the perceptions of courseware designers, which could have enhanced the results by shedding light on their priorities in producing children's courseware. Therefore, it would be worthwhile to explore these factors in further research.

### **Conclusion**

In this study, the Haugland Scale was utilized to gauge how developmentally appropriate for young children the courseware being used in Jordanian kindergartens is. The findings suggested that the courseware is moderately appropriate and more appropriate in public than private kindergartens.

Because the courseware implemented in Jordanian kindergarten was not at higher level of the scale (*outstanding* and *good*), more attention should be paid to developing the quality of these courseware programs to make them more developmentally appropriate for young children. Early childhood educators, principals and parents need to be informed about the features of DAC. Moreover, kindergarten teachers should be encouraged to make informed decisions about available courseware in order to select children's courseware appropriately and wisely. This could be done by providing training programs to teachers in order to improve their technological skills to be able to select and assess courseware for developmental appropriateness. According to Tsantis *et al* (2003), teachers must be sure to examine the underlying educational content, format and features before purchasing a courseware. They also must apply their professional scrutiny to children's courseware as they would to other instructional tools they use in their teaching practice.

Courseware companies should consider DAC criteria in producing, designing and updating their educational children's courseware using not only the Haugland Developmental Scale (1999), but also appropriate and timely measures and scales which may appear in the future as a result of the fast development of emerging courseware programs, devices and tools. They also should design courseware based on children's perspectives. That is to say, in the process of producing and designing children's courseware, it is important to avoid adults' perspectives and to pay more attention to children's abilities, needs and interests as this will result in more DAC (Tsantis *et al*, 2003).

In moving forward, there is a need to further develop the Haugland's (1997) scale or to create a whole new scale, especially in light of mobile technologies such as tablets in which some DAC items such as mouse usage will no longer apply.

As the Haugland scale only lead to general observations based on DAC, there is also a need to further develop these measures to include criteria to help courseware developers find out how they can better provide the learning activities that should be provided for kindergarten-aged children. Examples of these criteria include, but are not limited to, advances in mental representation through language, adapting speech to fit the needs of their listeners, make-believe play (increasingly more collaborative and less self-centered), spatial understanding, insights into types of symbol–real-world relation (eg, photographs and maps, etc) and developing children's multiple intelligences (ie, visual–spatial, verbal–linguistic, logical–mathematical intelligences, etc).

Moreover, Haugland scale did not address the cultural appropriateness criteria; thus, there is a need to include domain which is related to cultural appropriateness. This is very important as courseware should be designed to reflect cultural context of a country in which ethical, racial and

linguistic groups vary from other countries. In general, western courseware is not always appropriate to Jordanian context due to cultural considerations. Jordanian courseware developers should design a courseware that addresses the children's language and fosters belonging to their nation, traditions and customs. The courseware should reflect challenges and problems that Jordanian society faces, such as traffic accidents, respecting diversities, respecting labor work and establishing Jordanian and Arab core values, such as generosity and chivalry. Moreover, different pedagogical approaches need to be reflected in the courseware such as encouraging peer instruction and introducing concepts via some Jordanian popular play and songs.

As the results revealed that the courseware utilized in the private kindergartens was less developmentally appropriate than those used in the private kindergartens. Thus, the MOE needs to take a leading role in evaluating the quality and appropriateness of children's courseware being utilized in their public and private kindergartens, and it must ensure that kindergartens avoid purchasing or using courseware that is either ineffective with children and or inconsistent with their development and learning. It might be useful if the MOE encourages private kindergartens to employ its locally produced courseware in their kindergartens.

In this sense, courseware should offer something unique and important for young children. It is undeniable that the selection of DAC is an important and essential task for those who work with children. The MOE should ensure that children's courseware programs are designed by a panel of experts, comprised of teachers and people who are knowledgeable about computer design and its applications, as well as individuals who have a good understanding of children's development and learning. Finally, it is hoped that the current study may lead to change the status of the selection of children's courseware and make it developmentally appropriate.

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